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ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM

SMALL COMMUNITY POPULATION IMPACT MODEL

PREPARED FOR

BUREAU OF LAND MANAGEMENT
ALASKA OUTER CONTINENTAL SHELF OFFICE

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NOTICE

ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM
SMALL COMMUNITY POPULATION IMPACT MODEL

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I. INTRODUCTION

As part of the Alaska OCS Socioeconomic Studies Program, the Institute of Social and Economic Research has developed a model which can be used to project the impact of OCS development on small Alaska communities or regions. This model's development was documented in the OCS Technical Report Number 24, Design of a Population Distribution Model. The model has been used on a number of occasions to forecast small-area population growth. It has been used to estimate the effect on the census divisions of OCS development in the Northern and Western Gulf of Alaska. These forecasts were used in the preparation of the Environmental Impact Statements for OCS lease sales number 46 and number 55.

This paper describes an extension of this previous modeling effort. The extension is along two major lines suggested by the application of the model. First, changes to the structure of the model were made. The original model produced reasonable results; this was judged both examination of a historic case and the model's response to changes in parameter values. The model, however, was cumbersome to use and did not produce estimates of all of the information required by the OCS office. Changes in the structure of the model have made it easier to use and have produced projections of the larger amount of information required by the OCS office.

The second extension of the population distribution model involved an examination of some of the important model parameters. Sensitivity tests performed when the model was applied to the Kenai oil boom experience showed the results of the model to be highly sensitive to parameter assumptions. Two of the most important parameters are the local labor market response rates (the rate at which local labor responds to exogenous employment opportunities) and the multiplier (the rate at which local employment increases to serve the exogenous sector). Since the model is simply an accounting framework which describes the process of growth, the values of these parameters determine the growth projected for the region. The most accurate method of estimating these parameters would involve survey research in the specific area of study. Time and financial constraints often do not allow this effort. For these reasons, a framework for estimating these parameters should be developed. Part of this study begins the development of such a framework; the work is based on specific Alaskan research, as well as research in other areas. It attempts to establish ranges for the selection of the parameters.

Projections of the future can be used by policy makers to determine future demands and needs for services or to examine the effects of alternative policy choices. The model described below can be used for both purposes. It can be used to assess the future need for services in small Alaskan communities, as well as to examine the impact of OCS development under alternative assumptions.

Like all projections, those produced by this model are probabilistic. The structure of the model may not capture all of the important relationships; the parameters may not accurately reflect future structural change;

and the assumed growth of the exogenous variables may not take place. All of these affect the likelihood of any one forecast's actually occurring, but they do not limit the usefulness of the model to decision makers. The range of possible futures can be examined by testing the sensitivity of any results to important parameters. The sensitivity of a forecast can be tested by examining the effect on the results of changing these parameters.

This report describes a small community impact model (SCIMP) which can be used to describe the population and employment impacts of OCS development. Section II describes the model itself; this section highlights the major changes introduced in this research. The third section provides an idea of the range of values which the important parameters can take. Section IV provides an example of the model in use; the model is used to examine the impact of OCS development in the Bering Sea-Norton Sound on Nome. The sensitivity of the model to various assumptions is examined.

II. SCIMP: A SMALL COMMUNITY IMPACT MODEL FOR ALASKA COMMUNITIES

Introduction

Service bases used in Alaska OCS development will, in most cases, be located in or near small, rural Alaska communities. The undeveloped, remote nature of Alaska coastal communities in major lease sale areas guarantees this. The employment associated with OCS development is, in all cases, large relative to the size of these coastal communities. The in-migration into these small communities as a result of OCS development will be one of the major impacts of OCS activity. Both the social and economic character of these communities may be changed by this population in-migration. The need to assess the population impacts of OCS development was the original reason for the development of a population impact model.

This section describes the most recent version of the small community impact model. Emphasis is placed on explaining the population dynamics described by the model. The model description will highlight changes from the original verison of the model (Huskey, Serow, Volin, 1979).

The present version of the model maintains the most significant features of the original. Changes which have been made reflect both the application of the original model in specific analysis of the impacts of proposed OCS lease sales (Nebesky and Huskey, 1979; and Porter and Huskey, 1979) and discussions with the Alaska OCS office about required information for these impact analyses. The present model is similar to the original in its logical structure. It is an economic-demographic interaction model which stresses the link between the local labor supply and in-migration. It is also an accounting model with the flexibility of parameter choice which is required for application in alternative areas of rural Alaska. The most significant changes have been made to the baseline sector; these changes make this sector easier to project and more accurately describe the population dynamics.

The present model projects growth in four separate sectors--the baseline sector, the development sector, the operations sector, and the secondary sector. In each of these sectors, the model projects separately the major demographic events--births, deaths, and migration--which determine population change. Population is projected for each period of the projection cycle by adding changes in these demographic events to the previous period population. Although these are separate sectors, they are linked through labor supply and demand considerations in each sector. The remainder of Section II describes each sector of the model.

The Baseline Population

The population which would reside in the community in the absence of OCS development is the baseline population. Changes in the level of this population are important to the analysis of OCS impact for two reasons. First, the relative impact of OCS development will depend on the size of the affected community. A given size OCS development will have a smaller relative effect the larger the community serving as its base. Secondly, the level of baseline population is important as a source of labor supply for OCS employment.

The community will experience population change in the absence of OCS development. Population will change as a result of three demographic events--births, deaths, and migration. The excess of births over deaths determines the natural change in the population. Births and deaths are a function of the age and sex distribution of the population. Migration into and out of the community also affects the population levels. Migration is affected by changes in the employment opportunities and the amenities in the community. The model describes each of these determinants of population change.

A cohort survival approach is used to model the growth of the baseline population. Natural increase is projected by applying age-sex-race-specific fertility and survival rates to the appropriate cohort population. Once these rates are determined, the levels of births and deaths are determined by the population in a specific cohort. Application of these rates to the previous period population provides a projection of the survived population at the end of the period. Survival and fertility rates are assumed to remain constant throughout the projection period.

Community population levels will also be affected by the level of in- and out-migration. The model accounts for two types of migration: migration determined by employment opportunities and noneconomic migration. Noneconomic migration is modeled by applying age-sex-race-specific migration rates to the survived population; these rates are assumed to remain constant throughout the projection period. Migration rates define the net migration as a function of the cohort-specific survived population. Noneconomic migration includes such types of migration as moving for school or migration connected with retirement.

One of the major improvements in the current model involves the addition of a description of the baseline sector economy. Growth of employment opportunities and the baseline labor force determine the level and direction of economic migration. The labor force in the baseline is determined by applying age-sex-race-specific labor force participation rates to the specific cohorts. The size of the labor force is determined by the size and distribution of population by cohorts; labor force participation rates are assumed to remain constant throughout the projection period.

An economic base model of the local economy is used to project total employment. Economic base models assume a major distinction can be made between basic industries in which the level of activity is determined outside the region and nonbasic or support industries which exist to provide goods and services to the local community. In an economic base model, once the level of basic employment is determined, the level of support sector employment is determined by a series of multipliers which describe the relationship between the two sectors. The model describes four basic sectors (manufacturing-fishing, state and federal government, mining and special projects construction, and military) and two support sectors (local construction-transportation and finance-trade-services). In addition, the model projects the level of local government employment as a function of population and revenue. The model requires assumptions about the level of exogenous employment by sector and local government revenues and produces estimates of total and support sector employment.

Migration occurs to clear the local labor market; in-migration occurs when employment opportunities exceed the labor force, and out-migration occurs in the opposite case. When economic migration occurs, migration may be in excess of the amount needed to bring labor force and employment into equilibrium; the model allows two additional types of migration. One source of additional migration may be migrants who come to the community because of the employment opportunities but do not find employment. The model allows migration to occur until some equilibrium level of unemployment is reached or some proportion of this level is reached. The second source of additional migration includes the dependents of economic migrants. An age-sex-race distribution is applied to the number of direct migrants which distributes both direct migrants and their dependents to age-sex-race cohorts.

The model projects total population by adding the economic-induced migrants to the survived population, the noneconomic migrants, and the military/dependent population. Population is disaggregated into those not in the labor force, those in the labor force but unemployed, and those employed.

The baseline portion of the model is described below. The following convention will be observed in defining the cohorts for population variables: X(A,S,R) where X is the variable, A is the age cohort, S is the sex cohort, and R is the race cohort.

BASELINE POPULATION

Survived Population and Noneconomic Migration

1. $$BBTH(1,S,R) = SXR(1,S,R) * [\sum_{A=1}^{14} FR(A,2,R) * BPOP(A,2,R)(-1)]$$

2. BP(A,S,R) = SR(A,S,R) * BPOP(A,S,R) (-1)

3. BSPP(1,S,R) = [BBTH(1,S,R) + F(1) * BP(1,S,R)] * MR(1,S,R)

4. BSPP(A,S,R) = [(1-F(A-1)) * BP(A-1,S,R) + F(A) * BP(A,S,R)] * MR(A,S,R)

5. BSPP(14,S,R) = [(1-F(13)) * BP(13,S,R) + BP(14,S,R)]

Baseline Economy

6. $$LF = \sum_{A} \sum_{S} \sum_{R} LFPR(A,S,R) * BSPP(A,S,R)$$

7. EML = LØ + L1 * BPOP(-1) + L2 * REV

8. EMS = M10 + M11 * EMG + M12 * EMA + M13 * EMX + M14 * EMM

9. EMC = M20 + M21 * EMG + M22 * EMA + M23 * EMX + M24 * EMM

10. TE = EML + EMS + EMC + EMG + EMA + EMX

Economic Migration

11. UNE = LF-TE

12. BEMG = $\left(\frac{TE}{1-U\emptyset} - LF\right) * B2$

13. BPOP(A,S,R) = IF BEMG LE ∅ THEN BSPP(A,S,R) + C1(A,S,R) * BEMG
ELSE BSPP(A,S,R) + C2(A,S,R) * BEMG

Total Baseline Population

14. BPOPP = $\sum_{A} \sum_{S} \sum_{R}$ BPOP(A,S,R)

15. BASP(A,S,R) = BPOP(A,S,R) + EMM * C3(A,S,R)

16. BASPP = $\sum_{A} \sum_{S} \sum_{R}$ BASP(A,S,R)

17. NLF = BPOP - (LF + BEMG)

18. U = LF + BEMG - TE

19. TOTE = TE + EMM

Required Inputs:

SXR(1,S,R) = Distribution of sex at birth by race.

FR(A,2,R) = Age and race-specific fertility rates which measure births per woman in each age-race cohort.

SR(A,S,R) = Age, sex, and race specific survival rates which describe the probability that a member of a specific cohort survives over the period.

MR(A,S,R) = Age, sex, and race specific migration rates which define cohort specific net migration as a proportion of the cohort population.

F(A) = The age-specific advancement rate. This rate defines the proportion of the population which advances to the next cohort; it is greater than zero when the cohort contains more years than the projection cycle.

LFPR(A,S,R) = Age, sex, and race specific labor force participation rate which describes the proportion of each cohort which is in the labor force.

LØ,L1,L2 = Local government employment multipliers which describe the relation between the specific variable and local government employment.

REV = The level of exogenous revenue to the local government; requires assumed level for every year in the projection period.

M1Ø,M11,M12,M13,M14,M20,M21,M22,M23,M24 = Basic-nonbasic multipliers which describe the increase in the specific nonbasic industry employment with an increase of one employee in the specific basic sector.

EMG = State and federal government employment; requires assumed level for each year of the projection period.

EMA = Employment in fisheries and manufacturing; requires assumption for each year of the projection period.

EMX = Employment in mining and special projects construction; requires assumption for each year of the projection period.

EMM = Military employment; requires assumption for each year of the projection period.

UØ = Equilibrium unemployment rate.

B2 = Parameter of adjustment.

C1(A,S,R), C2(A,S,R) = Migrant and dependent age-sex-race distributions which describe the number of direct and dependent migrants per direct migrant in each cohort. Distributions differ for out- and in-migration.

C3(A,S,R) = Military and dependent age-sex-race distribution.

Model Outputs

BBTH(A,S,R) = Births by age, sex, and race.

BSPP(A,S,R) = Age-sex-race specific survived civilian population which is adjusted for noneconomic migration.

LF = Baseline labor force.

EML = Baseline local government employment.

EMS = Baseline employment in finance, trade, and services.

EMC = Baseline employment in local construction and transportation.

TE = Total baseline employment.

BEMG = Economic baseline migrants.

BPOP(A,S,R) = Baseline civilian population by age, race, and sex which includes economic migrants.

BPOPP = Total baseline civilian population.

BASP(A,S,R) = Age-race-sex specific total population which includes military.

BASPP = Total baseline population.

NLF = Population not in the labor force.

U = Unemployed population.

TOTE = Total civilian and military population.

Note: Excludes definition of those variables only used internally by the model.

The Development Sector

This version of the community impact model describes OCS induced population growth in three sectors: development, operations, and secondary. The distinction between the two direct sectors--development and operations--is necessary because of assumed differences in demographic characteristics and tenure of the associated in-migrants. In all sectors, the major determinants of migration are the same; in-migration occurs so that the local labor market clears. In-migrants in the development phase are assumed to reside in the community for only a short time, which reflects the temporary nature of their employment. Because of this, they are assumed to bring fewer dependents than in the operations phase.

The major determinant of OCS in-migration in the development phase is demand for labor to work in the development phase of the project. Local residents supply labor to the project, but any excess labor demand must be met through in-migration of workers. Project labor demand is assumed to have two components: imported labor demand and local labor demand. It is assumed that a portion of the labor will be imported from outside the community because of special skills which are required and not found in the local community or because of previous contact of the employees with the contractor, which includes management and supervisory personnel. It is assumed that the remainder of the OCS development jobs could be filled by community residents. The model requires information on OCS development employment in each component of demand.

Local labor supplied to the project is a function of the size of the community and the willingness of the local population to take OCS jobs. The model describes the willingness of local labor to take OCS jobs by assumed labor response rates which describe the proportion of population supplying labor to the project. The response of the community population to OCS employment opportunities is assumed to vary across mutually exclusive components of the population--employed, unemployed, and not in the labor force.

In-migration of direct development workers occurs to fill the gap between local labor supply and the local labor demand. In-migration equals the total imported development employment plus the migrants required to fill the gap between local labor demand and supply. The level of direct development migration determines the associated dependent migration, which determines the total population effect of the development sector. The model uses a series of age-sex-race specific multipliers to project the number of in-migrant dependents as well as the age-sex-race distribution of the direct in-migrants. These multipliers describe the number of dependents and employees in each age-sex-race cohort per direct migrant.

Two additional assumptions about the location of direct migrants are required before the total population impact on the community can be determined. First, the number of workers in the OCS enclave are determined. Enclave development is typical of Alaska resource development in remote areas and involves the location of employees in camps where all services are provided. Enclave workers are assumed to bring no dependents. Secondly, direct in-migrants are adjusted to subtract out those who may commute from outside the community. This is not very likely in most remote areas of the state where there are no alternative places in commuting range. Assumed rates of enclave and residency are required by the model.

The final step in the development phase is to adjust each labor supply group (employed, unemployed, not in the labor force) by reducing them by the members who have taken OCS development jobs. The labor supplied from each group forms a pool of labor. It is assumed that labor is drawn directly from this pool without recognition of the labor supply group, so the number of local employees is subtracted from each labor supply group in proportion to the total supply.

The product of this sector of the model is an age-sex-race profile of the impact population for each year of the projection period. This process is repeated for each year in which development occurs; implicitly, this assumes migrants leave after each year. The model also produces estimates of the total direct employed migrants as well as the migrants in the enclave.

DEVELOPMENT PHASE

Employment Induced Migration

1. LS1 = P1 * TE + P2 * U + P3 * NLF
2. DEMP = DDL + DIMPT
3. D1 = DDL - LS1
4. D2 = IF D1 LE Ø THEN Ø ELSE D1
5. DEMG = D2 + DIMPT
6. DEME = E1 * DEMG
7. DEMR = G1 * (DEMG - DEME)

Population

8. Dem(A,S,R) = (DEMR + DEME) * DE(A,S,R)
9. DDM(A,S,R) = DEMR * DD(A,S,R)
10. DPOP(A,S,R) = DEM (A,S,R) + DDM(A,S,R)
11. DPOPP = $\sum_{A} \sum_{S} \sum_{R}$ DPOP(A,S,R)

Adjust Local Labor Supply

12. TE1 = IF D1 GE Ø THEN TE * (1-P1) ELSE TE * (1-P1 * (DDL/LS1))
13. U1 = IF D1 GE Ø THEN U * (1-P2) ELSE U * (1-P2 * (DDL/LS1))
14. NLF1 = IF D1 GE Ø THEN NLF * (1-P3) ELSE NLF * (1-P3 * (DDL/LS1))

Required Inputs

P1,P2,P3 = Labor response rate which describes the proportion of the specific population group which will supply labor to the OCS development sector.

DDL = Project development demand for local labor; requires yearly assumptions.

DIMPT = Project development demand for imported labor; requires yearly assumptions.

E1 = Proportion of in-migrant development workers in an OCS enclave.

G1 = Proportion of OCS nonenclave in-migrants residing in the community.

DD(A,S,R) = Age-sex-race distribution of in-migrant dependents which describes the number of dependents per direct migrant in each cohort.

DE(A,S,R) = Age-sex-race distribution of in-migrant employees.

Outputs

LS1 = Local labor supplied to the development sector.

DEMP = Total OCS development sector employment.

DEMG = Total direct development employee migration.

DEME = Development sector enclave employment.

DEMR = Development sector nonenclave community residents.

DEM(A,S,R) = Age-sex-race specific direct employee migrant population.

DDM(A,S,R) = Age-sex-race specific dependent migrant population.

DPOP(A,S,R) = Age-sex-race specific total OCS development impact population which includes enclave and resident population.

DPOPP = Total OCS development impact population.

TE1,U1,NLF1 = Components of labor status groups adjusted for local residents taking OCS development sector jobs.

Note: Excludes definitions of those variables only used internally by the model.

The Operations Sector

Tenure characteristics are the main difference between jobs in the development and operations sectors of an OCS project. Operations employment is assumed to be long term and permanent, in contrast to the temporary nature of development employment. Because of the long-term nature of this employment and the assumed stability of population which this brings, new in-migrants cannot be assumed to fill OCS jobs each period. The migrant population assumes a permanence in the community and the social, demographic, and economic considerations which alter the composition of this population over time must be considered. The OCS operations sector-induced population is subject to turnover and out-migration as well as to fertility and mortality.

In-migration is determined by the model in much the same manner as in the development phase. Project operations demand is determined exogenously in both its imported and local components. This local project labor demand is matched with local labor supplied to the operations phase of OCS activity to determine the in-migration required to fill the gap between local labor demand and labor supply. Local labor supplied to the operations sector is determined by the assumed labor response rates for each local labor status group. Total direct in-migration is that required to clear the local labor market plus the imported operations employment. In-migrant operations employment is adjusted for enclave and nonlocal residents in the same way as development employment. Resident, nonenclave employed migrants are assumed to bring dependents at rates determined by assumed dependent-to-employee distributions.

The long-term, permanent nature of operations employment opportunities and the stability of the population introduces an additional source of labor supply in any year--the direct OCS operations employees from the previous period. Migrant operations employees from the previous year are subject to mortality and turnover which reduces the labor supplied the project from this group. Mortality is described by an assumed series of age-sex-race specific survival rates as in the baseline sector. Rates describing the proportion of employees in any age-race-sex specific cohort remaining in the community after one year are used to describe turnover and adjust survived population by out-migrants. Those workers who remain from the previous period are allocated among the local and imported labor and enclave, nonenclave resident, and nonresident employees. These remaining operations employees are a source of labor supply for the operations sector (the labor response rate of this group is one). Because of the existing source of migrant labor, the model only calculates changes in the migrant population. The existing migrant labor is assumed to be the first choice to fill OCS operations jobs. When the existing migrant operations labor supply exceeds operations employment demand, as a result of a reduction in the employment levels, out-migration occurs. Once the level of local employment in operations is projected, each labor status group is adjusted to reflect this employment.

Dependent migration follows the pattern established by employment-related migration. The previous year's dependent migrant population is subject to mortality, out-migration, and fertility. These are all described by age-sex-race specific rates. Migration of dependents is assumed to be determined by the migration of the employed population. The change in dependent migrant population is determined by the change in the number of operations sector employed migrants in any year. Age-sex-race specific dependents per employee multipliers are used to project the dependent population in each cohort.

The model produces projections of the total impact population by age, race, and sex for each year of the projection period. Projections also include the total employed migrants and the location of this employment in enclaves and in the community.

OPERATIONS SECTOR

Survived Population

1. OEP(A,S,R) = SR(A,S,R) * OEM(A,S,R)(-1)
2. ODP(A,S,R) = SR(A,S,R) * ODM(A,S,R)(-1)

3. $$\text{OBTH}(1,S,R) = \text{SXR}(1,S,R) * [\sum_{A=1}^{14} \text{FR}(A,2,R) * \text{ODM}(A,2,R)(-1)]$$

4. OSEP(A,S,R) = [(1-F(A-1)) * OEP(A-1,S,R) + FA * OEP(A,S,R)] * TO(A,S,R)
5. ODSP(1,S,R) = [OBTH(1,S,R) + F(1) * ODP(1,S,R)] * TD(1,S,R)
6. OSDP(A,S,R) = [(1-F(A-1)) * ODP(A-1,S,R) + F(A) * ODP(A,S,R)] * TD(A,S,R)
7. OSDP(14,S,R) = [(1-F(13)) * ODP(13,S,R) + ODP(14,S,R)] * TD(14,S,R)

Employment-Induced Migration

8. $OSEPP = \sum_{A} \sum_{S} \sum_{R} OSEP(A,S,R)$

9. Z1 = IF TOEM(-1) GT Ø THEN (OSEPP/TOEM(-1)) ELSE Ø

10. OSENR = Z1 * OENR(-1) - nonresident

11. OSEPT = OSEPP + OSENR

12. OEMP = ODL + OIMPT

13. LS2 = P4 * TE1 + PS * U1 + PL * NLF1

14. OSL = OSEPT - Z1 * OIMPT(-1)

15. O1 = ODL - OSL

16. O2 = O1 - LS2

17. NOEMG = IF O1 LT Ø THEN O1 + (OIMPT - Z1 * OIMPT(-1))
ELSE (IF O2 LT Ø THEN (OIMPT - Z1 * OIMPT(-1))
ELSE (O2 + OIMPT - Z1 * OIMPT(-1)))

18. NOEME = E2 * NOEMG

19. NOEMR = G2 * (NOEMG - NOEME)

20. NOENR = NOEMG - NOEME - NOEMR

Population

21. N1(A,S,R) = IF OSEPP EQ Ø THEN Ø ELSE (OSEP(A,S,R)/(OSEPP)

22. $OSDPP = \sum_{A} \sum_{S} \sum_{R} OSDP(A,S,R)$

23. N2(A,S,R) = IF OSDPP EQ Ø THEN Ø ELSE (OSDP(A,S,R)/OSDPP)

24. NOEM(A,S,R) = IF NOEMG LT Ø THEN (NOEME + NOEMR) * N1(A,S,R)

ELSE (NOEME + NOEMR) * OE(A,S,R)

25. NODM(A,S,R) = IF NOEMG LT Ø THEN NOEMR * N2(A,S,R) * (OSDPP/OSEPP)

ELSE NOEMR * OD(A,S,R)

26. OEM(A,S,R) = NOEM(A,S,R) + OSEP(A,S,R)

27. ODM(A,S,R) = NODM(A,S,R) + OSDP(A,S,R)

28. OPOP(A,S,R) = OEM(A,S,R) + ODM(A,S,R)

29. $OPOPP = \sum_{A} \sum_{S} \sum_{R} OPOP(A,S,R)$

30. $TOEM = \sum_{A} \sum_{S} \sum_{R} OEM(A,S,R)$

31. OENR = NOENR + OSENR

32. OEME = E2 * [TOEM + OENR]

Adjust Local Labor Supply

33. TE2 = IF O1 LE Ø THEN TE1 ELSE (IF O2 GE Ø THEN TE1 * (1-P4)

ELSE TE1 * (1-Pr * (O1/LS2)))

34. U2 = IF O1 LE Ø THEN U1 ELSE (IF O2 GE Ø THEN U1 * (1-P5)

ELSE U1 * (1-P5 * (O1/LS2)))

35. NLF2 = IF O1 LE Ø THEN NLF1 ELSE (IF O2 GE Ø THEN NLF1 * (1-P6)

ELSE NLF1 * (1-P6 * (O1/LS2)))

Required Inputs

TO(A,S,R) = Age-sex-race specific turnover rates of operations sector migrant employment which describes remaining proportion of previous year migrants. In-migrant workers who leave operations employment through turnover are assumed to leave the community.

TD(A,S,R) = Age-sex-race specific turnover rates for dependent migrants.

ODL = Operations sector demand for local labor; requires yearly assumptions.

OIMPT = Operations sector demand for imported labor; requires yearly assumptions.

P4,P5,P6 = Labor response rates which describe the proportion of each respective population group which would supply labor to the operations sector of the OCS project.

E2 = Proportion of in-migrant operations workers in an OCS enclave.

G2 = Proportion of OCS nonenclave in-migrants residing in the community.

OE(A,S,R) = Age-sex-race distribution of in-migrant operations sector employees.

OD(A,S,R) = Age-sex-race distribution of in-migrant dependents which describes the number of dependents per direct migrant in each cohort.

Model Outputs

LS2 = Local labor supplied to the operations sector.

OEMP = Total OCS operations sector employment.

NOEMG = The change in the level operations sector in-migrant employees.

OEM(A,S,R) = Age-sex-race specific distribution of operations sector in-migrant population.

ODM(A,S,R) = Age-sex-race specific distribution of operations sector dependent in-migration population.

OPOP(A,S,R) = Age-sex-race specific distribution of total operations sector impact population which includes enclave and resident population.

OPOPP = Total OCS operations impact population.

TOEM = Total OCS operations resident employment which includes enclave employment.

OEME = Operations sector enclave employment.

TE2,U2,NLF2 = Components of labor status groups adjusted for local residents taking OCS operations sector jobs.

Note: Excludes definition of those variables only used internally by the model.

The Secondary Sector

The population impacts of OCS development are not limited to the direct effects of development and operations employment. Another important component of migration is that which responds to secondary employment opportunities. Increased OCS employment may result in an expansion of support sector employment opportunities in the community which may also lead to migration. This version of the model is distinguished by a separate secondary response sector which combines the secondary response to both OCS development and operations employment.

The model allows three sources of secondary employment expansion. The first is the increase in local government employment. Because much of rural Alaska has only limited local government, we cannot expect a proportional expansion. Local government employment will be affected by both the population increase and revenues which result from OCS development, such as increased property taxes from the location of service base or production facilities. The second source of secondary employment is the expansion of the local support sector employment to serve the additional

OCS employees and their dependents. This relationship is described in the model by a series of multipliers which are applied to the direct OCS employment to determine the level of necessary secondary employment. The multiplier describes the support sector employment per employee in the OCS sector. The model allows multipliers to differ between operations and development sectors and between enclave and nonenclave employment. The response of the secondary sector may be less to development activity since it is temporary and less to the enclave sector since it has little interaction with the community. The final component of the secondary employment response is the replacement of those community residents who took jobs on the OCS project.

Migration in the secondary sector is determined as in the other sectors; direct employee migration occurs to clear the local labor market and determines the level of dependent migration. The assumed levels of OCS employment and exogenous revenues determine, through assumed multipliers, the induced local government and support sector labor demand. The assumed local labor response to direct OCS employment opportunities determines the labor required to replace local labor which has taken OCS jobs.

The potential local labor supply for secondary employment is determined by assumed labor response rates. It is assumed that labor will be supplied from only the unemployed and not-in-the-labor-force sectors of the community population since employed residents will not be able to improve their economic position. There are two additional sources of labor supply assumed in the secondary sector, the in-migrant support sector population from the previous year and the dependents of in-migrants in the operations and development sectors. As in the operations sector, secondary employee in-migrants are assumed to take long-term, permanent jobs and remain in the community from one period to the next. These migrants are subject to mortality and turnover, and the remaining migrants supply labor for secondary employment. Dependents of direct OCS employees are assumed to supply labor as determined by assumed labor force participation rates. Labor is assumed to be chosen for secondary employment--first from local residents, secondly from the previous year's secondary employee migrant population, and finally from direct OCS dependents. Migration occurs in any year to fill excess labor demand. Migration may be negative if the locally supplied labor plus the previous year's migrants exceed the secondary labor demand.

Dependent migration is determined by a series of age-sex specific multipliers which describe the dependent population per secondary employee by cohort. Dependents of these migrants are subject to births, deaths, and out-migration.

A final component of the secondary response is the migration of individuals in response to OCS employment opportunities who do not find work and become unemployed migrants. As in the baseline sector, this migration is assumed to be a function of an equilibrium unemployment rate. Unemployed migrants are also assumed to bring dependents.

The model produces projections of the total population response from this sector by age, sex, and race cohorts. Projections of the increased secondary employment are also produced.

SECONDARY RESPONSE

Survived Population (includes turnover)

1. SEP(A,S,R) = SR(A,S,R) * SEM(A,S,R)(-1)

2. SDP(A,S,R) = SR(A,S,R) * SDM(A,S,R)(-1)

3. $SBTH(1,S,R) = SXR(1,S,R) * [\ \sum_{A=1}^{14} FR(A,2,R) * SDM(A,2,R)(-1)\ ]$

*4. SSEP(A,S,R) = [(1-F(A-1)) * SEP(A-1,S,R) + F(A) * SEP(A,S,R)]
* TO(A,S,R)

5. SSDP(1,S,R) = [SBTH91,S,R) + F1 * SDP(1,S,R)] * TD(1,S,R)

6. SSDP(A,S,R) = [(1-F(A)) * SDP(A-1,S,R) + F(A) * SEP(A,S,R)]
* TD(A,S,R)

7. SSDP(14,S,R) = [(1-F13) * SDP(13,S,R) + SDP(14,S,R)] * TD(14,S,R)

Employment-Induced Migration

8. $SSEPP = \sum_{A} \sum_{S} \sum_{R} SSEP(A,S,R)$

9. $DLS = \sum_{A} \sum_{S} \sum_{R} (\ [ODM(A,S,R) + DOM(A,S,R)] * LFPR(A,S,R)\ )$

10. SEML = N11 * (OPOPP - OEME)(-1) + N12 * (DPOPP - DEME)(-1)

+ N13 * XREV(-1) + N14 * (SPOPP)(-1)

11. SEMS = N15 * (OEMP - OEME) + N16 * (DEMP - DEME) + N17 * (OEME + DEME)

12. SEMC = N18 * (OEMP - OEME) + N19 * (DEMP - DEME) + N20 * (OEME + DEME)

13. STE = SEML + SEMS + SEMC + (TE - TE2)

14. LS3 = P7 * U2 + P8 * NLF2

15. S1 = STE - LS3

16. S2 = S1 - SSEPP

17. S3 = S2 - DLS

18. NSEMG1 = IF S1 LT Ø THEN S1 ELSE (IF S2 LT Ø THEN S2

ELSE (IF S3 LT Ø THEN Ø ELSE S3))

19. NSEMG = IF SSCPP + NSEMG1 LT Ø THEN -SSEPP ELSE NSEMG1

Population

20. $SSDPP = \sum_{A} \sum_{S} \sum_{R} SSDP(A,S,R)$

21. R1(A,S,R) = IF SSEPP EQ Ø THEN Ø ELSE (SSEP(A,S,R)/SSEPP)

22. R2(A,S,R) = IF SSDPP EQ Ø THEN Ø ELSE (SSDP(A,S,R)/SSDPP)

23. NSEM(A,S,R) = IF NSEMG LT Ø THEN NSEMG * R1(A,S,R)

ELSE NSEMG * SD(A,S,R)

24. NSDM(A,S,R) = IF NSEMG LT Ø THEN NSEMG * R2(A,S,R) * (SSDPP/SSEPP)

ELSE NSEMG * SD(A,S,R)

25. SEM(A,S,R) = NSEM(A,S,R) + SSEP(A,S,R)

26. SDM(A,S,R) = NSDM(A,S,R) + SSDP(A,S,R)

27. SPOP(A,S,R) = SEM(A,S,R) + SDM(A,S,R)

28. $SPOPP = \sum_A \sum_S \sum_R SPOP(A,S,R)$

29. $SEMM = \sum_A \sum_S \sum_R SEM(A,S,R)$

Unemployed Migrants

30. U3 = IF S1 GE Ø THEN U2 * (1-P7) ELSE U2 * (1-P7 * [STE/LS3])

31. NLF3 = IF S1 GE Ø THEN NLF2 * (1-P8) ELSE NLF2 * (1-P8 * [STE/LS3])

32. UMG = Y1 * [UØ * (LF + BEMG + NLF - NLF3) - U3]

33. UM = UMG + UMG * UDEP

Required Inputs

N11,N12,N13,N14,N15,N16,N17,N18,N19,N20 = Basic-nonbasic multipliers which describe the increase in the industry employment with an increase in the level of the specific variable.

P7,P8 = Labor response rates which describe the proportion of each respective population group which would supply labor to the secondary sector.

SE(A,S,R) = Age-sex-race distribution of in-migrant secondary sector employees.

SD(A,S,R) = Age-sex-race distribution of in-migrant dependents which describes the number of dependents per direct migrant in each cohort.

XREV = Local government revenues produced by the OCS project.

UDEP = The number of dependents per unemployed migrant.

X2(A,S,R) = Age-sex-race distribution of in-migrant unemployed and dependent population which describes the number of unemployed and dependents per direct migrant in each cohort.

Model Outputs

SEML = Local government employment increase resulting from OCS development.

SEMS = Increased employment in the local service, trade, and finance industries as a result of OCS development.

SEMC = Increased employment in the local construction and transportation industries as a result of OCS development.

DLS = Labor supplied by direct OCS employee dependents.

LS3 = Local labor supplied to the operations sector.

NSEMG = The change in the level of secondary sector in-migrant employees.

SEM(A,S,R) = Age-sex-race specific distribution of secondary sector in-migrant employees.

SDM(A,S,R) = Age-sex-race specific distribution of secondary sector dependent in-migrant population.

SPOP(A,S,R) = Age-sex-race specific distribution of secondary sector impact population.

SPOPP = Total OCS secondary sector impact population.

SEMM = Total OCS secondary employed in-migrants.

U3,NLF3 = Components of labor status groups adjusted for local residents taking OCS secondary sector jobs.

UMG = Total unemployed migrants.

UM = Total unemployed and dependent migration.

Note: Excludes definition of those variables used only internally by the model.

Summation Sector

The final sector of the model provides summaries of important variables which result from the assumptions and relationships in the model. This sector provides projections of local residents employed in each sector of the OCS activity--development, operations, and secondary--as well as the total level of local employment. It also projects total OCS population impact and total population. Total employment by industry is also projected. This sector also provides projections of total OCS employment and the enclave component of this employment. Table 1 describes the four output reports the model produces and the information contained in each.

SUMMATION

1. DLE = DEMP - DEMG
2. OLE = OEMP - (TOEM + OENR)
3. SLE = IF S1 GE Ø THEN (STE - S1 - (TE-TE2)) ELSE (STE - (TE-TE2))
4. TLE = DLE + OLE + SLE
5. TOCSP = OPDPP + DPOPP + SPOPP + UM
6. TOTPOT = BASPP + TOCSP
7. TOTPP(A,S,R) = OPOP(A,S,R) + DPOP(A,S,R) + SPOP(A,S,R) + UM
   * X2(A,S,R) + BASP(A,S,R)
8. TEML = EML + SEML
9. TEMS = EMS + SEMS
10. TEMC - EMC + SEMC
11. TEMX = EMX + DEMP + OEMP
12. TOCSE = DEMP + OEMP + STE - (TE-TE2)
13. ENCL = DEME + OEME

Model Outputs

DLE = Local residents employed in the development sector.

OLE = Local residents employed in the operations sector.

SLE = Local residents employed in the secondary sector.

TLE = Total local residents employed in OCS sectors.

TOCSP = Total OCS impact population.

TOTPOP = Total population.

TOTPP(A,S,R) = Age-sex-race specific total population.

TEML = Total local government employment.

TEMS = Total service, finance, and trade employment.

TEMC = Total local construction and transportation employment.

TEMX = Total mining and special project construction employment (includes OCS).

TOCSE = Total OCS impact employment.

ENCL = Total OCS enclave population.

Note: Excludes definition of those variables used only internally by the model.

TABLE 1. SCIMP OUTPUT REPORTS

Report #1	Report #2	Report #3	Report #4	Report #5
BASP(A,S,R)*	BBTH	DEMP	TLE	TOTPOP
BASPP	EML	DDL	DLE	TEML
DPOP(A,S,R)	EMS	DIMPT	OLE	TEMS
DPOPP	EMC	DEMG	SLE	TEMC
OPOP(A,S,R)	EMG	DEME		TEMX
OPOPP	EMA	DPOPP		
SPOP(A,S,R)	EMX	DEMR		
SPOPP	EMM	OEMP		
TOTPP(A,S,R)	BPOPP	ODL		
TOTPOP	BASPP	OIMPT		
	TE	DPOPP		
	U	OPOPP		
	NLF	TOEM		
	BEMG	OEME		
		DLS		
		XREV		
		SEML		
		SEMS		
		SEMC		
		SEMM		
		UMG		
		UM		
		TOCSE		
		ENCL		
		TOCSP		

*All provided in five-year intervals.

III. A FRAMEWORK FOR PARAMETER SELECTION

Introduction

In a test application, the original population impact model projected the historical growth of population and employment in the Kenai Census Division for the period of the Kenai oil boom (1960-1975) with reasonable accuracy. Sensitivity tests showed the results were highly sensitive to the parameter assumptions.

The small community population impact model is an accounting model. This model describes the population dynamics involved in community growth. Its structure is both consistent and theoretically correct. However, the model is simply a structure. Forecasts depend on assumptions about parameters. The model itself offers no preconception of the level of these parameters, and they must be chosen for each study.

This is the only type of model which is general enough to be used in a wide variety of rural Alaska communities. The alternative would be a statistical or econometric model estimated at the census division level. Such a model, which would develop parameter assumptions from historical relations, offers two problems. First, a separate model would have to be estimated for each census division. This would require more time and resources than is often available. Secondly, many of the smaller census divisions in Alaska provide no consistent historical relationships. The primary reason for this is the small size of the economies. These small economies may also experience structural change because the change associated with OCS development is relatively large. Knowledge of historical relationships would be of no help in assessing potential future changes when this is the case.

The SCIMP model would ideally be used in conjunction with a detailed study of the local economy which would determine the parameter levels. In many cases, such an analysis would not be possible because of time and money constraints. A substitute, although not a perfect substitute, would be to develop a general framework for selecting the parameters in any specific studies. A first step toward the development of such a framework is developed in this section.

This section investigates ranges for multipliers and labor response rates. These rates have been isolated in past studies as the most important for projections. Assumptions about other parameters such as survival and fertility rates will be improved with the results of the 1980 census. The following analysis will examine each of these sets of parameters. A short description of theoretical considerations will be followed by the analysis of both national and Alaska empirical work. Based on this analysis, we will suggest ranges of parameters which can be used with the SCIMP model to make projections.

Economic Base Multipliers

In the present version of the population impact model, the growth of the local economy is described in terms of economic base theory. Economic base theory is widely used in regional analysis. This theory assumes the region grows primarily as a result of increased export activity to other regions and that the determinants of the level of export activity are external to the region. In the simple version of economic base theory, the region's economy is separated into two sectors, the export or basic sector and the support or nonbasic sector. The function of the support sector is to serve the export sector and the associated population. The relationship between the export and support sectors is defined by the economic base multiplier.

The economic base multiplier describes the increase in support sector economic activity per unit of increase in economic activity in the support sector. In most applications, the units of economic activity are described in terms of employment. The use of employment is really a matter of convenience since employment data is the type most generally available. A more general measure of economic activity would be output. Using employment as the measure of economic activity is not an important limitation in this model since we are interested in describing population growth as a function of labor market interaction.

In reality, the growth process of a region is more complex than that described by simple base theory. One criticism of this simple theory is that it does not account for differences in the export-support sector relationship across regions. To account for this difference, economic base theory must consider the effect of alternative industrial structures and the size of the region. The structure of the basic or export sector will affect the size of the multiplier. For two regions with export sectors which are similar in size but not in composition, the nonbasic or support sector will be larger for the region with the more stable, longer-term industries in its basic sector. To the extent that the region's basic sector is made up of industries which buy inputs on the local market, the multiplier will be larger. The SCIMP model attempts to account for this by describing the basic sector in terms of its industrial composition and allowing the possibility of different multipliers for each industry.

A second explanation of regional differences in multipliers is the population differences of regions. The relationship between export and support sectors is a function of the amount of goods and services produced and consumed locally; the greater the proportion of goods consumed and produced locally, the greater will be the multiplier. We expect larger regions to produce in the region a greater portion of the goods and services they consume because of economies of scale. Economies of scale allow the reduction of per-unit production costs with increased output and allow the goods or services to be profitably produced in the region. Larger regions provide more opportunities for achieving economies of scale and provide a larger proportion of their goods and services locally. Because of this, they will have larger multipliers.

EMPIRICAL ANALYSIS

The purpose of this section is to provide guidance to the possible range of multiplier parameter values which can be used in specific studies. Empirical work from Alaska and other regions of the United States will be reviewed, but no specific estimate will be developed. The limited empirical work reviewed will not allow a specific estimate of the "correct" multiplier; but a single multiplier would not be appropriate for use in all areas. The empirical work in this section will serve as a check to estimates of parameters for specific studies and as a base for assumptions when there are not resources for specific research.

Two studies will be examined from other regions of the United States; these studies are by Conopask (1978) and Stenehjem and Metzger (1976). Both studies attempt to define industry-specific multipliers for non-metropolitan counties by examining the effect on the level of support sector employment of a change in the level of basic sector employment. Stenehjem and Metzger estimate their multipliers by examining cross-section data on nonmetropolitan counties from the 1970 Census. This data is analyzed by groups of states or subregions of the country. Conopask examines the multiplier in fifteen counties in the Northern Great Plains region of the country; the counties selected were those which experienced some major mining or energy project impact. Conopask used both cross-section and time-series data on the counties in his analysis. Both studies used regression analysis to estimate the multipliers for specific basic industries.

Conopask estimated multipliers using various regression techniques for manufacturing, mining, construction, government, and the basic sector components of certain traditional support sector activities. This final component was estimated using location coefficients and represented the activities of regional trade centers, like Anchorage. His estimates of multiplier values are shown in Table 2. This table shows the 95 percent confidence intervals as well as the mean value (in parentheses). Stenehjem and Metzger's results are also presented in Table 2; the results for those regions of the United States which were felt to most accurately reflect Alaska conditions are shown. Stenehjem and Metzger pooled industries in the basic sector to obtain the best results. (The publication showed only those multipliers which could be used for energy project impact analysis; i.e., the government multiplier was not presented.)

These studies provide what seem to be inconsistent results. These seeming inconsistencies may be explained by differences in industry definitions in the studies and differences in functional form. Conopask includes a portion of traditional support sector industries (trade, service, finance) in the basic sector of certain regional centers. Conopask also uses pooled cross-section time-series data, while Stenehjem and Metzger use only cross-section. The use of pooled cross-section time-series allows Conopask to capture changes in the structure of economies which may result only partially as a response to changes in the level of basic sector activity.

TABLE 2. SUPPORT SECTOR EMPLOYMENT PER BASIC SECTOR EMPLOYEE

		Stenehjem and Metzger Study	
	Conopask Study	Idaho, Montana, Wyoming	Nevada, Utah, Colorado, Arizona, New Mexico
Manufacturing	1.58 - 2.94 (2.26)	.7	1.7
Mining	.72 - 1.26 (.99)	.8	.5
Construction	.47 - .57 (.52)	.7	1.7
Government	1.78 - 2.08 (1.93)	-	-
Agriculture	*	.8	.5

*Nonsignificant results

SOURCES FOR TABLES:

J. V. Conopask, "A Data Pooling Approach to Estimate Employment Multipliers for Small Regional Economies," U.S. Department of Agriculture, Tech. Bulletin No. 1583, 1978.

E. Stenehjem and J. Metzger, "A Framework for Projecting Employment and Population Changes Accompanying Energy Development," Argonne National Laboratory, 1976.

Examining the results of these studies allows a range of possible multiplier parameter values to be established. Any specific work done with SCIMP should be consistent with this range of values. The results discussed above serve as a check on specific work on rural Alaska; any specific work which diverges a great deal from this range should be questioned.

Examination of Alaska data will provide further help in selecting multiplier values. Using information from the 1970 Census in Alaska, we estimated a series of regressions in an attempt to define the relation between basic and nonbasic sector employment. Cross-section regressions were estimated using the census divisions as units of observation, and the large regions were excluded. Attempts to estimate the effect on the multiplier of the population of the census division did not produce significant results.

A series of regressions was estimated in an attempt to duplicate the results of Conopask and Stenehjem and Metzger. In these equations, the level of employment in various support sector industries was regressed against employment in basic industries. The multipliers derived from this analysis are shown in Table 3. The results for construction and mining seem consistent with the other work; the combined multiplier is 1.4 for Alaska, 1.51 in Conopask's study (mean value), and 1.5 in the Idaho region in Stenehjem and Metzger's study. The multipliers for Agriculture and Manufacturing and Government are much lower in the Alaska study.

These Alaska results must be used in specific SCIMP applications with caution for two reasons. First, the regressions are cross-section. This means that the variability is due partially to differences in the economic structure of the census divisions. The local economies of rural Alaska may be thought of as a system of places where certain

TABLE 3. ALASKA MULTIPLIERS

Basic Industries	Support Sector			
	Transportation, Communication, and Utilities	Trade	Finance and Services	Total
Agriculture, Fisheries, and Manufacturing	.11	.22	*	*
Mining and Construction	.47	.56	.37	1.40
Government	.23	.42	.34	.99

*No significant relation

larger villages serve as regional centers for large areas; these regional centers include Nome, Bethel, Kotzebue, and Barrow. These regional centers may provide services for many census divisions, and their growth may reflect basic sector growth in other areas. Because of this structure, the cross-section equations may overestimate the multipliers. The second reason for caution in applying these multipliers is the seasonality of rural Alaska employment. Census information is taken in the spring when construction and mining employment may be in a seasonal contraction. Support sector employment may reflect the annual average level of employment in the basic industries which may be much higher than in the spring. Because census data may reflect seasonality, this approach may overestimate the multipliers.

The multipliers shown in Tables 1 and 2 provide a guide to the selection of parameters for particular studies. Because of the problems mentioned, these results should be used only when there are limited resources to do regional studies. At a minimum, some analysis of the simple total-to-basic employment ratios in the region should be combined with the above information when selecting a set of multipliers for a region. A further source of information may be the analysis of the combined time-series/cross-section employment data from the Labor Department. Such an analysis should attempt to account for the regional service center structure of rural Alaska economies.

Labor Response Rates

Typically, population growth in an economic base model is a function of the growth in employment. In the SCIMP model, the growth of the local labor supply influences the relation between employment and population growth. The migration response to any OCS project results from efforts to clear the local labor markets; the excess of OCS demand over local labor supplies will be filled by migrants. The local labor supplied to the project is a function of the population of the region and its willingness to work on OCS projects.

The willingness to work on OCS projects is described in the model by a series of labor response rates. These rates are assumed to be different for different groups in the population--employed, unemployed, and not-in-the-labor-force. The level of these rates depends on three important considerations: 1) the willingness of employed workers to change jobs,

2) the increase in labor force participation which results from increased employment opportunities, and 3) the match between skills required and possessed by each population group.

Theories of labor economics offer some insight into the determinants of these rates. First, if we consider that workers are continually searching for better opportunities, they will switch jobs if they can improve their wages or working conditions. We would expect the proportion of employed residents willing to take OCS jobs would be determined by the relative difference in wage rates in the OCS and local economy. Second, we would expect the level of labor force participation to depend on the expected wages in the economy. Expected wages reflect both the probability of having employment and the average wage rates offered. For a given wage, the expected wage will be lower the smaller the proportion of population employed. The inability to find work may result in workers dropping out of the labor force. Workers may be out of the labor force because they know there are no jobs. If this is the case, the population not in the labor force may be an important source of labor supply in rural Alaska.

EMPIRICAL ANALYSIS

Originally, labor force response rates were developed using census data (see Huskey, Serow, Volin, 1979). These rates equalled the probabilities of each group supplying labor to the OCS project; these probabilities equaled the joint probability that a member of the population would want to work on the project and had the skills to work on the project. The first set of probabilities was determined by experience in the census year (i.e., the proportion of employed population changing jobs). The second set of probabilities was determined by the occupational mix of the population and the mining and construction industries. This section ignores the second set of probabilities and assumes anyone willing to work could take an OCS job. We will concentrate on examining the determinants of the labor response of the employed and not-in-the-labor-force sectors of the population. We will assume that all unemployed would be willing to take jobs.

Two sources of information were examined. Cross-sectional analysis of the 1970 Census provided some insight into the determinants of labor force participation. The second source of information was a survey conducted in the North Slope Borough in 1977. This survey provided information on individuals' labor force and employment histories during a period when the North Slope was witnessing a large increase in employment opportunities.

The North Slope data was used to examine the effects of a change in expected wages on the probability that an employed person would change jobs. A regression was estimated across those members of the population who were employed when the survey was conducted. The dependent variable equaled one if the employee had changed jobs during the year (unless he had been terminated from a previous job) and zero if the current job was the only job during the year. The dependent variables included age and sex descriptions and a variable describing the relative wage. The relative wage equaled the wage on the previous job divided by the worker's expected wage, which is a function of the worker's education, experience, training, and sex. If the expected wage is greater than the previous job wage, the probability that the worker will change jobs is increased. The results of that analysis provide the following equation for determining the proportion of employed population willing to take OCS jobs:

III.1) $P_1 = .065 \left(1 - \frac{W}{W_{ocs}} \right)$ where P_1 = the labor response rate .

W = average local wage

W_{ocs} = average OCS wage

The North Slope survey data was also used to estimate the response to OCS activity of those not in the labor force. An equation was estimated which explained the months the respondent spent in the labor force. The independent variables included the respondent's expected wage, demographic variables, and variables describing the amount of time the respondent and other household members spent in subsistence activities. The effect of the level of expected wage on labor force participation provides an estimate of the labor response rates of those not in the labor force. P_3, the response rate of the population not-in-the-labor-force, can be found as:

III.2) $P_3 = .012 (W_{ocs} - W) * \frac{\text{Population}}{\text{Not in the Labor Force}}$

where the first part of the equation describes the increase in the labor force participation rate and the second part adjusts that to apply to the portion of the population not-in-the-labor-force.

The final analysis used 1970 Census information to examine the combined effects of increased employment and wages from OCS on labor response rates. The civilian labor force participation rate for each census division was regressed against the expected earnings defined as the average earnings times the probability of being employed (employment divided by labor force). This measure of expected earnings will increase with both an increase in the earnings of those employed and an increase in employment. This analysis provides the following equation for estimating P_3:

$$\text{III.3)}\quad P_3 = .00002 * \left[\frac{E_{ocs} * \overline{W}_{ocs} - E_1 * \overline{W}_1}{LF} \right] * \frac{\text{Population}}{\text{Not in the Labor Force}}$$

where E_{ocs} = local employment opportunities with OCS

$\overline{W}_{ocs}$ = average earnings with OCS

E_1 = local employment opportunities without OCS

$\overline{W}_1$ = average earnings without OCS

LF = labor force

The coefficients in equations III.2 and III.3 differ because of the respective use of wages and yearly earnings in each equation.

This section was intended to provide additional information for estimating labor response rates. This may be more helpful than the previous section on multipliers since information on labor response rates is less accessible in individual census divisions than is information needed to derive multipliers. Caution must be used in applying this analysis directly. First, directly applying these rates assumes there is no skill or occupation requirement for OCS workers. If this is not the case, the labor response rates should be adjusted to reflect the difference between local skill mix and OCS requirements. Different skill requirements can be reflected in both the labor response rates and the separation of imported and local labor demand. A second caution is that the North Slope situation may not be able to be generalized to other areas of the state.

Conclusion

The analysis in this section is not intended to provide the final word on either multipliers or labor response rates in rural Alaska. This section should also not be assumed to substitute for an analysis of the local economy under study. The analysis in this section was simply meant to provide an insight into the levels of these parameters for use in those studies where the time and resources are not available to do a detailed study of the local economy.

When time and resources are available to conduct a study of the local economy, the results of this section should be used to provide guidance and consistency checks for parameters developed in the study. When a study can be conducted, the historical change in the economy should be examined. The location of the economy on the network of regional centers should also be determined. This, along with possible examination of regions slightly bigger, should provide information to determine the multiplier. Examination of the potential labor force, the occupational structure of the population, and the density of population of the region should be useful in determining the level of potential labor response rates.

IV. BERING-NORTON OCS LEASE SALE APPLICATION

Introduction

The SCIMP model was used to analyze the impact of OCS development on the Nome Census Division. This section describes this analysis. This example is intended to illustrate the model in use and the model's sensitivity to certain required assumptions. No particular research on the Nome Census Division was done; parameter assumptions were based on secondary information.

Base Case Growth of the Nome Census Division

INPUTS

Projections of the growth of the census division require regional-specific assumptions about the basic sector employment growth, local population, labor force participation, and noneconomic migration. The growth of EMX (mining and special projects) and EMA (agriculture, forestry, fishing, and manufacturing) was based on the scenarios developed by the Institute of Social and Economic Research (ISER) for the Bering-Norton OCS study (Porter, 1980). It was assumed that employment in these industries in Wade Hampton would remain constant at 1976 levels. EMG (state and federal government) was assumed to stay constant at 1976 levels. All of these exogenous inputs are presented in Table 4.

TABLE 4. EXOGENOUS EMPLOYMENT INPUTS

	Mining and Special Projects	Agriculture-Forestry-Fisheries and Manufacturing	State and Federal Government
1980	101	56	480
1981	101	56	480
1982	101	57	480
1983	101	57	480
1984	101	58	480
1985	101	58	480
1986	101	58	480
1987	101	59	480
1988	101	60	480
1989	101	60	480
1990	101	61	480
1991	101	61	480
1992	101	62	480
1993	101	62	480
1994	101	63	480
1995	101	64	480
1996	101	64	480
1997	101	65	480
1998	101	66	480
1999	101	67	480
2000	101	68	480

SOURCE: Alaska Department of Labor and Porter, 1980.

The 1980 population was estimated by extrapolating the 1978 estimated population by the average annual percent change between 1970 and 1978 (see Table 5). The age-sex distribution was estimated using a cohort survival approach. Noneconomic age-sex-race migration rates were based on the migration between 1965 and 1970 (Kerr, 1979).

Labor force participation rates by age, sex, and race were found by adjusting the 1970 census distribution. The non-Native male rates were assumed to be the same as 1970. Female rates were adjusted by the percent change between 1970 and 1977 at the national level. Native males were adjusted to 10 percent below the non-Native males, and Native females were adjusted to 10 percent below Native males. Labor force participation rates were adjusted to reflect the 1978 population and labor force estimates for the Nome Census Division. These rates are presented in Table 6.

Other parameter assumptions were based on statewide information (see Huskey, Serow, Volin, 1979). These parameter values are listed in Appendix A.

Base Case Growth

In the base case, population decreased at about 1 percent annually. Since local government employment is partly a function of population, it also fell (see Table 7). Only minimal expansion of the exogenous sector is assumed. Employment in the support sectors, EMS and EMC, remain relatively constant. Out-migration occurs to bring local labor

TABLE 5. POPULATION DISTRIBUTION
1980

	Non-Native		Native	
	Male	Female	Male	Female
< 5	68	70	370	302
5-9	76	87	400	363
10-14	70	75	419	438
15-19	47	49	334	333
20-24	134	69	198	174
25-29	100	86	170	139
30-34	65	40	154	136
35-39	72	37	147	127
40-44	56	31	132	119
45-49	66	40	130	94
50-54	46	36	92	84
55-59	43	19	98	101
60-64	24	11	58	60
65+	35	16	116	105
	902	666	2,818	2,575
			Total	6,961

SOURCES: 1970 Census and Alaska Department of Labor, Population Estimates.

TABLE 6. LABOR FORCE PARTICIPATION RATES

	Non-Native		Native	
	Male	Female	Male	Female
< 5	0	0	0	0
5-9	0	0	0	0
10-14	0	0	0	0
15-19	.254	.22	.244	.15
20-24	.90	.20	.80	.60
25-29	.80	.30	.70	.60
30-34	.80	.40	.70	.60
35-39	.80	.40	.73	.63
40-44	.83	.36	.73	.63
45-49	.76	.36	.67	.57
50-54	.76	.35	.67	.57
55-59	.76	.35	.67	.57
60-64	.76	.35	.67	.57
65+	.26	.12	.17	.17

SOURCE: 1970 Census

TABLE 7. BASE CASE GROWTH

Baseline	Total Population	Total Employment	Local Government Employment	Finance, Trade, Services	Local Construction & Transportation	Exogenous Employment
1985	6,109	2,173	305	546	547	639
1990	5,801	2,163	285	550	550	642
1995	5,703	2,157	279	550	550	645
2000	5,683	2,169	278	554	554	649

supply into equilibrium in the relatively constant labor demand. This accounts for the fall in population over the period.

OCS Impact

INPUTS

The most important inputs for assessing the level of OCS impacts are the project labor demands and the assumed enclave proportions. These assumed levels are shown in Table 8. They were based on the Bering-Norton mean scenario (Dames and Moore, 1980). The aggregation between sector and demand components was based on the SEAR (Share of Employment to Alaska Residents) factors (Huskey and Nebesky, 1979) used in previous studies. It is assumed that 50 percent of the migrant employees in each phase locate in an enclave.

OCS Induced Growth

The population impact of OCS development is 4,092 by 1985; this peaks in 1990 at 13,614 and falls to 9,417 by the year 2000. The total employment impact of OCS grows from 2,052 in 1985 to 4,712 by 2000; its peak is in 1990 when total employment impact equals 6,300. Less than half of the total employment impact of this development is direct OCS employees. At the peak impact in 1990, direct OCS employment accounts for 45 percent of the total impact. Of the direct OCS employment, over half is located in enclaves. Local labor employed in all phases of the impact is 485 in 1985 and 446 in 2000. The total local labor supplied to the OCS effort is a function of total labor supply. Given our parameters, total

TABLE 8. OCS OPERATIONS AND DEVELOPMENT EMPLOYMENT

	Operations		Development	
	Local	Import	Local	Import
1983	75	41	47	200
1984	135	136	90	512
1985	156	156	95	636
1986	238	158	105	772
1987	582	250	73	537
1988	534	178	302	1,401
1989	332	84	431	1,294
1990	301	53	710	2,133
1991	463	51	699	1,633
1992	478	25	880	1,636
1993	490	10	992	992
1994	480	10	883	883
1995	479	10	885	885
1996	479	10	915	915
1997	479	10	930	930
1998	479	10	930	930
1999	479	10	930	930
2000	479	10	930	930

SOURCE: OCS Technical Report No. 49

local labor employed stayed relatively constant throughout the period following the initial impact (see Table 9).

The demographic and economic effects of OCS employment are very large. From 1988 through 2000, population and total employment impacts are greater than the baseline levels. All sectors of employment are profoundly affected by OCS activities.

Sensitivity Tests

The results described above are dependent on the assumptions made about the parameters. This section will describe how important these assumptions are. Since in-migration is determined by the interaction of labor supply and labor demand, assumptions determining these will be examined. Six cases were run; three altered the labor supply parameters and the rest altered the demand parameters. Examining these results will provide an idea of the importance to our results of each assumption. Table 10 compares the results for each of six cases in five-year increments. This table shows the effect of changing the assumptions on baseline population, total OCS population and employment impact, total secondary sector migrants, and the employment of local population resulting from OCS development. Sensitivity tests also allow us to test further the logic of the model by examining the effect of parameter changes on the results.

Test No. 1 shows the importance of labor market response parameters on the total local labor employed in OCS activities (TLE). In this test,

TABLE 9. OCS DEVELOPMENT

(difference from base case)

	Total Population Impact (TOCSP)	Total OCS Employment Impact (TOCSE)	Secondary Local Govt. Employment Impact (SEML)	Secondary Finance, Trade, Services Impact (SEMS)	Secondary Local Construction & Transportation Impact (SEMC)
1985	4,092	2,052	111	449	449
1990	13,614	6,300	381	1,361	1,361
1995	8,856	4,521	371	946	946
2000	9,417	4,712	394	984	984

	OCS Direct Employment (DEMP+OEMP)	Total Local Labor Employed (TLE)	Total Enclave Employment (ENCL)
1985	731	485	432
1990	2,843	446	1,531
1995	1,770	449	1,036
2000	1,860	446	1,081

TABLE 10. SENSITIVITY OF SCIMP IMPACT RESULTS TO PARAMETER ASSUMPTIONS

Brief Test Description	Year	Baseline Population	Total OCS Population Impact	Total OCS Employment Impact	Support Sector Employed In-Migrants	Total Local OCS Employment
Base Case						
	1985	6,109	4,092	2,052	600	485
	1990	5,801	13,614	2,300	2,440	446
	1995	5,703	8,856	4,521	1,735	449
	2000	5,683	9,417	4,712	1,831	446
Test #1: Multiplying all labor market response rates by 2						
	1985	6,109	3,099	2,016	218	916
	1990	5,801	13,112	6,353	2,216	868
	1995	5,703	8,527	4,605	1,611	869
	2000	5,683	9,091	4,797	1,711	863
Test #2: Setting labor market response rates of the employed to zero						
	1985	6,109	3,627	1,970	391	490
	1990	5,801	13,361	6,240	2,290	459
	1995	5,703	8,451	4,428	1,502	449
	2000	5,683	9,011	4,619	1,597	446
Test #3: Dividing the basic/nonbasic multipliers by 2						
	1985	6,109	2,303	1,515	63	485
	1990	5,801	8,502	4,665	804	446
	1995	5,703	5,616	3,315	529	449
	2000	5,683	5,929	3,449	568	446
Test #4: Setting baseline migration to 1.0						
	1985	6,714	3,878	2,044	527	556
	1990	6,720	13,399	6,296	2,346	548
	1995	6,827	8,608	4,519	1,632	575
	2000	6,992	9,135	4,711	1,713	591

TABLE 10. (Continued)

Brief Test Description	Year	Baseline Population	Total OCS Population Impact	Total OCS Employment Impact	Support Sector Employed In-Migrants	Total Local OCS Employment
Test #5: Setting percentage of enclave employment to Ø.Ø						
	1985	6,109	6,765	2,748	1,193	485
	1990	5,801	22,874	8,866	4,677	446
	1995	5,703	14,461	6,274	3,235	449
	2000	5,683	15,458	6,555	3,408	446
Test #6: Setting enclave employment to equal 100 percent						
	1985	6,109	1,401	1,362	12	485
	1990	5,801	4,319	3,735	226	446
	1995	5,703	3,226	2,767	246	449
	2000	5,683	3,366	2,868	261	446

all labor response rates (coefficients P1 through P8) were doubled. The most notable results are the doubling of total local labor employed.

Test No. 2 demonstrates the effect of employment response of local labor already employed to OCS development and operations. By reducing the labor response rates of this group (P1 and P4) to zero, no significant change takes place to local labor employed. Total secondary employment (SEMM), total OCS employment (TOCSE), and total OCS population (TOCSP) are reduced since it is no longer necessary to replace local employees who have taken OCS jobs.

Test No. 3 considers the basic/nonbasic multiplier relationships. Dividing all the impact multipliers (N11 through N20) by 2 results in a most profound reduction, as would be expected, of the secondary impact of OCS development.

Test No. 4 is a test of the effect of baseline population growth. Baseline migration rates are increased to 1.0. This increases the total population in the baseline. Increased baseline population results in increases in the total local labor supplied to the OCS project. This results in an increase in total local labor employed as a result of OCS development.

Test No. 5 looks at the effect of reducing the proportion of workers living in enclaves from .5 to zero. The secondary employment (SEMM) is increased, as are the total impact variables (TOCSE and TOCSP). This results since the multipliers for nonenclave employment are larger than the enclave multipliers.

Test No. 6 increases the enclave proportion to 1.0 and results in the opposite effect of test no. 5.

The importance of parameter assumptions to the projection results has been illustrated by these sensitivity tests. The sensitivity tests also provided a final test of the logic of the model. The model responded in a reasonable manner to specific parameter changes. The importance of the parameter assumptions to the results means that in future applications of the model, more effort must be put into determining those assumptions.

APPENDIX A

PROGRAM LISTING FROM SMALL COMMUNITY IMPACT MODEL

```
C
C--------------------------------------------------------------------------
C       SCIMP - SMALL COMMUNITY POPULATION IMPACT MODEL
C       WRITTEN BY THEODORE P. VOLIN - 1/15/80
C
C       FILE CODES
C
C       08 (INPUT) UNLOADED EXOGENOUS VALUES, ENDOGENOUS
C           STARTING VALUES
C
C           "N" RECORD, VARIABLE NAME, COHORT ATTRIBUTES
C               CC  1- 1  "N"
C                   3- 5  VARIABLE NUMBER
C                   7-12  VARIABLE NAME
C                  14-15  # AGE COHORTS
C                  17-18  # SEX COHORTS
C                  20-21  # RACE COHORTS
C
C           "V" RECORD, VALUES
C               CC  1- 1  "V"
C                   3- 5  VARIABLE NUMBER
C                   6- 8  START YEAR
C                   9-11  ENDING YEAR
C                  12-14  STARTING LOCATION
C                  15-16  NUMBER OF LOCATIONS
C                  17-24  VAL(1)
C                  25-32  VAL(2)
C                  33-40  VAL(3)
C                  41-48  VAL(4)
C                  49-56  VAL(5)
C                  57-64  VAL(6)
C                  65-72  VAL(7)
C
C       09 (INPUT/OUTPUT) LOADED HISTORY FILE - RANDOM, UNFORMATED
C
C       42 (OUTPUT) ERROR MESSAGES
C
C       06 (OUTPUT) REPORT
C
C       05 (INPUT) MENU, FREE-FORM
C
C           L                         - LOAD HISTORY FILE.
C
C           S,SYR,NYR                 - SIMULATES NYR YEARS STARTING AT SYR
C
C          C,VNAME,VAL,YRS,YRE        - TEMP CHANGES VARIABLE VNAME
C                                       TO VAL FOR YEARS YRS THRU YRE
C
C           Q (OR CNTL-G)             - QUIT RUN
C
C          P,VNAME,SYR,NYR            - PRINTS VARIABLE VNAME FOR NYR YEARS
C                                       STARTING AT SYR
C
C--------------------------------------------------------------------------
C
C-----ENDOGENOUS VARIABLES
C
        REAL BASP(14,2,2)
        REAL BASPP
        REAL BEMG
        REAL BP(14,2,2)
        REAL BPOP(14,2,2)
        REAL BPOPP
        REAL BBIH(1,2,2)
```

```
      REAL BSPP(14,2,2)
      REAL D1
      REAL D2
      REAL DDM(14,2,2)
      REAL DEM(14,2,2)
      REAL DEME
      REAL DEMG
      REAL DEMP
      REAL DEMR
      REAL DLE
      REAL DLS
      REAL DPOP(14,2,2)
      REAL DPOPP
      REAL EMC
      REAL EML
      REAL EMS
      REAL ENCL
      REAL LF
     REAL LS1
     REAL LS2
      REAL LS3
      REAL N1(14,2,2)
      REAL N2(14,2,2)
      REAL NLF
      REAL NLF1
      REAL NLF2
     REAL NLF3
      REAL NODM(14,2,2)
      REAL NOEM(14,2,2)
      REAL NOEME
      REAL NOEMG
      REAL NOEMR
      REAL NOENR
      REAL NSDM(14,2,2)
      REAL NSEM(14,2,2)
      REAL NSEMG
      REAL NSEMG1
      REAL O1
      REAL O2
      REAL OBTH(1,2,2)
      REAL ODM(14,2,2)
      REAL ODP(14,2,2)
      REAL OEM(14,2,2)
      REAL OEME
      REAL OEMP
      REAL OENR
      REAL OEP(14,2,2)
      REAL OLE
      REAL OPOP(14,2,2)
      REAL OPOPP
      REAL OSDP(14,2,2)
      REAL OSENR
      REAL OSEP(14,2,2)
      REAL OSEPP
      REAL OSEPT
      REAL OSDPP
      REAL OSL
      REAL R1(14,2,2)
      REAL R2(14,2,2)
      REAL S1
      REAL S2
      REAL S3
      REAL SBTH(1,2,2)
      REAL SDM(14,2,2)
      REAL SDP(14,2,2)
      REAL SEM(14,2,2)
      REAL SEMC
      REAL SEML
```

YEAR 15 DPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	116.	116.	0.	0.
2	81.	81.	0.	0.
3	75.	75.	0.	0.
4	224.	71.	0.	0.
5	220.	91.	0.	0.
6	291.	97.	0.	0.
7	366.	91.	0.	0.
8	138.	42.	0.	0.
9	122.	31.	0.	0.
10	104.	35.	0.	0.
11	104.	25.	0.	0.
12	64.	18.	0.	0.
13	33.	11.	0.	0.
14	13.	3.	0.	0.

YEAR 15 DPOPP = 2740.

YEAR 15 OPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	47.	47.	0.	0.
2	45.	45.	0.	0.
3	44.	44.	0.	0.
4	50.	42.	0.	0.
5	41.	28.	0.	0.
6	62.	36.	0.	0.
7	87.	48.	0.	0.
8	63.	35.	0.	0.
9	49.	27.	0.	0.
10	32.	18.	0.	0.
11	23.	13.	0.	0.
12	16.	9.	0.	0.
13	10.	6.	0.	0.
14	1.	0.	0.	0.

YEAR 15 OPOPP = 967.

YEAR 10 OPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	39.	39.	0.	0.
2	44.	44.	0.	0.
3	41.	41.	0.	0.
4	42.	37.	0.	0.
5	34.	25.	0.	0.
6	49.	30.	0.	0.
7	72.	42.	0.	0.
8	59.	34.	0.	0.
9	38.	22.	0.	0.
10	23.	13.	0.	0.
11	16.	9.	0.	0.
12	11.	7.	0.	0.
13	7.	4.	0.	0.
14	0.	0.	0.	0.

YEAR 10 OPOPP = 819.

YEAR 10 SPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	641.	640.	0.	0.
2	305.	305.	0.	0.
3	243.	243.	0.	0.
4	345.	232.	0.	0.
5	320.	148.	0.	0.
6	637.	280.	0.	0.
7	889.	366.	0.	0.
8	475.	155.	0.	0.
9	326.	118.	0.	0.
10	181.	58.	0.	0.
11	141.	49.	0.	0.
12	95.	32.	0.	0.
13	57.	18.	0.	0.
14	11.	9.	0.	0.

YEAR 10 SPOPP = 7317.

YEAR 1 TOTPP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	63.	65.	339.	294.
2	69.	79.	361.	328.
3	66.	72.	377.	302.
4	57.	54.	283.	345.
5	166.	69.	237.	211.
6	155.	85.	135.	148.
7	97.	47.	151.	128.
8	76.	36.	143.	120.
9	64.	31.	128.	110.
10	61.	37.	124.	93.
11	47.	35.	93.	81.
12	41.	21.	90.	89.
13	25.	11.	58.	59.
14	38.	18.	121.	113.

YEAR 1 TOTPOP= 6892.

YEAR 5 BASP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	51.	53.	297.	297.
2	46.	54.	252.	250.
3	45.	54.	247.	259.
4	42.	55.	171.	306.
5	125.	63.	259.	293.
6	162.	73.	249.	210.
7	114.	54.	163.	125.
8	71.	36.	128.	95.
9	58.	26.	108.	80.
10	49.	27.	103.	78.
11	42.	28.	87.	71.
12	35.	21.	72.	61.
13	23.	12.	49.	43.
14	47.	23.	132.	135.

YEAR 5 BASPP = 6109.

YEAR 5 DPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	45.	45.	0.	0.
2	31.	31.	0.	0.
3	29.	29.	0.	0.
4	86.	27.	0.	0.
5	84.	35.	0.	0.
6	111.	37.	0.	0.
7	140.	35.	0.	0.
8	53.	16.	0.	0.
9	47.	12.	0.	0.
10	40.	13.	0.	0.
11	40.	10.	0.	0.
12	24.	7.	0.	0.
13	13.	4.	0.	0.
14	5.	1.	0.	0.

YEAR 5 DPOPP = 1048.

YEAR 5 OPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	34.	34.	0.	0.
2	26.	26.	0.	0.
3	23.	23.	0.	0.
4	29.	22.	0.	0.
5	24.	13.	0.	0.
6	45.	23.	0.	0.
7	60.	31.	0.	0.
8	26.	13.	0.	0.
9	18.	9.	0.	0.
10	9.	5.	0.	0.
11	8.	4.	0.	0.
12	5.	3.	0.	0.
13	3.	1.	0.	0.
14	1.	0.	0.	0.

YEAR 5 OPOPP = 519.

YEAR 5 SPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	186.	185.	0.	0.
2	83.	83.	0.	0.
3	71.	71.	0.	0.
4	106.	70.	0.	0.
5	88.	45.	0.	0.
6	171.	77.	0.	0.
7	223.	102.	0.	0.
8	82.	43.	0.	0.
9	63.	29.	0.	0.
10	31.	15.	0.	0.
11	28.	13.	0.	0.
12	18.	9.	0.	0.
13	10.	4.	0.	0.
14	3.	2.	0.	0.

YEAR 5 SPOPP = 1909.

YEAR 5 TOTPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	520.	523.	297.	297.
2	318.	326.	252.	250.
3	288.	297.	247.	259.
4	379.	282.	171.	306.
5	389.	215.	259.	293.
6	627.	328.	249.	210.
7	712.	370.	163.	125.
8	285.	154.	128.	95.
9	233.	116.	108.	80.
10	150.	78.	103.	78.
11	139.	72.	87.	71.
12	94.	50.	72.	61.
13	55.	27.	49.	43.
14	62.	33.	132.	135.

YEAR 5 TOTPOP= 10201.

YEAR 10 BASP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	49.	50.	297.	310.
2	39.	44.	214.	233.
3	34.	41.	172.	191.
4	36.	47.	106.	226.
5	106.	66.	214.	294.
6	153.	76.	282.	276.
7	122.	57.	205.	169.
8	82.	42.	146.	104.
9	64.	29.	106.	69.
10	46.	24.	90.	61.
11	37.	23.	75.	58.
12	31.	19.	62.	47.
13	21.	12.	41.	32.
14	56.	32.	137.	147.

YEAR 10 BASPP = 5801.

YEAR 10 DPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	191.	191.	0.	0.
2	134.	134.	0.	0.
3	123.	123.	0.	0.
4	368.	116.	0.	0.
5	362.	150.	0.	0.
6	479.	160.	0.	0.
7	602.	149.	0.	0.
8	227.	68.	0.	0.
9	201.	51.	0.	0.
10	171.	57.	0.	0.
11	171.	41.	0.	0.
12	105.	30.	0.	0.
13	55.	18.	0.	0.
14	22.	5.	0.	0.

YEAR 10 DPOPP = 4506.

YEAR 10 OPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	39.	39.	0.	0.
2	44.	44.	0.	0.
3	41.	41.	0.	0.
4	42.	37.	0.	0.
5	34.	25.	0.	0.
6	49.	30.	0.	0.
7	72.	42.	0.	0.
8	59.	34.	0.	0.
9	38.	22.	0.	0.
10	23.	13.	0.	0.
11	16.	9.	0.	0.
12	11.	7.	0.	0.
13	7.	4.	0.	0.
14	0.	0.	0.	0.

YEAR 10 OPOPP = 819.

YEAR 10 SPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	641.	640.	0.	0.
2	305.	305.	0.	0.
3	243.	243.	0.	0.
4	345.	232.	0.	0.
5	320.	148.	0.	0.
6	637.	280.	0.	0.
7	889.	366.	0.	0.
8	475.	155.	0.	0.
9	326.	118.	0.	0.
10	181.	58.	0.	0.
11	141.	49.	0.	0.
12	95.	32.	0.	0.
13	57.	18.	0.	0.
14	11.	9.	0.	0.

YEAR 10 SPOPP = 7317.

YEAR 10 TOTPP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	1244.	1245.	297.	310.
2	728.	733.	214.	233.
3	631.	638.	172.	191.
4	974.	603.	106.	226.
5	931.	482.	214.	294.
6	1536.	731.	292.	276.
7	1961.	848.	205.	169.
8	928.	371.	146.	104.
9	703.	283.	106.	69.
10	454.	181.	90.	61.
11	398.	150.	75.	58.
12	262.	104.	62.	47.
13	150.	61.	41.	32.
14	99.	55.	137.	147.

YEAR 10 TOTPOP= 19415.

YEAR 15 BASP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	49.	50.	288.	303.
2	39.	42.	206.	232.
3	32.	36.	150.	175.
4	34.	41.	83.	182.
5	103.	67.	172.	255.
6	149.	82.	266.	284.
7	122.	62.	220.	200.
8	89.	46.	171.	130.
9	73.	34.	122.	79.
10	50.	27.	92.	58.
11	38.	22.	70.	49.
12	30.	18.	55.	39.
13	20.	12.	37.	26.
14	64.	39.	136.	149.

YEAR 15 BASPP = 5703.

YEAR 15 DPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	116.	116.	0.	0.
2	81.	81.	0.	0.
3	75.	75.	0.	0.
4	224.	71.	0.	0.
5	220.	91.	0.	0.
6	291.	97.	0.	0.
7	366.	91.	0.	0.
8	138.	42.	0.	0.
9	122.	31.	0.	0.
10	104.	35.	0.	0.
11	104.	25.	0.	0.
12	64.	18.	0.	0.
13	33.	11.	0.	0.
14	13.	3.	0.	0.

YEAR 15 DPOPP = 2740.

YEAR 15 OPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	47.	47.	0.	0.
2	45.	45.	0.	0.
3	44.	44.	0.	0.
4	50.	42.	0.	0.
5	41.	28.	0.	0.
6	62.	36.	0.	0.
7	87.	48.	0.	0.
8	63.	35.	0.	0.
9	49.	27.	0.	0.
10	32.	18.	0.	0.
11	23.	13.	0.	0.
12	16.	9.	0.	0.
13	10.	6.	0.	0.
14	1.	0.	0.	0.

YEAR 15 OPOPP = 967.

```
      REAL SEMM
      REAL SEMS
      REAL SEP(14,2,2)
      REAL SLE
      REAL SPOP(14,2,2)
      REAL SPOPP
      REAL SSDP(14,2,2)
      REAL SSDPP
      REAL SSEP(14,2,2)
      REAL SSEPP
      REAL STE
      REAL TE
      REAL TE1
      REAL TE2
      REAL TEMC
      REAL TEML
      REAL TEMS
      REAL TEMX
      REAL TLE
      REAL TOCSE
      REAL TOCSP
      REAL TOEM
      REAL TOTE
      REAL TOTPOP
      REAL TOTPP(14,2,2)
      REAL U
      REAL U1
      REAL U2
      REAL U3
      REAL UDM
      REAL UM
      REAL UMG
      REAL UNE
      REAL Z1
C
C-----EXOGENOUS VARIABLES
C
      REAL DDL
      REAL DIMPT
      REAL EMA
      REAL EMG
      REAL EMM
      REAL EMX
      REAL ODL
      REAL OIMPT
      REAL REV
      REAL XREV
C
C-----COEFFICIENTS
C
      REAL B1/1.0/
      REAL B2/1.0/
      REAL B3/1.0/
      REAL C1(14,2,2)
     &/3*.084,.126,2*.084,3*.063,4*.030,.021,
     & 3*.063,.093,.066,.060,3*.048,4*.021,.015,
     & 3*.084,.126,2*.084,3*.063,4*.030,.021,
     & 3*.063,.093,.066,.060,3*.048,4*.021,.015/
      REAL C2(14,2,2)
     &/4*.057,.195,.171,3*.072,5*.024,
     & 4*.039,.125,.126,3*.048,5*.018,
     & 4*.057,.195,.171,3*.072,5*.024,
     & 4*.039,.125,.126,3*.048,5*.018/
      REAL C3(14,2,2)
     &/3*0.0,.10,.30,.30,.20,2*.05,47*0.0/
      REAL DE(14,2,2)
     &/3*0.0,.105,.127,.172,.218,.082,.073,2*.062,.038,.020,.008,
     & 3*0.0,.004,.005,.007,.009,4*.003,.002,.001,29*0.0/
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      REAL DD(14,2,2)
     &/.140,.098,.090,.059,.011,.006,.004,.002,4*.001,2*0.0,
     & .140,.098,.090,.077,.100,.103,.091,.044,.031,.036,.024,
     & .018,.011,.004,28*0.0/
      REAL E1/.50/
      REAL E2/.50/
      REAL F(14)/14*.80/
      REAL FR(14,2,2)
     &/16*0.0,.0380,.118,.144,.093,.039,.014,.004,21*0.0,
     & .045,.165,.227,.159,.088,.050,.015,5*0.0/
      REAL G1/1.0/
      REAL G2/1.0/
      REAL L0/0.0/
      REAL L1/.05/
      REAL L2/0.0/
      REAL LFPR(14,2,2)
     &/3*0.0,.23,.83,2*.75,.77,.77,4*.71,.24,
     & 3*0.0,.22,.2,.3,.3,.4,.4,.36,.36,.35,.35,.12,
     & 3*0.0,.244,.8,.7,.7,.73,.73,4*.67,.17,
     & 3*0.0,.15,.7,.6,.6,.63,.63,4*.57,.17/
      REAL M10/0.0/
      REAL M11/.81/
      REAL M12/.81/
      REAL M13/.47/
      REAL M14/.47/
      REAL M20/.81/
      REAL M21/.81/
      REAL M22/.81/
      REAL M23/.47/
      REAL M24/.47/
      REAL MR(14,2,2)
     &/.906,.914,.908,.823,1.044,1.038,.952,.956,.945,.961,
     & .945,.945,.910,.969,
     & .922,.935,.926,.975,1.015,1.000,.932,.928,.918,.958,
     & .954,.922,.881,.948,
     & .906,.914,.908,.823,1.044,1.038,.952,.956,.945,.961,
     & .945,.945,.910,.969,
     & .922,.935,.926,.975,1.015,1.000,.932,.928,.918,.958,
     & .954,.922,.881,.948/
      REAL N11/.05/
      REAL N12/.05/
      REAL N13/.02/
      REAL N14/.05/
      REAL N15/.47/
      REAL N16/.81/
      REAL N17/.05/
      REAL N18/.47/
      REAL N19/.81/
      REAL N20/.05/
      REAL OD(14,2,2)
     &/.333,.213,.196,.112,.017,.024,.030,.010,.008,.003,.003,
     & .002,.001,.001,
     & .333,.213,.196,.164,.081,.161,.203,.062,.055,.025,.025,
     & .014,.008,.007,28*0.0/
      REAL OE(14,2,2)
     &/3*0.0,.077,.094,.201,.254,.077,.069,.031,.031,.018,.010,.009,
     & 3*0.0,.012,.014,.030,.038,.012,.010,.004,.004,.003,.001,.001,
     & 28*0.0/
      REAL P1/.031/
      REAL P2/.074/
      REAL P3/.009/
      REAL P4/.029/
      REAL P5/.040/
      REAL P6/.005/
      REAL P7/.50/
      REAL P8/.09/
      REAL SD(14,2,2)
     &/.333,.213,.196,.112,.017,.024,.030,.010,.008,.003,.003,
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     & .002,.001,.001,
     & .333,.213,.196,.164,.081,.161,.203,.062,.055,.025,.025,
     & .014,.008,.007,28*0.0/
      REAL SE(14,2,2)
     &/3*0.0,.077,.094,.201,.254,.077,.069,.031,.031,.018,.010,.009,
     & 3*0.0,.012,.014,.030,.038,.012,.010,.004,.004,.003,.001,.001,
     & 28*0.0/
      REAL SR(14,2,2)
     &/2*.997,.998,4*.997,.996,.993,.990,.987,.979,.959,.945,
     & .997,6*.999,.998,.997,.996,.993,.991,.976,.961,
     & .994,.999,.997,.993,.992,.995,.996,.993,.989,.989,.987,
     & .974,.952,.940,
     & .996,.999,.999,.997,.997,.996,.994,.992,.981,.980,.989,
     & .980,.967,.962/
      REAL SXR(1,2,2)/.503,.497,.503,.497/
      REAL TD(14,2,2)
     &/.784,.813,.825,.822,.784,.813,.825,.838,.850,.863,.875,
     & .888,.900,0.0,
     & .784,.813,.825,.822,.784,.813,.825,.838,.850,.863,.875,
     & .888,.900,29*0.0/
      REAL TO(14,2,2)
     &/.784,.813,.825,.822,.784,.813,.825,.838,.850,.863,.875,
     & .888,.900,0.0,
     & .784,.813,.825,.822,.784,.813,.825,.838,.850,.863,.875,
     & .888,.900,29*0.0/
      REAL U0/.085/
      REAL UDEP/2.0/
      REAL X2(14,2,2)
     &/.333,.213,.196,.189,.111,.225,.284,.087,.077,.034,.034,
     & .020,.011,.010,
     & .333,.213,.196,.176,.095,.191,.241,.074,.065,.029,.029,
     & .017,.009,.009,
     & 28*0.0/
      REAL Y1/1.0/
C
C-----INPUT/OUTPUT BUFFERS
C
      REAL BUFF(1800),BUFF2(1800)
      EQUIVALENCE(BUFF(    1),BASP   )
      EQUIVALENCE(BUFF(   57),BASPP  )
      EQUIVALENCE(BUFF(   58),BEMG   )
      EQUIVALENCE(BUFF(   59),BP     )
      EQUIVALENCE(BUFF(  115),BPOP   )
      EQUIVALENCE(BUFF(  171),BPOPP  )
      EQUIVALENCE(BUFF(  172),BBTH   )
      EQUIVALENCE(BUFF(  176),BSPP   )
      EQUIVALENCE(BUFF(  232),D1     )
      EQUIVALENCE(BUFF(  233),D2     )
      EQUIVALENCE(BUFF(  234),DDM    )
      EQUIVALENCE(BUFF(  290),DEM    )
      EQUIVALENCE(BUFF(  346),DEME   )
      EQUIVALENCE(BUFF(  347),DEMG   )
      EQUIVALENCE(BUFF(  348),DEMP   )
      EQUIVALENCE(BUFF(  349),DEMR   )
      EQUIVALENCE(BUFF(  350),DLE    )
      EQUIVALENCE(BUFF(  351),DLS    )
      EQUIVALENCE(BUFF(  352),DPOP   )
      EQUIVALENCE(BUFF(  408),DPOPP  )
      EQUIVALENCE(BUFF(  409),EMC    )
      EQUIVALENCE(BUFF(  410),EML    )
      EQUIVALENCE(BUFF(  411),EMS    )
      EQUIVALENCE(BUFF(  412),ENCL   )
      EQUIVALENCE(BUFF(  413),LF     )
      EQUIVALENCE(BUFF(  414),LS1    )
      EQUIVALENCE(BUFF(  415),LS2    )
      EQUIVALENCE(BUFF(  416),LS3    )
      EQUIVALENCE(BUFF(  417),N1     )
      EQUIVALENCE(BUFF(  473),N2     )
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      EQUIVALENCE(BUFF( 529),NLF    )
      EQUIVALENCE(BUFF( 530),NLF1   )
      EQUIVALENCE(BUFF( 531),NLF2   )
      EQUIVALENCE(BUFF( 532),NODM   )
      EQUIVALENCE(BUFF( 588),NOEM   )
      EQUIVALENCE(BUFF( 644),NOEME  )
      EQUIVALENCE(BUFF( 645),NOEMG  )
      EQUIVALENCE(BUFF( 646),NOEMR  )
      EQUIVALENCE(BUFF( 647),NOENR  )
      EQUIVALENCE(BUFF( 648),NSDM   )
      EQUIVALENCE(BUFF( 704),NSEM   )
      EQUIVALENCE(BUFF( 760),NSEMG  )
      EQUIVALENCE(BUFF( 761),O1     )
      EQUIVALENCE(BUFF( 762),O2     )
      EQUIVALENCE(BUFF( 763),OBTH   )
      EQUIVALENCE(BUFF( 767),ODM    )
      EQUIVALENCE(BUFF( 823),ODP    )
      EQUIVALENCE(BUFF( 879),OEM    )
      EQUIVALENCE(BUFF( 935),OEME   )
      EQUIVALENCE(BUFF( 936),OEMP   )
      EQUIVALENCE(BUFF( 937),OENR   )
      EQUIVALENCE(BUFF( 938),OEP    )
      EQUIVALENCE(BUFF(994),OLE    )
      EQUIVALENCE(BUFF( 995),OPOP   )
      EQUIVALENCE(BUFF(1051),OPOPP  )
      EQUIVALENCE(BUFF(1052),OSDP   )
      EQUIVALENCE(BUFF(1108),OSENR  )
      EQUIVALENCE(BUFF(1109),OSEP   )
      EQUIVALENCE(BUFF(1165),OSEPP  )
      EQUIVALENCE(BUFF(1166),OSEPT  )
      EQUIVALENCE(BUFF(1167),OSDPP  )
      EQUIVALENCE(BUFF(1168),OSL    )
      EQUIVALENCE(BUFF(1169),R1     )
      EQUIVALENCE(BUFF(1225),R2     )
      EQUIVALENCE(BUFF(1281),S1     )
      EQUIVALENCE(BUFF(1282),S2     )
      EQUIVALENCE(BUFF(1283),S3     )
      EQUIVALENCE(BUFF(1284),SBTH   )
      EQUIVALENCE(BUFF(1288),SDM    )
      EQUIVALENCE(BUFF(1344),SDP    )
      EQUIVALENCE(BUFF(1400),SEM    )
      EQUIVALENCE(BUFF(1456),SEMC)
      EQUIVALENCE(BUFF(1457),SEML   )
      EQUIVALENCE(BUFF(1458),SEMM   )
      EQUIVALENCE(BUFF(1459),SEMS   )
      EQUIVALENCE(BUFF(1460),SEP    )
      EQUIVALENCE(BUFF(1516),SLE    )
      EQUIVALENCE(BUFF(1517),SPOP   )
      EQUIVALENCE(BUFF(1573),SPOPP  )
      EQUIVALENCE(BUFF(1574),SSDP   )
      EQUIVALENCE(BUFF(1630),SSDPP  )
      EQUIVALENCE(BUFF(1631),SSEP   )
      EQUIVALENCE(BUFF(1687),SSEPP  )
      EQUIVALENCE(BUFF(1688),STE    )
      EQUIVALENCE(BUFF(1689),TE     )
      EQUIVALENCE(BUFF(1690),TE1    )
      EQUIVALENCE(BUFF(1691),TE2    )
      EQUIVALENCE(BUFF(1692),TEMC   )
      EQUIVALENCE(BUFF(1693),TEML   )
      EQUIVALENCE(BUFF(1694),TEMS   )
      EQUIVALENCE(BUFF(1695),TEMX   )
      EQUIVALENCE(BUFF(1696),TLE    )
      EQUIVALENCE(BUFF(1697),TOCSE  )
      EQUIVALENCE(BUFF(1698),TOCSP  )
      EQUIVALENCE(BUFF(1699),TOEM   )
      EQUIVALENCE(BUFF(1700),TOTE   )
      EQUIVALENCE(BUFF(1701),TOTPOP)
      EQUIVALENCE(BUFF(1702),TOTPP  )
```

YEAR 20 OPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	46.	46.	0.	0.
2	43.	43.	0.	0.
3	42.	42.	0.	0.
4	48.	40.	0.	0.
5	40.	27.	0.	0.
6	61.	35.	0.	0.
7	85.	46.	0.	0.
8	61.	33.	0.	0.
9	48.	26.	0.	0.
10	33.	18.	0.	0.
11	25.	14.	0.	0.
12	18.	10.	0.	0.
13	12.	7.	0.	0.
14	1.	0.	0.	0.

YEAR 20 OPOPP = 952.

YEAR 20 SPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	314.	313.	0.	0.
2	118.	118.	0.	0.
3	81.	82.	0.	0.
4	166.	84.	0.	0.
5	197.	64.	0.	0.
6	403.	116.	0.	0.
7	614.	165.	0.	0.
8	469.	103.	0.	0.
9	382.	80.	0.	0.
10	271.	52.	0.	0.
11	204.	40.	0.	0.
12	145.	28.	0.	0.
13	95.	18.	0.	0.
14	3.	3.	0.	0.

YEAR 20 SPOPP = 4726.

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	817.	817.	273.	287.
2	470.	472.	199.	225.
3	403.	405.	143.	170.
4	645.	387.	76.	165.
5	671.	336.	151.	224.
6	1116.	504.	243.	266.
7	1452.	579.	214.	204.
8	843.	295.	181.	146.
9	704.	233.	138.	94.
10	500.	163.	104.	66.
11	410.	129.	75.	50.
12	279.	91.	55.	35.
13	172.	56.	35.	22.
14	96.	60.	134.	148.

YEAR 20 TOTPOP= 15099.

YEAR 1 BBTH .

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	14.	79.	78.

YEAR 2 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	15.	15.	83.	82.

YEAR 20 TOTPP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	817.	817.	273.	287.
2	470.	472.	199.	225.
3	403.	405.	143.	170.
4	645.	387.	76.	165.
5	671.	336.	151.	224.
6	1116.	504.	243.	266.
7	1452.	579.	214.	204.
8	843.	295.	181.	146.
9	704.	233.	138.	94.
10	500.	163.	104.	66.
11	410.	129.	75.	50.
12	279.	91.	55.	35.
13	172.	56.	35.	22.
14	96.	60.	134.	148.

YEAR 20 TOTPOP= 15099.

YEAR 1 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	14.	79.	78.

YEAR 2 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	15.	15.	83.	82.

YEAR 3 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	14.	85.	84.

YEAR 4 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	14.	87.	86.

YEAR 5 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	14.	89.	88.

YEAR 6 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	13.	90.	89.

YEAR 7 BBTH

YEAR 7 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	13.	91.	89.

YEAR 8 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	13.	13.	91.	90.

YEAR 9 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	13.	91.	90.

YEAR 10 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	13.	13.	90.	89.

YEAR 11 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	13.	13.	89.	88.

YEAR 12 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	13.	13.	88.	87.

YEAR 13 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	13.	13.	87.	86.

YEAR 14 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	13.	13.	86.	85.

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      EQUIVALENCE(BUFF(1758),U      )
      EQUIVALENCE(BUFF(1759),U1     )
      EQUIVALENCE(BUFF(1760),U2     )
      EQUIVALENCE(BUFF(1761),U3    )
      EQUIVALENCE(BUFF(1762),UDM    )
      EQUIVALENCE(BUFF(1763),UM     )
      EQUIVALENCE(BUFF(1764),UMG    )
      EQUIVALENCE(BUFF(1765),UNE    )
      EQUIVALENCE(BUFF(1766),Z1     )
      EQUIVALENCE(BUFF(1777),NSEMG1)
      EQUIVALENCE(BUFF(1778),NLF3   )
C-----EXOGENOUS VARIABLES
C
      EQUIVALENCE(BUFF(1767),DDL    )
      EQUIVALENCE(BUFF(1768),DIMPT  )
      EQUIVALENCE(BUFF(1769),EMA    )
      EQUIVALENCE(BUFF(1770),EMG    )
      EQUIVALENCE(BUFF(1771),EMM    )
      EQUIVALENCE(BUFF(1772),EMX    )
      EQUIVALENCE(BUFF(1773),ODL    )
      EQUIVALENCE(BUFF(1774),OIMPT  )
      EQUIVALENCE(BUFF(1775),REV    )
      EQUIVALENCE(BUFF(1776),XREV   )
C
C-----NAME TABLE
C
      INTEGER DV(3,119)/357*0/
      CHARACTER NAMES*6(119)/119*"NONAME"/
      INTEGER TABLE(119)
     &/1,57,58,59,115,171,172,176,232,233,234,290,346,347,348,
     & 349,350,351,352,408,409,410,411,412,413,414,415,416,417,
     & 473,529,530,531,532,588,644,645,646,647,648,704,760,761,
     & 762,763,767,823,879,935,936,937,938,994,995,1051,1052,
     & 1108,1109,1165,1166,1167,1168,1169,1225,1281,1282,1283,
     & 1284,1288,1344,1400,1456,1457,1458,1459,1460,1516,1517,
     & 1573,1574,1630,1631,1687,1688,1689,1690,1691,1692,1693,
     & 1694,1695,1696,1697,1698,1699,1700,1701,1702,1758,1759,
     & 1760,1761,1762,1763,1764,1765,1766,1767,1768,1769,1770,1771,
     & 1772,1773,1774,1775,1776,1777,1778/
C
C-----MISCELLANOUS DECLARATIONS
C
      CHARACTER CMND*1,LINE*12(10),RESP*72,REST*67
      CHARACTER VNAME*6
      INTEGER A,S,R,AL,SL,RL,AA,SS,RR
      INTEGER LA/14/,LS/2/,LR/2/,YEARS/21/,BSIZE/1800/
      INTEGER YR,YRS,YRE,NYR,I,J,STLOC,NLOC,VNUMB,ICOM,PIB
      REAL XMISS/-12345.E+30/
      REAL VAL(7),TEMP
      COMMON/BLANK/ICOM,PIB,XMISS
      COMMON/BUFFER/BUFF,BUFF2,DV,TABLE,NAMES
C
C-----------------------------------------------------------------------
C
      CALL RANSIZ(9,1800)
    5 READ (8,40,END=6) RESP
      DECODE (RESP,50) CMND,VNUMB,REST
      IF (CMND.NE."N") GO TO 5
      DECODE (REST,60) VNAME,AL,SL,RL
      NAMES(VNUMB)=VNAME
      DV(1,VNUMB)=AL
      DV(2,VNUMB)=SL
      DV(3,VNUMB)=RL
      GO TO 5
    6 REWIND 08
      GO TO 125
   10 PRINT, "LOADING HISTORY FILE$$$PLEASE WAIT"
      DO 120 YR=1,YEARS
```

```
      DO 20 I=1,BSIZE
   20 BUFF(I)=XMISS
   30 READ (8,40,END=110) RESP
   40 FORMAT(A72)
      DECODE(RESP,50) CMND,VNUMB,REST
   50 FORMAT(A1,I4,A67)
      IF (CMND.EQ."N") GO TO 30
   60 FORMAT(1X,A6,3I3)
   70 IF (CMND.NE."V") GO TO 100
      DECODE (REST,80) YRS,YRE,STLOC,NLOC,VAL
   80 FORMAT(3I3,I2,7F8.0)
      YRS=YRS+1
      YRE=YRE+1
      IF (.NOT.((YR.GE.YRS).AND.(YR.LE.YRE))) GO TO 30
      DO 90 I=1,NLOC
   90 BUFF(TABLE(VNUMB)+STLOC+I-2)=VAL(I)
      GO TO 30
  100 PRINT, "IGNORED..",RESP
      GO TO 30
  110 WRITE (9'YR) BUFF
      REWIND 08
  120 CONTINUE
  125 PRINT, "L/S/C/Q/P"
      READ (5,130,END=1360) CMND,REST
  130 FORMAT (A1,1X,A67)
      IF (CMND.EQ."Q") GO TO 1360
      IF (CMND.EQ."L") GO TO 10
      IF (CMND.NE."S") GO TO 1100
      DECODE (REST,140) YRS,NYR
      YRS=YRS+1
  140 FORMAT()
      DO 1090 I=YRS,(NYR+YRS-1)
      ICOM=I
      PIB=I-1
      READ (9'I) BUFF
      READ (9'PIB) BUFF2
C
C-----BASELINE SECTOR
C
C-----EQUATION 1.1
C
      DO 160 SS=1,LS; S=SS
      DO 160 RR=1,LR; R=RR
      TEMP=0.0
      DO 150 AA=1,LA; A=AA
  150 TEMP=TEMP+FR(A,2,R)*GET3("1.1",5,A,2,R,-1)
  160 BBTH(1,S,R)=SXR(1,S,R)*TEMP
C
C-----EQUATION 1.2
C
      DO 170 AA=1,LA; A=AA
      DO 170 SS=1,LS; S=SS
      DO 170 RR=1,LR; R=RR
  170 BP(A,S,R)=SR(A,S,R)*GET3("1.2",5,A,S,R,-1)
C
C-----EQUATION 1.3
C
      DO 180 SS=1,LS; S=SS
      DO 180 RR=1,LR; R=RR
  180 BSPP(1,S,R)=(BBTH(1,S,R)+F(1)*BP(1,S,R))*MR(1,S,R)
C
C-----EQUATION 1.4
C
      DO 190 AA=2,LA-1; A=AA
      DO 190 SS=1,LS; S=SS
      DO 190 RR=1,LR; R=RR
  190 BSPP(A,S,R)=((1.-F(A-1))*BP(A-1,S,R)+F(A)*BP(A,S,R))*MR(A,S,R)
C
```

```
  660 NODM(A,S,R)=NOEMR*N2(A,S,R)*OSDPP/OSEPP
C
C-----EQUATION 3.26
C
  670 DO 680 AA=1,LA; A=AA
      DO 680 SS=1,LS; S=SS
      DO 680 RR=1,LR; R=RR
  680 OEM(A,S,R)=NOEM(A,S,R)+OSEP(A,S,R)
C
C-----EQUATION 3.27
C
      DO 690 AA=1,LA; A=AA
      DO 690 SS=1,LS; S=SS
      DO 690 RR=1,LR; R=RR
  690 ODM(A,S,R)=NODM(A,S,R)+OSDP(A,S,R)
C
C-----EQUATION 3.28
C
      DO 700 AA=1,LA; A=AA
      DO 700 SS=1,LS; S=SS
      DO 700 RR=1,LR; R=RR
  700 OPOP(A,S,R)=OEM(A,S,R)+ODM(A,S,R)
C
C-----EQUATION 3.29
C
      OPOPP=0.0
      DO 710 AA=1,LA; A=AA
      DO 710 SS=1,LS; S=SS
      DO 710 RR=1,LR; R=RR
  710 OPOPP=OPOPP+OPOP(A,S,R)
C
C-----EQUATION 3.30
C
      TOEM=0.0
      DO 720 AA=1,LA; A=AA
      DO 720 SS=1,LS; S=SS
      DO 720 RR=1,LR; R=RR
  720 TOEM=TOEM+OEM(A,S,R)
C
C-----EQUATION 3.31
C
      OENR=NOENR+OSENR
C
C-----EQUATION 3.32
C
      IF (O1.LE.0.0) GO TO 740
      IF (O2.GE.0.0) GO TO 730
      TE2=TE1*(1.-P4*O1/LS2)
      GO TO 750
  730 TE2=TE1*(1.-P4)
      GO TO 750
  740 TE2=TE1
C
C-----EQUATION 3.33
C
  750 IF (O1.LE.0.0) GO TO 770
      IF (O2.GE.0.0) GO TO 760
      U2=U1*(1.-P5*O1/LS2)
      GO TO 780
  760 U2=U1*(1.-P5)
      GO TO 780
  770 U2=U1
C
C-----EQUATION 3.34
C
  780 IF (O1.LE.0.0) GO TO 800
      IF (O2.GE.0.0) GO TO 790
      NLF2=NLF1*(1.-P6*O1/LS2)
```

```
      GO TO 810
  790 NLF2=NLF1*(1.-P6)
      GO TO 810
  800 NLF2=NLF1
C
C-----SECONDARY RESPONSE
C
C-----EQUATION 4.1
C
  810 DO 820 AA=1,LA; A=AA
      DO 820 SS=1,LS; S=SS
      DO 820 RR=1,LR; R=RR
  820 SEP(A,S,R)=SR(A,S,R)*GET3("4.1",71,A,S,R,-1)
C
C-----EQUATION 4.2
C
      DO 830 AA=1,LA; A=AA
      DO 830 SS=1,LS; S=SS
      DO 830 RR=1,LR; R=RR
  830 SDP(A,S,R)=SR(A,S,R)*GET3("4.2",69,A,S,R,-1)
C
C-----EQUATION 4.3
C
      DO 850 SS=1,LS; S=SS
      DO 850 RR=1,LR; R=RR
      TEMP=0.0
      DO 840 AA=1,LA; A=AA
  840 TEMP=TEMP+FR(A,2,R)*GET3("4.3",69,A,2,R,-1)
  850 SBTH(1,S,R)=SXR(1,S,R)*TEMP
C
C-----EQUATION 4.4
C
      DO 855 SS=1,LS; S=SS
      DO 855 RR=1,LR; R=RR
  855 SSEP(1,S,R)=F(1)*SEP(1,S,R)*TO(1,S,R)
      DO 860 AA=2,LA; A=AA
      DO 860 SS=1,LS; S=SS
      DO 860 RR=1,LR; R=RR
  860 SSEP(A,S,R)=((1.-F(A-1))*SEP(A-1,S,R)+F(A)*SEP(A,S,R))*TO(A,S,R)
      DO 865 S=1,LS
      DO 865 R=1,LR
  865 SSEP(14,S,R)=((1.-F(13))*SEP(13,S,R)+SEP(14,S,R))*TO(14,S,R)
C
C-----EQUATION 4.5
C
      DO 870 SS=1,LS; S=SS
      DO 870 RR=1,LR; R=RR
  870 SSDP(1,S,R)=(SBTH(1,S,R)+F(1)*SDP(1,S,R))*TD(1,S,R)
C
C-----EQUATION 4.6
C
      DO 880 AA=2,A-1; A=AA
      DO 880 SS=1,LS; S=SS
      DO 880 RR=1,LR; R=RR
  880 SSDP(A,S,R)=((1.-F(A-1))*SDP(A-1,S,R)+F(A)*SEP(A,S,R))*TD(A,S,R)
C
C-----EQUATION 4.7
C
      DO 890 SS=1,LS; S=SS
      DO 890 RR=1,LR; R=RR
  890 SSDP(14,S,R)=((1.-F(13))*SDP(13,S,R)+SDP(14,S,R))*TD(14,S,R)
C
C-----EQUATION 4.8
C
      SSEPP=0.0
      DO 900 AA=1,LA; A=AA
      DO 900 SS=1,LS; S=SS
      DO 900 RR=1,LR; R=RR
```

```
  900 SSEPP=SSEPP+SSEP(A,S,R)
C
C-----EQUATION 4.9
C
      DLS=0.0
      DO 910 AA=1,LA; A=AA
      DO 910 SS=1,LS; S=SS
         DO 910 RR=1,LR; R=RR
  910 DLS=DLS+(ODM(A,S,R)+DDM(A,S,R))*LFPR(A,S,R)
C
C-----EQUATION 4.10
C
        OEME=E2*(TOEM+OENR)
C
C-----EQUATION 4.11
C
        SEML=N11*(GET("4.11",55,-1)-GET("4.11",49,-1))
     &     +N12*(GET("4.11",20,-1)-GFT("4.11",13,-1))
     &     +N13*GET("4.11",117,-1)+N14*GET("4.11",79,-1)
C
C-----EQUATION 4.12
C
        SEMS=N15*(OEMP-OEME)+N16*(DEMP-DEME)+N17*(OEME+DEME)
C
C-----EQUATION 4.13
C
        SEMC=N18*(OEMP-OEME)+N19*(DEMP-DEME)+N20*(OEME+DEME)
C
C-----EQUATION 4.14
C
        STE=SEML+SEMS+SEMC+TE-TE2
C
C-----EQUATION 4.15
C
        LS3=P7*U2+P8*NLF2
C
C-----EQUATION 4.16
C
        S1=STE-LS3
C
C-----EQUATION 4.17
C
        S2=S1-SSEPP
C
C-----EQUATION 4.18
C
        S3=S2-DLS
C
C-----EQUATION 4.19
C
        NSEMG1=S1
           IF (S1.LT.0.0) GO TO 930
        NSEMG1=S2
           IF (S2.LT.0.0) GO TO 930
        NSEMG1=0.0
           IF (S3.LT.0.0) GO TO 930
        NSEMG1=S3
C
C-----EQUATION 4.20
C
      930 NSEMG=NSEMG1
        IF ((SSEPP+NSEMG1).LT.0.0) NSEMG=-SSEPP
C
C-----EQUATION 4.21
C
        SSDPP=0.0
           DO 940 AA=1,LA; A=AA
           DO 940 SS=1,LS; S=SS
```

```
          DO 940 RR=1,LR; R=RR
  940 SSDPP=SSDPP+SSDP(A,S,R)
C
C-----EQUATION 4.22
C
          DO 950 AA=1,LA; A=AA
          DO 950 SS=1,LS; S=SS
          DO 950 RR=1,LR; R=RR
          R1(A,S,R)=0.0
  950 IF (SSEPP.NE.0.0) R1(A,S,R)=SSFP(A,S,R)/SSEPP
C
C-----EQUATION 4.23
C
          DO 960 AA=1,LA; A=AA
          DO 960 SS=1,LS; S=SS
          DO 960 RR=1,LR: R=RR
          R2(A,S,R)=0.0
  960 IF (SSDPP.NE.0.0) R2(A,S,R)=SSDP(A,S,R)/SSDPP
C
C-----EQUATION 4.24
C
          DO 970 AA=1,LA; A=AA
          DO 970 SS=1,LS; S=SS
          DO 970 RR=1,LR; R=RR
      NSEM(A,S,R)=NSEMG*SE(A,S,R)
  970 IF (NSEMG.LT.0.0) NSEM(A,S,R)=NSEMG*R1(A,S,R)
C
C-----EQUATION 4.25
C
      IF (NSEMG.LT.0.0) GO TO 990
          DO 980 AA=1,LA; A=AA
          DO 980 SS=1,LS; S=SS
          DO 980 RR=1,LR; R=RR
  980 NSDM(A,S,R)=NSEMG*SD(A,S,R)
          GO TO 1010
  990     DO 1000 AA=1,LA; A=AA
          DO 1000 SS=1,LS; S=SS
          DO 1000 RR=1,LR; R=RR
 1000 NSDM(A,S,R)=NSEMG*R2(A,S,R)*SSDPP/SSEPP
C
C-----EQUATION 4.26
C
 1010     DO 1020 AA=1,LA; A=AA
          DO 1020 SS=1,LS; S=SS
          DO 1020 RR=1,LR: R=RR
 1020 SEM(A,S,R)=NSEM(A,S,R)+SSEP(A,S,R)
C
C-----EQUATION 4.27
C
          DO 1030 AA=1,LA: A=AA
          DO 1030 SS=1,LS; S=SS
          DO 1030 RR=1,LR; R=RR
 1030 SDM(A,S,R)=NSDM(A,S,R)+SSDP(A,S,R)
C
C-----EQUATION 4.28
C
          DO 1040 AA=1,LA; A=AA
          DO 1040 SS=1,LS; S=SS
          DO 1040 RR=1,LR; R=RR
 1040 SPOP(A,S,R)=SEM(A,S,R)+SDM(A,S.R)
          SPOPP=0.0
C
C-----EQUATION 4.29
C
          DO 1050 AA=1,LA; A=AA
          DO 1050 SS=1,LS; S=SS
          DO 1050 RR=1,LR; R=RR
 1050 SPOPP=SPOPP+SPOP(A,S,R)
```

```
C
C-----EQUATION 4.29.5
      SEMM=0.0
      DO 1060 AA=1,LA; A=AA
      DO 1060 SS=1,LS; S=SS
      DO 1060 RR=1,LR; R=RR
 1060 SEMM=SEMM+SEM(A,S,R)
C
C-----UNEMPLOYED MIGRANTS
C
C-----EQUATION 5.1
C
      DLE=DEMP-DEMG
C
C-----EQUATION 5.2
C
      OLE=OEMP-(TOEM+OENR)
C
C-----EQUATION 5.3
C
      SLE=STE-(TE-TE2)
      IF (S1.GE.0.0) SLE=STF-S1-(TE-TE2)
C
C-----EQUATION 5.3.5
C
      TLE=DLE+OLE+SLE
C
C-----EQUATION 5.4
C
      U3=U2*(1.-P7*STE/LS3)
      IF (S1.GE.0.0) U3=U2*(1.-P7)
C
C-----EQUATION 5.4.5
C
      NLF3=NLF2*(1.-P8*STE/LS3)
      IF (S1.GE.0.0) NLF3=NLF3*(1.-P8)
C
C-----EQUATION 5.5
C
      UMG=Y1*(U0*(LF+BEMG+NLF-NLF3)-U3)
C
C-----EQUATION 5.6
C
      UDM=UMG*UDEP
C
C-----EQUATION 5.7
C
      UM=UMG+UDM
C
C-----SUMATION
C
C-----EQUATION 6.1
C
      TOCSP=OPOPP+DPOPP+SPOPP+UM
C
C-----EQUATION 6.2
C
      TOTPOP=BASPP+TOCSP
C
C-----EQUATION 6.3
C
      DO 1080 AA=1,LA; A=AA
      DO 1080 SS=1,LS; S=SS
      DO 1080 RR=1,LR; R=RR
 1080 TOTPP(A,S,R)=OPOP(A,S,R)+DPOP(A,S,R)+SPOP(A,S,R)+BASP(A,S,R)
     & +UM*X2(A,S,R)
C-----EQUATION 6.4
C
```

```
      TEML=EML+SEML
C
C-----EQUATION 6.5
C
      TEMS=EMS+SEMS
C
C-----EQUATION 6.6
C
      TEMC=EMC+SEMC
C
C-----EQUATION 6.7
C
      TEMX=EMX+DEMP+OEMP
C
C-----EQUATION 6.8
C
      TOCSE=DEMP+OEMP+STE-(TE-TE2)
C
C-----EQUATION 6.9
C
      ENCL=DEME+OEME
      WRITE (9'I) BUFF
 1090 CONTINUE
        GO TO 125
 1100 IF (CMND.NE."D") GO TO 1170
        DECODE(REST,140) YRS,NYR
      YRS=YRS+1
        DO 1160 I=YRS,(NYR+YRS-1)
      READ (9'I) BUFF
      WRITE (6,1110) I-1
 1110 FORMAT ("1YEAR ",I5,//," LOCATION  ",7X,"1",11X,
     & "2",11X,"3",11X,"4",11X,"5",11X,"6",11X,"7",11X,
     & "8",11X,"9",11X,"0")
        DO 1150 J=1,1800,10
        DO 1130 K=1,10
        ENCODE(LINE(K),1120) BUFF(J+K-1)
 1120 FORMAT (F12.2)
        IF (BUFF(J+K-1).LE.XMISS) LINE(K)="     N/A"
 1130 CONTINUE
        WRITE (6,1140) J,(LINE(K),K=1,10)
 1140 FORMAT (" BUFF(",I4,")",10A12)
 1150 CONTINUE
 1160 CONTINUE
        GO TO 125
 1170 IF (CMND.NE."C") GO TO 1220
        VNAME="NOFIND"
        VALL=XMISS
        YRS=-1
        YRE=-1
        DECODE (REST,140) VNAME,VALL,YRS,YRE
      DO 1180 I=108,117
        IF (NAMES(I).EQ.VNAME) GO TO 1190
 1180 CONTINUE
        PRINT, VNAME," NOT FOUND"
        GO TO 125
 1190 VNUMB=I
        IF (.NOT.((VALL.LE.XMISS).OR.(YRS.EQ.-1))) GO TO 1200
        PRINT, "UNABLE TO DECODE"
        GO TO 125
 1200 IF (YRS.EQ.-1) YRE=YRS
        DO 1210 I=YRS+1,YRE+1
        READ (9'I) BUFF
        PRINT, VNAME," YEAR",I," CHANGED",BUFF(TABLE(VNUMB))
        PRINT, "CHANGED TO ", VALL
        BUFF(TABLE(VNUMB))=VALL
        WRITE(9'I) BUFF
 1210 CONTINUE
        GO TO 125
```

```
 1220 IF (CMND.NE."P") GO TO 1350
      VNAME="NOFIND"
      YRS=-1
      NYR=1
      DECODE (REST,140) VNAME,YRS,NYR
      DO 1230 I=1,1778
      IF (NAMES(I).EQ.VNAME) GO TO 1240
 1230 CONTINUE
      PRINT, VNAME," NOT FOUND"
      GO TO 125
 1240 VNUMB=I
      IF (.NOT.(YRS.EQ.-1)) GO TO 1250
      PRINT, "UNABLE TO DECODE"
      GO TO 125
 1250 YRS=YRS+1
      DO 1340 I=YRS,(NYR+YRS-1)
      READ (9'I) BUFF
      IF (DV(1,VNUMB).EQ.0) GO TO 1310
      WRITE (6,1260) I-1,NAMES(VNUMB)
 1260 FORMAT (//," YEAR",I3,1X,A6)
      WRITE (6,1270)
 1270 FORMAT ("0+---+",2(19("-"),"+"),
     &/" :   :",5X,"NON-NATIVE",4X,":",7X,"NATIVE",6X,":",
     &/" :AGE+",4(9("-"),"+"),
     &/" :   :",2("  MALES   : FEMALES :"))
      WRITE (6,1284)
 1284 FORMAT (" +---+",4(9("-"),"+"))
      DO 1290 J=1,DV(1,VNUMB)
 1290 WRITE (6,1300) J,
     & (BUFF(TABLE(VNUMB)+(J-1)+(K-1)*DV(1,VNUMB)),K=1,4)
 1300 FORMAT (" :",I2," :",4(F8.0," :"))
      WRITE (6,1284)
      GO TO 1330
 1310 WRITE (6,1320) I-1,NAMES(VNUMB),BUFF(TABLE(VNUMB))
 1320 FORMAT (" YEAR",I3,1X,A6,"=",F8.0)
 1330 CONTINUE
 1340 CONTINUE
      GO TO 125
 1350 PRINT, "INVALID COMMAND"
 1360 STOP
      END
      REAL FUNCTION GET3(LABEL,VARNMB,A,S,R,PERIOD)
C
C     "GET"'S A LAGGED VARIABLE(VARNMB) WHICH HAS AGE (A)
C     RACE (R), AND SEX (S) COHORTS.  PERIOD IS AMOUNT OF LAG,
C    I.E. 0 = THIS PERIOD, -1 = LAST PERIOD.  LABEL IS
C     A TRACER BACK TO CALLING PROGRAM
      REAL XMISS
      INTEGER CHKSUM,IND
      CHARACTER NAMES*6(119)
      REAL BUFF(1800),BUFF2(1800)
      INTEGER DV(3,119),TABLE(119)
      COMMON/BLANK/ICOM,PIB,XMISS
      COMMON/BUFFER/BUFF,BUFF2,DV,TABLE,NAMES
      INTEGER A,S,R,AL,SL,RL,VARNMB,PERIOD,INDEX,PIB,ICOM
      CHARACTER LABEL*6
      AL=DV(1,VARNMB)
      SL=DV(2,VARNMB)
      RL=DV(3,VARNMB)
      CHKSUM=AL*SL*RL
      IND=A+AL*(S-1)+AL*SL*(R-1)-1
      IF (CHKSUM.NE.0) GO TO 5
      PRINT, "CHECKSUM ERROR 1", LABEL, VARNMB
      IF (IND.LE.CHKSUM) GO TO 5
      PRINT, "CHECKSUM ERROR 2", LABEL,VARNMB,A,S,R
    5 INDEX=IND+TABLE(VARNMB)
      IF (PERIOD.EQ.0) GO TO 10
      IF (PIB.NE.(ICOM+PERIOD)) READ (9'(ICOM+PERIOD)) BUFF2
```

```
      GET3=BUFF2(INDEX)
      GO TO 20
   10 GET3=BUFF(INDEX)
   20 IF (GET3.GT.XMISS) RETURN
      PRINT, LABEL, NAMES(VARNMB),A,S,R,(ICOM+PERIOD)
      PRINT, "TRIED TO USE UNITIALIZFD VARIABLE"
      GET3=0.0
      RETURN
      END
      REAL FUNCTION GET(LABEL,VARNMB.PERIOD)
C
C   "GET"'S A LAGGED VARIABLE (VARNMB).  PERIOD IS AMOUNT
C   OF LAG.  I.E. 0 = THIS PERIOD, -1 = LAST PERIOD.
C   LABEL IS A TRACER BACK TO MAIN PROGRAM
      REAL XMISS
      CHARACTER NAMES*6(119)
      REAL BUFF(1800),BUFF2(1800)
      INTEGER DV(3,119),TABLE(119)
      COMMON/BLANK/ICOM,PIB,XMISS
      COMMON/BUFFER/BUFF,BUFF2,DV,TABI E,NAMES
      INTEGER VARNMB,PERIOD,INDEX,PIB,ICOM
      CHARACTER LABEL*6
      INDEX=TABLE(VARNMB)
      IF (PERIOD.EQ.0) GO TO 10
      IF (PIB.NE.(ICOM+PERIOD)) READ (9'(ICOM+PERIOD)) BUFF2
      GET=BUFF2(INDEX)
      GO TO 20
   10 GET=BUFF(INDEX)
   20 IF(GET.GT.XMISS) RETURN
      PRINT, LABEL,NAMES(VARNMB),(ICOM+PERIOD)
      PRINT, "TRIED TO USE UNINITIALIZED VARIABLE"
      GET = 0.0
      RETURN
      END
```

APPENDIX B

OUTPUT FROM SMALL COMMUNITY IMPACT MODEL

YEAR 1 BASP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	63.	65.	339.	294.
2	69.	79.	361.	328.
3	66.	72.	377.	392.
4	57.	54.	288.	345.
5	166.	69.	237.	211.
6	155.	85.	185.	148.
7	97.	47.	151.	128.
8	76.	36.	143.	120.
9	64.	31.	128.	110.
10	61.	37.	124.	93.
11	47.	35.	93.	81.
12	41.	21.	90.	89.
13	25.	11.	58.	59.
14	38.	18.	121.	113.

YEAR 1 BASPP = 6892.

YEAR 1 DPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	0.	0.	0.	0.
2	0.	0.	0.	0.
3	0.	0.	0.	0.
4	0.	0.	0.	0.
5	0.	0.	0.	0.
6	0.	0.	0.	0.
7	0.	0.	0.	0.
8	0.	0.	0.	0.
9	0.	0.	0.	0.
10	0.	0.	0.	0.
11	0.	0.	0.	0.
12	0.	0.	0.	0.
13	0.	0.	0.	0.
14	0.	0.	0.	0.

YEAR 1 DPOPP = 0.

YEAR 1 OPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	0.	0.	0.	0.
2	0.	0.	0.	0.
3	0.	0.	0.	0.
4	0.	0.	0.	0.
5	0.	0.	0.	0.
6	0.	0.	0.	0.
7	0.	0.	0.	0.
8	0.	0.	0.	0.
9	0.	0.	0.	0.
10	0.	0.	0.	0.
11	0.	0.	0.	0.
12	0.	0.	0.	0.
13	0.	0.	0.	0.
14	0.	0.	0.	0.

YEAR 1 OPOPP = 0.

YEAR 1 SPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	0.	0.	0.	0.
2	0.	0.	0.	0.
3	0.	0.	0.	0.
4	0.	0.	0.	0.
5	0.	0.	0.	0.
6	0.	0.	0.	0.
7	0.	0.	0.	0.
8	0.	0.	0.	0.
9	0.	0.	0.	0.
10	0.	0.	0.	0.
11	0.	0.	0.	0.
12	0.	0.	0.	0.
13	0.	0.	0.	0.
14	0.	0.	0.	0.

YEAR 1 SPOPP = 0.

YEAR 15 SPOP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	256.	255.	0.	0.
2	97.	97.	0.	0.
3	62.	62.	0.	0.
4	131.	62.	0.	0.
5	179.	50.	0.	0.
6	375.	98.	0.	0.
7	602.	144.	0.	0.
8	525.	98.	0.	0.
9	393.	75.	0.	0.
10	254.	45.	0.	0.
11	176.	32.	0.	0.
12	124.	22.	0.	0.
13	81.	14.	0.	0.
14	3.	2.	0.	0.

YEAR 15 SPOPP = 4316.

YEAR 15 TOTPP

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	746.	746.	288.	303.
2	440.	443.	206.	232.
3	376.	380.	150.	175.
4	596.	362.	83.	182.
5	636.	316.	172.	255.
6	1065.	472.	266.	284.
7	1414.	544.	220.	200.
8	888.	283.	171.	130.
9	701.	221.	122.	79.
10	469.	149.	92.	58.
11	370.	116.	70.	49.
12	250.	81.	55.	39.
13	154.	50.	37.	26.
14	88.	53.	136.	149.

YEAR 15 TOTPOP= 14559.

YEAR 20 BASP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	52.	52.	273.	287.
2	41.	43.	199.	225.
3	34.	36.	143.	170.
4	36.	39.	76.	165.
5	108.	67.	151.	224.
6	154.	88.	243.	266.
7	125.	68.	214.	204.
8	94.	52.	181.	146.
9	80.	39.	138.	94.
10	57.	31.	104.	66.
11	42.	25.	75.	50.
12	32.	18.	55.	35.
13	21.	12.	35.	22.
14	70.	46.	134.	148.

YEAR 20 BASPP = 5683.

YEAR 20 DPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	123.	123.	0.	0.
2	86.	86.	0.	0.
3	79.	79.	0.	0.
4	236.	75.	0.	0.
5	232.	96.	0.	0.
6	307.	103.	0.	0.
7	386.	96.	0.	0.
8	146.	44.	0.	0.
9	129.	32.	0.	0.
10	110.	37.	0.	0.
11	110.	26.	0.	0.
12	67.	19.	0.	0.
13	35.	11.	0.	0.
14	14.	4.	0.	0.

YEAR 20 DPOPP = 2888.

YEAR 20 BASP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	52.	52.	273.	287.
2	41.	43.	199.	225.
3	34.	36.	143.	170.
4	36.	39.	76.	165.
5	108.	67.	151.	224.
6	154.	88.	243.	266.
7	125.	68.	214.	204.
8	94.	52.	181.	146.
9	80.	39.	138.	94.
10	57.	31.	104.	66.
11	42.	25.	75.	50.
12	32.	18.	55.	35.
13	21.	12.	35.	22.
14	70.	46.	134.	148.

YEAR 20 BASPP = 5683.

YEAR 20 DPOP

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	123.	123.	0.	0.
2	86.	86.	0.	0.
3	79.	79.	0.	0.
4	236.	75.	0.	0.
5	232.	96.	0.	0.
6	307.	103.	0.	0.
7	386.	96.	0.	0.
8	146.	44.	0.	0.
9	129.	32.	0.	0.
10	110.	37.	0.	0.
11	110.	26.	0.	0.
12	67.	19.	0.	0.
13	35.	11.	0.	0.
14	14.	4.	0.	0.

YEAR 20 DPOPP = 2888.

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	13.	13.	85.	84.

YEAR 16 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	13.	13.	84.	83.

YEAR 17 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	14.	83.	82.

YEAR 18 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	13.	81.	80.

YEAR 19 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	14.	80.	79.

YEAR 20 BBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	14.	79.	78.

YEAR 1 EML = 348.
YEAR 2 EML = 338.
YEAR 3 EML = 324.
YEAR 4 EML = 313.
YEAR 5 EML = 305.
= 299.

YEAR	1	EML	=	348.
YEAR	2	EML	=	338.
YEAR	3	EML	=	324.
YEAR	4	EML	=	313.
YEAR	5	EML	=	305.
YEAR	6	EML	=	299.
YEAR	7	EML	=	293.
YEAR	8	EML	=	289.
YEAR	9	EML	=	288.
YEAR	10	EML	=	285.
YEAR	11	EML	=	283.
YEAR	12	EML	=	282.
YEAR	13	EML	=	281.
YEAR	14	EML	=	280.
YEAR	15	EML	=	279.
YEAR	16	EML	=	278.
YEAR	17	EML	=	280.
YEAR	18	EML	=	279.
YEAR	19	EML	=	278.
YEAR	20	EML	=	278.
YEAR	1	EMS	=	546.
YEAR	2	EMS	=	546.
YEAR	3	EMS	=	546.
YEAR	4	EMS	=	546.
YEAR	5	EMS	=	546.
YEAR	6	EMS	=	546.
YEAR	7	EMS	=	546.
YEAR	8	EMS	=	550.
YEAR	9	EMS	=	550.
YEAR	10	EMS	=	550.
YEAR	11	EMS	=	550.
YEAR	12	EMS	=	550.
YEAR	13	EMS	=	550.
YEAR	14	EMS	=	550.
YEAR	15	EMS	=	550.
YEAR	16	EMS	=	554.
YEAR	17	EMS	=	554.
YEAR	18	EMS	=	554.
YEAR	19	EMS	=	554.
YEAR	20	EMS	=	554.
YEAR	1	EMC	=	547.
YEAR	2	EMC	=	547.
YEAR	3	EMC	=	547.
YEAR	4	EMC	=	547.
YEAR	5	EMC	=	547.
YEAR	6	EMC	=	547.
YEAR	7	EMC	=	547.
YEAR	8	EMC	=	550.
YEAR	9	EMC	=	550.
YEAR	10	EMC	=	550.
YEAR	11	EMC	=	550.
YEAR	12	EMC	=	550.
YEAR	13	EMC	=	550.
YEAR	14	EMC	=	550.
YEAR	15	EMC	=	550.
YEAR	16	EMC	=	554.
YEAR	17	EMC	=	554.
YEAR	18	EMC	=	554.
YEAR	19	EMC	=	554.
YEAR	20	EMC	=	554.
YEAR	1	EMG	=	480.
YEAR	2	EMG	=	480.
YEAR	3	EMG	=	480.
YEAR	4	EMG	=	480.
YEAR	5	EMG	=	480.
YEAR	6	EMG	=	480.
YEAR	7	EMG	=	480.
YEAR	8	EMG	=	480.
YEAR	9	EMG	=	480.
YEAR	10	EMG	=	480.
YEAR	11	EMG	=	480.
YEAR	12	EMG	=	480.
YEAR	13	EMG	=	480.
YEAR	14	EMG	=	480.
YEAR	15	EMG	=	480.

```
YEAR 16 EMG   =    480.
YEAR 17 EMG   =    480.
YEAR 18 EMG   =    480.
YEAR 19 EMG   =    480.
YEAR 20 EMG   =    480.
YEAR  1 EMA   =     57.
YEAR  2 EMA   =     57.
YEAR  3 EMA   =     57.
YEAR  4 EMA   =     57.
YEAR  5 EMA   =     57.
YEAR  6 EMA   =     57.
YEAR  7 EMA   =     57.
YEAR  8 EMA   =     61.
YEAR  9 EMA   =     61.
YEAR 10 EMA   =     61.
YEAR 11 EMA   =     61.
YEAR 12 EMA   =     61.
YEAR 13 EMA   =     61.
YEAR 14 EMA   =     61.
YEAR 15 EMA   =     61.
YEAR 16 EMA   =     66.
YEAR 17 EMA   =     66.
YEAR 18 EMA   =     66.
YEAR 19 EMA   =     66.
YEAR 20 EMA   =     66.
YEAR  1 EMX   =    101.
YEAR  2 EMX   =    101.
YEAR  3 EMX   =    101.
YEAR  4 EMX   =    101.
YEAR  5 EMX   =    101.
YEAR  6 EMX   =    101.
YEAR  7 EMX   =    101.
YEAR  8 EMX   =    101.
YEAR  9 EMX   =    101.
YEAR 10 EMX   =    101.
YEAR 11 EMX   =    101.
YEAR 12 EMX   =    101.
YEAR 13 EMX   =    101.
YEAR 14 EMX   =    101.
YEAR 15 EMX   =    101.
YEAR 16 EMX   =    101.
YEAR 17 EMX   =    101.
YEAR 18 EMX   =    101.
YEAR 19 EMX   =    101.
YEAR 20 EMX   =    101.
YEAR  1 EMM   =    136.
YEAR  2 EMM   =    136.
YEAR  3 EMM   =    136.
YEAR  4 EMM   =    136.
YEAR  5 EMM   =    136.
YEAR  6 EMM   =    136.
YEAR  7 EMM   =    136.
YEAR  8 EMM   =    136.
YEAR  9 EMM   =    136.
YEAR 10 EMM   =    136.
YEAR 11 EMM   =    136.
YEAR 12 EMM   =    136.
YEAR 13 EMM   =    136.
YEAR 14 EMM   =    136.
YEAR 15 EMM   =    136.
YEAR 16 EMM   =    136.
YEAR 17 EMM   =    136.
YEAR 18 EMM   =    136.
YEAR 19 EMM   =    136.
YEAR 20 EMM   =    136.
YEAR  1 BPOPP =   6756.
YEAR  2 BPOPP =   6477.
YEAR  3 BPOPP =   6269.
```

YEAR	16	EMG	=	480.
YEAR	4	BPOPP	=	6104.
YEAR	5	BPOPP	=	5973.
YEAR	6	BPOPP	=	5869.
YEAR	7	BPOPP	=	5787.
YEAR	8	BPOPP	=	5760.
YEAR	9	BPOPP	=	5699.
YEAR	10	BPOPP	=	5665.
YEAR	11	BPOPP	=	5635.
YEAR	12	BPOPP	=	5613.
YEAR	13	BPOPP	=	5595.
YEAR	14	BPOPP	=	5580.
YEAR	15	BPOPP	=	5567.
YEAR	16	BPOPP	=	5600.
YEAR	17	BPOPP	=	5575.
YEAR	18	BPOPP	=	5569.
YEAR	19	BPOPP	=	5557.
YEAR	20	BPOPP	=	5547.
YEAR	1	BASPP	=	6892.
YEAR	2	BASPP	=	6613.
YEAR	3	BASPP	=	6405.
YEAR	4	BASPP	=	6240.
YEAR	5	BASPP	=	6109.
YEAR	6	BASPP	=	6005.
YEAR	7	BASPP	=	5923.
YEAR	8	BASPP	=	5896.
YEAR	9	BASPP	=	5835.
YEAR	10	BASPP	=	5801.
YEAR	11	BASPP	=	5771.
YEAR	12	BASPP	=	5749.
YEAR	13	BASPP	=	5731.
YEAR	14	BASPP	=	5716.
YEAR	15	BASPP	=	5703.
YEAR	16	BASPP	=	5736.
YEAR	17	BASPP	=	5711.
YEAR	18	BASPP	=	5705.
YEAR	19	BASPP	=	5693.
YEAR	20	BASPP	=	5683.
YEAR	1	TE	=	2080.
YEAR	2	TE	=	2069.
YEAR	3	TE	=	2055.
YEAR	4	TE	=	2045.
YEAR	5	TE	=	2037.
YEAR	6	TE	=	2030.
YEAR	7	TE	=	2025.
YEAR	8	TE	=	2031.
YEAR	9	TE	=	2030.
YEAR	10	TE	=	2027.
YEAR	11	TE	=	2025.
YEAR	12	TE	=	2024.
YEAR	13	TE	=	2023.
YEAR	14	TE	=	2022.
YEAR	15	TE	=	2021.
YEAR	16	TE	=	2033.
YEAR	17	TE	=	2035.
YEAR	18	TE	=	2034.
YEAR	19	TE	=	2034.
YEAR	20	TE	=	2033.
YEAR	1	U	=	193.
YEAR	2	U	=	192.
YEAR	3	U	=	191.
YEAR	4	U	=	190.
YEAR	5	U	=	189.
YEAR	6	U	=	169.
YEAR	7	U	=	188.
YEAR	8	U	=	189.
YEAR	9	U	=	189.
YEAR	10	U	=	183.
YEAR	11	U	=	183.

```
YEAR 16 EMG    =   480.
YEAR 12 U      =   188.
YEAR 13 U      =   188.
YEAR 14 U      =   188.
YEAR 15 U      =   188.
YEAR 16 U      =   189.
YEAR 17 U      =   189.
YEAR 18 U      =   189.
YEAR 19 U      =   189.
YEAR 20 U      =   189.
YEAR  1 NLF    =  4493.
YEAR  2 NLF    =  4215.
YEAR  3 NLF    =  4022.
YEAR  4 NLF    =  3869.
YEAR  5 NLF    =  3747.
YEAR  6 NLF    =  3650.
YEAR  7 NLF    =  3574.
YEAR  8 NLF    =  3539.
YEAR  9 NLF    =  3480.
YEAR 10 NLF    =  3450.
YEAR 11 NLF    =  3422.
YEAR 12 NLF    =  3401.
YEAR 13 NLF    =  3384.
YEAR 14 NLF    =  3370.
YEAR 15 NLF    =  3358.
YEAR 16 NLF    =  3378.
YEAR 17 NLF    =  3351.
YEAR 18 NLF    =  3346.
YEAR 19 NLF    =  3334.
YEAR 20 NLF    =  3325.
YEAR  1 BEMG   =    21.
YEAR  2 BEMG   =   -15.
YEAR  3 BEMG   =    -4.
YEAR  4 BEMG   =     2.
YEAR  5 BEMG   =     6.
YEAR  6 BEMG   =     9.
YEAR  7 BEMG   =    13.
YEAR  8 BEMG   =    28.
YEAR  9 BEMG   =    16.
YEAR 10 BEMG   =    24.
YEAR 11 BEMG   =    24.
YEAR 12 BEMG   =    27.
YEAR 13 BEMG   =    29.
YEAR 14 BEMG   =    31.
YEAR 15 BEMG   =    32.
YEAR 16 BEMG   =    48.
YEAR 17 BEMG   =    30.
YEAR 18 BEMG   =    37.
YEAR 19 BEMG   =    36.
YEAR 20 BEMG   =    38.
YEAR  1 DEMP   =     0.
YEAR  2 DEMP   =     0.
YEAR  3 DEMP   =   247.
YEAR  4 DEMP   =   602.
YEAR  5 DEMP   =   731.
YEAR  6 DEMP   =   877.
YEAR  7 DEMP   =   610.
YEAR  8 DEMP   =  1703.
YEAR  9 DEMP   =  1725.
YEAR 10 DEMP   =  2843.
YEAR 11 DEMP   =  2332.
YEAR 12 DEMP   =  2516.
YEAR 13 DEMP   =  1984.
YEAR 14 DEMP   =  1766.
YEAR 15 DEMP   =  1770.
YEAR 16 DEMP   =  1830.
YEAR 17 DEMP   =  1860.
YEAR 16 DEMP   =  1860.
YEAR 19 DEMP   =  1860.
[illegible]
```

```
YEAR 20 DEMP  =  1860.
YEAR  1 DDL   =     0.
YEAR  2 DDL   =     0.
YEAR  3 DDL   =    47.
YEAR  4 DDL   =    90.
YEAR  5 DDL   =    95.
YEAR  6 DDL   =   105.
YEAR  7 DDL   =    73.
YEAR  8 DDL   =   302.
YEAR  9 DDL   =   431.
YEAR 10 DDL   =   710.
YEAR 11 DDL   =   699.
YEAR 12 DDL   =   880.
YEAR 13 DDL   =   992.
YEAR 14 DDL   =   883.
YEAR 15 DDL   =   885.
YEAR 16 DDL   =   915.
YEAR 17 DDL   =   930.
YEAR 18 DDL   =   930.
YEAR 19 DDL   =   930.
YEAR 20 DDL   =   930.
YEAR  1 DIMPT =     0.
YEAR  2 DIMPT =     0.
YEAR  3 DIMPT =   200.
YEAR  4 DIMPT =   512.
YEAR  5 DIMPT =   636.
YEAR  6 DIMPT =   772.
YEAR  7 DIMPT =   537.
YEAR  8 DIMPT =  1401.
YEAR  9 DIMPT =  1294.
YEAR 10 DIMPT =  2133.
YEAR 11 DIMPT =  1633.
YEAR 12 DIMPT =  1636.
YEAR 13 DIMPT =   992.
YEAR 14 DIMPT =   883.
YEAR 15 DIMPT =   885.
YEAR 16 DIMPT =   915.
YEAR 17 DIMPT =   930.
YEAR 18 DIMPT =   930.
YEAR 19 DIMPT =   930.
YEAR 20 DIMPT =   930.
YEAR  1 DEMG  =     0.
YEAR  2 DEMG  =     0.
YEAR  3 DEMG  =   200.
YEAR  4 DEMG  =   512.
YEAR  5 DEMG  =   636.
YEAR  6 DEMG  =   772.
YEAR  7 DEMG  =   537.
YEAR  8 DEMG  =  1594.
YEAR  9 DEMG  =  1617.
YEAR 10 DEMG  =  2735.
YEAR 11 DEMG  =  2224.
YEAR 12 DEMG  =  2409.
YEAR 13 DEMG  =  1877.
YEAR 14 DEMG  =  1659.
YEAR 15 DEMG  =  1663.
YEAR 16 DEMG  =  1723.
YEAR 17 DEMG  =  1753.
YEAR 18 DEMG  =  1753.
YEAR 19 DEMG  =  1753.
YEAR 20 DEMG  =  1753.
YEAR  1 DEME  =     0.
YEAR  2 DEME  =     0.
YEAR  3 DEME  =   100.
YEAR  4 DEME  =   256.
YEAR  5 DEME  =   318.
YEAR  6 DEME  =   386.
YEAR  7 DEME  =   269.
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```
YEAR  8 DEME   =    797.
YEAR  9 DEME   =    808.
YEAR 10 DEME   =   1368.
YEAR 11 DEME   =   1112.
YEAR 12 DEME   =   1204.
YEAR 13 DEME   =    938.
YEAR 14 DEME   =    830.
YEAR 15 DEME   =    832.
YEAR 16 DEME   =    961.
YEAR 17 DEME   =    876.
YEAR 18 DEME   =    876.
YEAR 19 DEME   =    876.
YEAR 20 DEME   =    877.
YEAR  1 DPOPP  =      0.
YEAR  2 DPOPP  =      0.
YEAR  3 DPOPP  =    330.
YEAR  4 DPOPP  =    844.
YEAR  5 DPOPP  =   1048.
YEAR  6 DPOPP  =   1272.
YEAR  7 DPOPP  =    885.
YEAR  8 DPOPP  =   2626.
YEAR  9 DPOPP  =   2664.
YEAR 10 DPOPP  =   4506.
YEAR 11 DPOPP  =   3665.
YEAR 12 DPOPP  =   3968.
YEAR 13 DPOPP  =   3092.
YEAR 14 DPOPP  =   2733.
YEAR 15 DPOPP  =   2740.
YEAR 16 DPOPP  =   2838.
YEAR 17 DPOPP  =   2888.
YEAR 18 DPOPP  =   2888.
YEAR 19 DPOPP  =   2888.
YEAR 20 DPOPP  =   2888.
YEAR  1 DEMR   =      0.
YEAR  2 DEMR   =      0.
YEAR  3 DEMR   =    100.
YEAR  4 DEMR   =    256.
YEAR  5 DEMR   =    318.
YEAR  6 DEMR   =    386.
YEAR  7 DEMR   =    269.
YEAR  8 DEMR   =    797.
YEAR  9 DEMR   =    808.
YEAR 10 DEMR   =   1368.
YEAR 11 DEMR   =   1112.
YEAR 12 DEMR   =   1204.
YEAR 13 DEMR   =    938.
YEAR 14 DEMR   =    830.
YEAR 15 DEMR   =    832.
YEAR 16 DEMR   =    861.
YEAR 17 DEMR   =    876.
YEAR 18 DEMR   =    876.
YEAR 19 DEMR   =    876.
YEAR 20 DEMR   =    877.
YEAR  1 OEMP   =      0.
YEAR  2 OEMP   =      0.
YEAR  3 OEMP   =    116.
YEAR  4 OEMP   =    271.
YEAR  5 OEMP   =    312.
YEAR  6 OEMP   =    396.
YEAR  7 OEMP   =    832.
YEAR  8 OEMP   =    712.
YEAR  9 OEMP   =    436.
YEAR 10 OEMP   =    354.
YEAR 11 OEMP   =    514.
YEAR 12 OEMP   =    503.
YEAR 13 OEMP   =    500.
YEAR 14 OEMP   =    490.
YEAR 15 OEMP   =    489.
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YEAR 16 OEMP  =     489.
YEAR 17 OEMP  =     489.
YEAR 18 OEMP  =     489.
YEAR 19 OEMP  =     489.
YEAR 20 OEMP  =     489.
YEAR  1 ODL   =       0.
YEAR  2 ODL   =       0.
YEAR  3 ODL   =      75.
YEAR  4 ODL   =     135.
YEAR  5 ODL   =     156.
YEAR  6 ODL   =     238.
YEAR  7 ODL   =     582.
YEAR  8 ODL   =     534.
YEAR  9 ODL   =     332.
YEAR 10 ODL   =     301.
YEAR 11 ODL   =     463.
YEAR 12 ODL   =     478.
YEAR 13 ODL   =     490.
YEAR 14 ODL   =     480.
YEAR 15 ODL   =     479.
YEAR 16 ODL   =     479.
YEAR 17 ODL   =     479.
YEAR 18 ODL   =     479.
YEAR 19 ODL   =     479.
YEAR 20 ODL   =     479.
YEAR  1 OIMPT =       0.
YEAR  2 OIMPT =       0.
YEAR  3 OIMPT =      41.
YEAR  4 OIMPT =     136.
YEAR  5 OIMPT =     156.
YEAR  6 OIMPT =     158.
YEAR  7 OIMPT =     250.
YEAR  8 OIMPT =     178.
YEAR  9 OIMPT =     104.
YEAR 10 OIMPT =      53.
YEAR 11 OIMPT =      51.
YEAR 12 OIMPT =      25.
YEAR 13 OIMPT =      10.
YEAR 14 OIMPT =      10.
YEAR 15 OIMPT =      10.
YEAR 16 OIMPT =      10.
YEAR 17 OIMPT =      10.
YEAR 18 OIMPT =      10.
YEAR 19 OIMPT =      10.
YEAR 20 OIMPT =      10.
```

YEAR 1 OBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	0.	0.	0.	0.

YEAR 2 OBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	0.	0.	0.	0.

YEAR 3 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	0.	0.	0.	0.

YEAR 4 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	1.	1.	0.	0.

YEAR 5 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	3.	3.	0.	0.

YEAR 6 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	4.	4.	0.	0.

YEAR 7 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	5.	5.	0.	0.

YEAR 8 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	12.	12.	0.	0.

YEAR 9 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	10.	10.	0.	0.

YEAR 10 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	8.	8.	0.	0.

YEAR 11 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	6.	6.	0.	0.

YEAR 12 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	8.	8.	0.	0.

YEAR 13 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	8.	8.	0.	0.

YEAR 14 OBTH

AGE	NON-NATIVE MALES	NON-NATIVE FEMALES	NATIVE MALES	NATIVE FEMALES
1	8.	7.	0.	0.

YEAR 15 OBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	7.	7.	0.	0.

YEAR 16 OBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	7.	7.	0.	0.

YEAR 17 OBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	7.	7.	0.	0.

YEAR 18 OBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	7.	7.	0.	0.

YEAR 19 OBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	7.	7.	0.	0.

YEAR 20 OBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	7.	7.	0.	0.

YEAR 1 OSEPT = 0.
YEAR 2 OSEPT = 0.
YEAR 3 OSEPT = 0.
YEAR 4 OSEPT = 33.
YEAR 5 OSEPT = 152.
YEAR 6 OSEPT = 188.

YEAR	8	OSEPT	=	613.
YEAR	9	OSEPT	=	520.
YEAR	10	OSEPT	=	360.
YEAR	11	OSEPT	=	271.
YEAR	12	OSEPT	=	357.
YEAR	13	OSEPT	=	349.
YEAR	14	OSEPT	=	347.
YEAR	15	OSEPT	=	339.
YEAR	16	OSEPT	=	338.
YEAR	17	OSEPT	=	338.
YEAR	18	OSEPT	=	338.
YEAR	19	OSEPT	=	338.
YEAR	20	OSEPT	=	338.
YEAR	1	OSEPP	=	0.
YEAR	2	OSEPP	=	0.
YEAR	3	OSEPP	=	0.
YEAR	4	OSEPP	=	33.
YEAR	5	OSEPP	=	152.
YEAR	6	OSEPP	=	188.
YEAR	7	OSEPP	=	258.
YEAR	8	OSEPP	=	613.
YEAR	9	OSEPP	=	520.
YEAR	10	OSEPP	=	360.
YEAR	11	OSEPP	=	271.
YEAR	12	OSEPP	=	357.
YEAR	13	OSEPP	=	349.
YEAR	14	OSEPP	=	347.
YEAR	15	OSEPP	=	339.
YEAR	16	OSEPP	=	338.
YEAR	17	OSEPP	=	338.
YEAR	18	OSEPP	=	338.
YEAR	19	OSEPP	=	338.
YEAR	20	OSEPP	=	338.
YEAR	1	OPOPP	=	0.
YEAR	2	OPOPP	=	0.
YEAR	3	OPOPP	=	92.
YEAR	4	OPOPP	=	421.
YEAR	5	OPOPP	=	519.
YEAR	6	OPOPP	=	712.
YEAR	7	OPOPP	=	1696.
YEAR	8	OPOPP	=	1437.
YEAR	9	OPOPP	=	1054.
YEAR	10	OPOPP	=	819.
YEAR	11	OPOPP	=	1046.
YEAR	12	OPOPP	=	1015.
YEAR	13	OPOPP	=	1002.
YEAR	14	OPOPP	=	974.
YEAR	15	OPOPP	=	967.
YEAR	16	OPOPP	=	962.
YEAR	17	OPOPP	=	959.
YEAR	18	OPOPP	=	956.
YEAR	19	OPOPP	=	953.
YEAR	20	OPOPP	=	952.
YEAR	1	TOEM	=	0.
YEAR	2	TOEM	=	0.
YEAR	3	TOEM	=	41.
YEAR	4	TOEM	=	187.
YEAR	5	TOEM	=	229.
YEAR	6	TOEM	=	314.
YEAR	7	TOEM	=	750.
YEAR	8	TOEM	=	630.
YEAR	9	TOEM	=	436.
YEAR	10	TOEM	=	327.
YEAR	11	TOEM	=	433.
YEAR	12	TOEM	=	422.
YEAR	13	TOEM	=	419.
YEAR	14	TOEM	=	410.
YEAR	15	TOEM	=	409.
YEAR	16	TOEM	=	408.

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES		

YEAR 16 TOEM = 408.
YEAR 17 TOEM = 408.
YEAR 18 TOEM = 408.
YEAR 19 TOEM = 408.
YEAR 20 TOEM = 408.
YEAR 1 OEME = 0.
YEAR 2 OEME = 0.
YEAR 3 OEME = 20.
YEAR 4 OEME = 93.
YEAR 5 OEME = 114.
YEAR 6 OEME = 157.
YEAR 7 OEME = 375.
YEAR 8 OEME = 315.
YEAR 9 OEME = 218.
YEAR 10 OEME = 164.
YEAR 11 OEME = 217.
YEAR 12 OEME = 211.
YEAR 13 OEME = 210.
YEAR 14 OEME = 205.
YEAR 15 OEME = 204.
YEAR 16 OEME = 204.
YEAR 17 OEME = 204.
YEAR 18 OEME = 204.
YEAR 19 OEME = 204.
YEAR 20 OEME = 204.

YEAR 1 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	0.	0.	0.	0.

YEAR 2 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	0.	0.	0.	0.

YEAR 3 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	0.	0.	0.	0.

YEAR 4 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	0.	0.	0.	0.

YEAR 12 TOEM = 408.

YEAR 5 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	12.	12.	0.	0.

YEAR 6 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	12.	12.	0.	0.

YEAR 7 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	14.	13.	0.	0.

YEAR 8 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	7.	7.	0.	0.

YEAR 9 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	34.	33.	0.	0.

YEAR 10 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	19.	19.	0.	0.

YEAR 11 SBTH

YEAR 11 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	42.	42.	0.	0.

YEAR 12 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	25.	25.	0.	0.

YEAR 13 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	25.	25.	0.	0.

YEAR 14 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	11.	10.	0.	0.

YEAR 15 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	8.	8.	0.	0.

YEAR 16 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	12.	12.	0.	0.

YEAR 17 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	16.	16.	0.	0.

YEAR 18 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	17.	16.	0.	0.

YEAR 19 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	16.	16.	0.	0.

YEAR 20 SBTH

AGE	NON-NATIVE		NATIVE	
	MALES	FEMALES	MALES	FEMALES
1	16.	16.	0.	0.

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YEAR  1 SSEPP =      0.
YEAR  2 SSEPP =      0.
YEAR  3 SSEPP =      0.
YEAR  4 SSEPP =      0.
YEAR  5 SSEPP =    305.
YEAR  6 SSEPP =    492.
YEAR  7 SSEPP =    659.
YEAR  8 SSEPP =    618.
YEAR  9 SSEPP =   1307.
YEAR 10 SSEPP =   1314.
YEAR 11 SSEPP =   2003.
YEAR 12 SSEPP =   1959.
YEAR 13 SSEPP =   2025.
YEAR 14 SSEPP =   1708.
YEAR 15 SSEPP =   1481.
YEAR 16 SSEPP =   1437.
YEAR 17 SSEPP =   1472.
YEAR 18 SSEPP =   1505.
YEAR 19 SSEPP =   1513.
YEAR 20 SSEPP =   1515.
YEAR  1 DLS   =      0.
YEAR  2 DLS   =      0.
YEAR  3 DLS   =     26.
YEAR  4 DLS   =     81.
YEAR  5 DLS   =    103.
YEAR  6 DLS   =    133.
YEAR  7 DLS   =    187.
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YEAR	8	DLS	=	279.
YEAR	9	DLS	=	259.
YEAR	10	DLS	=	352.
YEAR	11	DLS	=	320.
YEAR	12	DLS	=	338.
YEAR	13	DLS	=	287.
YEAR	14	DLS	=	265.
YEAR	15	DLS	=	265.
YEAR	16	DLS	=	271.
YEAR	17	DLS	=	274.
YEAR	18	DLS	=	273.
YEAR	19	DLS	=	273.
YEAR	20	DLS	=	273.
YEAR	1	XREV	=	0.
YEAR	2	XREV	=	0.
YEAR	3	XREV	=	0.
YEAR	4	XREV	=	0.
YEAR	5	XREV	=	0.
YEAR	6	XREV	=	0.
YEAR	7	XREV	=	0.
YEAR	8	XREV	=	0.
YEAR	9	XREV	=	1000.
YEAR	10	XREV	=	1000.
YEAR	11	XREV	=	1000.
YEAR	12	XREV	=	1000.
YEAR	13	XREV	=	1000.
YEAR	14	XREV	=	1000.
YEAR	15	XREV	=	1000.
YEAR	16	XREV	=	1000.
YEAR	17	XREV	=	1000.
YEAR	18	XREV	=	1000.
YEAR	19	XREV	=	1000.
YEAR	20	XREV	=	1000.
YEAR	1	SEML	=	0.
YEAR	2	SEML	=	0.
YEAR	3	SEML	=	0.
YEAR	4	SEML	=	15.
YEAR	5	SEML	=	111.
YEAR	6	SEML	=	152.
YEAR	7	SEML	=	194.
YEAR	8	SEML	=	201.
YEAR	9	SEML	=	397.
YEAR	10	SEML	=	381.
YEAR	11	SEML	=	576.
YEAR	12	SEML	=	518.
YEAR	13	SEML	=	533.
YEAR	14	SEML	=	426.
YEAR	15	SEML	=	371.
YEAR	16	SEML	=	369.
YEAR	17	SEML	=	384.
YEAR	18	SEML	=	393.
YEAR	19	SEML	=	394.
YEAR	20	SEML	=	394.
YEAR	1	SEMS	=	0.
YEAR	2	SEMS	=	0.
YEAR	3	SEMS	=	170.
YEAR	4	SEMS	=	381.
YEAR	5	SEMS	=	449.
YEAR	6	SEMS	=	537.
YEAR	7	SEMS	=	524.
YEAR	8	SEMS	=	976.
YEAR	9	SEMS	=	896.
YEAR	10	SEMS	=	1361.
YEAR	11	SEMS	=	1194.
YEAR	12	SEMS	=	1270.
YEAR	13	SEMS	=	1041.
YEAR	14	SEMS	=	944.
YEAR	15	SEMS	=	946.

YEAR	16	SEMS	=	972.
YEAR	17	SEMS	=	985.
YEAR	18	SEMS	=	985.
YEAR	19	SEMS	=	985.
YEAR	20	SEMS	=	984.
YEAR	1	SEMC	=	0.
YEAR	2	SEMC	=	0.
YEAR	3	SEMC	=	170.
YEAR	4	SEMC	=	381.
YEAR	5	SEMC	=	449.
YEAR	6	SEMC	=	537.
YEAR	7	SEMC	=	524.
YEAR	8	SEMC	=	976.
YEAR	9	SEMC	=	896.
YEAR	10	SEMC	=	1361.
YEAR	11	SEMC	=	1194.
YEAR	12	SEMC	=	1270.
YEAR	13	SEMC	=	1041.
YEAR	14	SEMC	=	944.
YEAR	15	SEMC	=	946.
YEAR	16	SEMC	=	972.
YEAR	17	SEMC	=	985.
YEAR	18	SEMC	=	985.
YEAR	19	SEMC	=	985.
YEAR	20	SEMC	=	984.
YEAR	1	SEMM	=	0.
YEAR	2	SEMM	=	0.
YEAR	3	SEMM	=	0.
YEAR	4	SEMM	=	375.
YEAR	5	SEMM	=	600.
YEAR	6	SEMM	=	803.
YEAR	7	SEMM	=	750.
YEAR	8	SEMM	=	1596.
YEAR	9	SEMM	=	1596.
YEAR	10	SEMM	=	2440.
YEAR	11	SEMM	=	2376.
YEAR	12	SEMM	=	2455.
YEAR	13	SEMM	=	2063.
YEAR	14	SEMM	=	1787.
YEAR	15	SEMM	=	1735.
YEAR	16	SEMM	=	1779.
YEAR	17	SEMM	=	1819.
YEAR	18	SEMM	=	1828.
YEAR	19	SEMM	=	1830.
YEAR	20	SEMM	=	1831.
YEAR	1	UMG	=	0.
YEAR	2	UMG	=	0.
YEAR	3	UMG	=	127.
YEAR	4	UMG	=	192.
YEAR	5	UMG	=	206.
YEAR	6	UMG	=	219.
YEAR	7	UMG	=	214.
YEAR	8	UMG	=	274.
YEAR	9	UMG	=	266.
YEAR	10	UMG	=	324.
YEAR	11	UMG	=	321.
YEAR	12	UMG	=	327.
YEAR	13	UMG	=	299.
YEAR	14	UMG	=	281.
YEAR	15	UMG	=	278.
YEAR	16	UMG	=	281.
YEAR	17	UMG	=	283.
YEAR	18	UMG	=	284.
YEAR	19	UMG	=	284.
YEAR	20	UMG	=	283.
YEAR	1	UM	=	0.
YEAR	2	UM	=	0.
YEAR	3	UM	=	380.

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YEAR  4 UM     =    577.
YEAR  5 UM     =    617.
YEAR  6 UM     =    656.
YEAR  7 UM     =    643.
YEAR  8 UM     =    823.
YEAR  9 UM     =    799.
YEAR 10 UM     =    972.
YEAR 11 UM     =    964.
YEAR 12 UM     =    980.
YEAR 13 UM     =    898.
YEAR 14 UM     =    843.
YEAR 15 UM     =    833.
YEAR 16 UM     =    844.
YEAR 17 UM     =    850.
YEAR 18 UM     =    852.
YEAR 19 UM     =    851.
YEAR 20 UM     =    850.
YEAR  1 TOCSE  =      0.
YEAR  2 TOCSE  =      0.
YEAR  3 TOCSE  =    703.
YEAR  4 TOCSE  =   1650.
YEAR  5 TOCSE  =   2052.
YEAR  6 TOCSE  =   2500.
YEAR  7 TOCSE  =   2683.
YEAR  8 TOCSE  =   4568.
YEAR  9 TOCSE  =   4351.
YEAR 10 TOCSE  =   6300.
YEAR 11 TOCSE  =   5810.
YEAR 12 TOCSE  =   6078.
YEAR 13 TOCSE  =   5098.
YEAR 14 TOCSE  =   4571.
YEAR 15 TOCSE  =   4521.
YEAR 16 TOCSE  =   4632.
YEAR 17 TOCSE  =   4702.
YEAR 18 TOCSE  =   4711.
YEAR 19 TOCSE  =   4712.
YEAR 20 TOCSE  =   4712.
YEAR  1 ENCL   =      0.
YEAR  2 ENCL   =      0.
YEAR  3 ENCL   =    121.
YEAR  4 ENCL   =    349.
YEAR  5 ENCL   =    432.
YEAR  6 ENCL   =    543.
YEAR  7 ENCL   =    643.
YEAR  8 ENCL   =   1112.
YEAR  9 ENCL   =   1026.
YEAR 10 ENCL   =   1531.
YEAR 11 ENCL   =   1329.
YEAR 12 ENCL   =   1416.
YEAR 13 ENCL   =   1148.
YEAR 14 ENCL   =   1034.
YEAR 15 ENCL   =   1036.
YEAR 16 ENCL   =   1065.
YEAR 17 ENCL   =   1080.
YEAR 18 ENCL   =   1081.
YEAR 19 ENCL   =   1081.
YEAR 20 ENCL   =   1081.
YEAR  1 TOCSP  =      0.
YEAR  2 TOCSP  =      0.
YEAR  3 TOCSP  =    801.
YEAR  4 TOCSP  =   3155.
YEAR  5 TOCSP  =   4092.
YEAR  6 TOCSP  =   5079.
YEAR  7 TOCSP  =   5302.
YEAR  8 TOCSP  =   9882.
YEAR  9 TOCSP  =   9045.
YEAR 10 TOCSP  =  13614.
YEAR 11 TOCSP  =  12251.
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YEAR 12 TOCSP =  12651.
YEAR 13 TOCSP =  10171.
YEAR 14 TOCSP =   8888.
YEAR 15 TOCSP =   8856.
YEAR 16 TOCSP =   9191.
YEAR 17 TOCSP =   9393.
YEAR 18 TOCSP =   9416.
YEAR 19 TOCSP =   9417.
YEAR 20 TOCSP =   9417.
YEAR  1 TLE   =      0.
YEAR  2 TLE   =      0.
YEAR  3 TLE   =    462.
YEAR  4 TLE   =    495.
YEAR  5 TLE   =    485.
YEAR  6 TLE   =    478.
YEAR  7 TLE   =    460.
YEAR  8 TLE   =    468.
YEAR  9 TLE   =    443.
YEAR 10 TLE   =    446.
YEAR 11 TLE   =    456.
YEAR 12 TLE   =    454.
YEAR 13 TLE   =    452.
YEAR 14 TLE   =    450.
YEAR 15 TLE   =    449.
YEAR 16 TLE   =    452.
YEAR 17 TLE   =    449.
YEAR 18 TLE   =    449.
YEAR 19 TLE   =    447.
YEAR 20 TLE   =    446.
YEAR  1 DLE   =      0.
YEAR  2 DLE   =      0.
YEAR  3 DLE   =     47.
YEAR  4 DLE   =     90.
YEAR  5 DLE   =     95.
YEAR  6 DLE   =    105.
YEAR  7 DLE   =     73.
YEAR  8 DLE   =    109.
YEAR  9 DLE   =    108.
YEAR 10 DLE   =    108.
YEAR 11 DLE   =    108.
YEAR 12 DLE   =    107.
YEAR 13 DLE   =    107.
YEAR 14 DLE   =    107.
YEAR 15 DLE   =    107.
YEAR 16 DLE   =    107.
YEAR 17 DLE   =    107.
YEAR 18 DLE   =    107.
YEAR 19 DLE   =    107.
YEAR 20 DLE   =    107.
YEAR  1 OLE   =      0.
YEAR  2 OLE   =      0.
YEAR  3 OLE   =     75.
YEAR  4 OLE   =     84.
YEAR  5 OLE   =     83.
YEAR  6 OLE   =     82.
YEAR  7 OLE   =     82.
YEAR  8 OLE   =     82.
YEAR  9 OLE   =     -0.
YEAR 10 OLE   =     27.
YEAR 11 OLE   =     81.
YEAR 12 OLE   =     81.
YEAR 13 OLE   =     81.
YEAR 14 OLE   =     80.
YEAR 15 OLE   =     80.
YEAR 16 OLE   =     81.
YEAR 17 OLE   =     81.
YEAR 18 OLE   =     81.
YEAR 19 OLE   =     81.
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YEAR 20 OLE    =      81.
YEAR  1 SLE    =       0.
YEAR  2 SLE    =       0.
YEAR  3 SLE    =     340.
YEAR  4 SLE    =     321.
YEAR  5 SLE    =     306.
YEAR  6 SLE    =     291.
YEAR  7 SLE    =     304.
YEAR  8 SLE    =     278.
YEAR  9 SLE    =     335.
YEAR 10 SLE    =     312.
YEAR 11 SLE    =     268.
YEAR 12 SLE    =     266.
YEAR 13 SLE    =     264.
YEAR 14 SLE    =     263.
YEAR 15 SLE    =     262.
YEAR 16 SLE    =     264.
YEAR 17 SLE    =     261.
YEAR 18 SLE    =     261.
YEAR 19 SLE    =     260.
YEAR 20 SLE    =     259.
YEAR  1 TOTPOP=    6892.
YEAR  2 TOTPOP=    6613.
YEAR  3 TOTPOP=    7206.
YEAR  4 TOTPOP=    9394.
YEAR  5 TOTPOP=   10201.
YEAR  6 TOTPOP=   11084.
YEAR  7 TOTPOP=   11225.
YEAR  8 TOTPOP=   15778.
YEAR  9 TOTPOP=   14880.
YEAR 10 TOTPOP=   19415.
YEAR 11 TOTPOP=   18022.
YEAR 12 TOTPOP=   18400.
YEAR 13 TOTPOP=   15902.
YEAR 14 TOTPOP=   14604.
YEAR 15 TOTPOP=   14559.
YEAR 16 TOTPOP=   14927.
YEAR 17 TOTPOP=   15104.
YEAR 18 TOTPOP=   15121.
YEAR 19 TOTPOP=   15109.
YEAR 20 TOTPOP=   15099.
YEAR  1 TEML   =     348.
YEAR  2 TEML   =     338.
YEAR  3 TEML   =     324.
YEAR  4 TEML   =     328.
YEAR  5 TEML   =     417.
YEAR  6 TEML   =     451.
YEAR  7 TEML   =     487.
YEAR  8 TEML   =     490.
YEAR  9 TEML   =     685.
YEAR 10 TEML   =     666.
YEAR 11 TEML   =     859.
YEAR 12 TEML   =     800.
YEAR 13 TEML   =     813.
YEAR 14 TEML   =     706.
YEAR 15 TEML   =     650.
YEAR 16 TEML   =     648.
YEAR 17 TEML   =     664.
YEAR 18 TEML   =     672.
YEAR 19 TEML   =     673.
YEAR 20 TEML   =     672.
YEAR  1 TEMS   =     546.
YEAR  2 TEMS   =     546.
YEAR  3 TEMS   =     716.
YEAR  4 TEMS   =     928.
YEAR  5 TEMS   =     995.
YEAR  6 TEMS   =    1084.
YEAR  7 TEMS   =    1070.
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YEAR  8  TEMS  =  1525.
YEAR  9  TEMS  =  1446.
YEAR 10  TEMS  =  1911.
YEAR 11  TEMS  =  1744.
YEAR 12  TEMS  =  1820.
YEAR 13  TEMS  =  1590.
YEAR 14  TEMS  =  1494.
YEAR 15  TEMS  =  1495.
YEAR 16  TEMS  =  1525.
YEAR 17  TEMS  =  1538.
YEAR 18  TEMS  =  1538.
YEAR 19  TEMS  =  1538.
YEAR 20  TEMS  =  1538.
YEAR  1  TEMC  =   547.
YEAR  2  TEMC  =   547.
YEAR  3  TEMC  =   717.
YEAR  4  TEMC  =   928.
YEAR  5  TEMC  =   996.
YEAR  6  TEMC  =  1084.
YEAR  7  TEMC  =  1071.
YEAR  8  TEMC  =  1526.
YEAR  9  TEMC  =  1447.
YEAR 10  TEMC  =  1911.
YEAR 11  TEMC  =  1745.
YEAR 12  TEMC  =  1821.
YEAR 13  TEMC  =  1591.
YEAR 14  TEMC  =  1495.
YEAR 15  TEMC  =  1496.
YEAR 16  TEMC  =  1526.
YEAR 17  TEMC  =  1539.
YEAR 18  TEMC  =  1539.
YEAR 19  TEMC  =  1539.
YEAR 20  TEMC  =  1539.
YEAR  1  TEMX  =   101.
YEAR  2  TEMX  =   101.
YEAR  3  TEMX  =   464.
YEAR  4  TEMX  =   974.
YEAR  5  TEMX  =  1144.
YEAR  6  TEMX  =  1374.
YEAR  7  TEMX  =  1543.
YEAR  8  TEMX  =  2516.
YEAR  9  TEMX  =  2262.
YEAR 10  TEMX  =  3293.
YEAR 11  TEMX  =  2947.
YEAR 12  TEMX  =  3120.
YEAR 13  TEMX  =  2565.
YEAR 14  TEMX  =  2357.
YEAR 15  TEMX  =  2360.
YEAR 16  TEMX  =  2420.
YEAR 17  TEMX  =  2450.
YEAR 18  TEMX  =  2450.
YEAR 19  TEMX  =  2450.
YEAR 20  TEMX  =  2450.
```

```
C-----EQUATION 1.5
C
      DO 200 SS=1,LS; S=SS
      DO 200 RR=1,LR; R=RR
  200 BSPP(14,S,R)=(1.-F(13))*BP(13,S,R)+BP(14,S,R)
C
C-----EQUATION 1.6
C
      LF=0.0
      DO 210 AA=1,LA; A=AA
      DO 210 SS=1,LS; S=SS
      DO 210 RR=1,LR; R=RR
  210 LF=LF+LFPR(A,S,R)*BSPP(A,S,R)
C
C-----EQUATION 1.7
C
      EML=L0+L1*GET("1.7",6,-1)+L2*REV
C
C-----EQUATION 1.8
C
      EMS=M10+M11*EMG+M12*EMA+M13*EMX+M14*EMM
C
C-----EQUATION 1.9
C
      EMC=M20+M21*EMG+M22*EMA+M23*EMX+M24*EMM
C
C-----EQUATION 1.10
C
      TE=EML+EMS+EMC+EMG+EMA+EMX
C
C-----EQUATION 1.11
C
      UNE=LF-TE
C
C-----EQUATION 1.12
      IF (UNE.GE.0.0) GO TO 220
      BEMG=((TF/(1-U0))-LF)*B2
      GO TO 230
  220 BEMG=((TF/(1-U0))-LF)*B1
C
C-----EQUATION 1.13
C
  230 IF (BEMG.LE.0.0) GO TO 250
      DO 240 AA=1,LA; A=AA
      DO 240 SS=1,LS; S=SS
      DO 240 RR=1,LR; R=RR
  240 BPOP(A,S,R)=BSPP(A,S,R)+C2(A,S,R)*BEMG
      GO TO 270
  250 DO 260 AA=1,LA; A=AA
      DO 260 SS=1,LS; S=SS
      DO 260 RR=1,LR; R=RR
  260 BPOP(A,S,R)=BSPP(A,S,R)+C1(A,S,R)*BEMG
C
C-----EQUATION 1.14
C
  270 BPOPP=0.0
      DO 280 AA=1,LA; A=AA
      DO 280 SS=1,LS; S=SS
      DO 280 RR=1,LR; R=RR
  280 BPOPP=BPOPP+BPOP(A,S,R)
C
C-----EQUATION 1.15
C
      DO 290 AA=1,LA; A=AA
      DO 290 SS=1,LS;S=SS
      DO 290 RR=1,LR; R=RR
  290 BASP(A,S,R)=BPOP(A,S,R)+EMM*C3(A,S,R)
C-----EQUATION 1.16
```

```
C
      BASPP=0.0
      DO 300 AA=1,LA; A=AA
      DO 300 SS=1,LS; S=SS
      DO 300 RR=1,LR;R=RR
  300 BASPP=BASPP+BASP(A,S,R)
C
C-----EQUATION 1.17
C
      NLF=BPOPP-(LF+BEMG)
C
C-----EQUATION 1.18
C
      U=LF+BEMG-TE
C
C-----EQUATION 1.19
      TOTE=TE+EMM
C
C-----DEVELOPMENT SECTOR
C
C-----EQUATION 2.1
      LS1=P1*TF+P2*U+P3*NLF
C
C-----EQUATION 2.2
C
      DEMP=DDL+DIMPT
C
C-----EQUATION 2.3
C
      D1=DDL-LS1
C
C-----EQUATION 2.4
C
      D2=0.0
      IF (D1.GT.0.0) D2=D1
C
C-----EQUATION 2.5
C
      DEMG=D2+DIMPT
C
C-----EQUATION 2.6
C
      DEME=E1*DEMG
C
C-----EQUATION 2.7
C
      DEMR=G1*(DEMG-DEME)
C
C-----EQUATION 2.8
C
      DO 310 AA=1,LA; A=AA
      DO 310 SS=1,LS; S=SS
      DO 310 RR=1,LR; R=RR
  310 DEM(A,S,R)=(DEMR+DEME)*DE(A,S,R)
C
C-----EQUATION 2.9
C
      DO 320 AA=1,LA; A=AA
      DO 320 SS=1,LS; S=SS
      DO 320 RR=1,LR; R=RR
  320 DDM(A,S,R)=DEMR*DD(A,S,R)
C
C-----EQUATION 2.10
C
      DO 330 AA=1,LA; A=AA
      DO 330 SS=1,LS; S=SS
      DO 330 RR=1,LR; R=RR
  330 DPOP(A,S,R)=DEM(A,S,R)+DDM(A,S,R)
```

```
C
C-----EQUATION 2.11
C
      DPOPP=0.0
      DO 340 AA=1,LA; A=AA
      DO 340 SS=1,LS; S=SS
      DO 340 RR=1,LR; R=RR
  340 DPOPP=DPOPP+DPOP(A,S,R)
C
C-----EQUATION 2.12
C
      IF (D1.GE.0.0) GO TO 350
      TE1=TE*(1.-P1*DDL/LS1)
      GO TO 360
  350 TE1=TE*(1.-P1)
C
C-----EQUATION 2.13
C
  360 IF (D1.GE.0.0) GO TO 370
      U1=U*(1.-P2*DDL/LS1)
      GO TO 380
  370 U1=U*(1.-P2)
C
C-----EQUATION 2.14
C
  380 IF (D1.GE.0.0) GO TO 390
      NLF1=NLF*(1.-P3*DDL/LS1)
      GO TO 400
  390 NLF1=NLF*(1.-P3)
C
C-----OPERATION SECTOR
C
C-----EQUATION 3.1
C
  400 DO 410 AA=1,LA; A=AA
      DO 410 SS=1,LS; S=SS
      DO 410 RR=1,LR;R=RR
  410 OEP(A,S,R)=SR(A,S,R)*GET3("3.1",48,A,S,R,-1)
C
C-----EQUATION 3.2
C
      DO 420 AA=1,LA; A=AA
      DO 420 SS=1,LS; S=SS
      DO 420 RR=1,LR; R=RR
  420 ODP(A,S,R)=SR(A,S,R)*GET3("3.2",46,A,S,R,-1)
C
C-----EQUATION 3.3
C
      DO 440 SS=1,LS; S=SS
      DO 440 RR=1,LR; R=RR
      TEMP=0.0
      DO 430 AA=1,LA; A=AA
  430 TEMP=TEMP+FR(A,2,R)*GET3("3.3",46,A,2,R,-1)
  440 OBTH(1,S,R)=SXR(1,S,R)*TEMP
C
C-----EQUATION 3.4
C
      DO 445 SS=1,LS; S=SS
      DO 445 RR=1,LR; R=RR
  445 OSEP(1,S,R)=F(1)*OEP(1,S,R)*TO(1,S,R)
      DO 450 AA=2,LA; A=AA
      DO 450 SS=1,LS; S=SS
      DO 450 RR=1,LR; R=RR
  450 OSEP(A,S,R)=((1.-F(A-1))*OEP(A-1,S,R)+F(A)*OEP(A,S,R))*TO(A,S,R)
      DO 455 S=1,LS
      DO 455 R=1,LR
  455 OSEP(15,S,R)=((1.-F(13))*OEP(13,S,R)+OEP(14,S,R))*TO(14,S,R)
C
```

```
C-----EQUATION 3.5
C
      DO 460 SS=1,LS; S=SS
      DO 460 RR=1,LR; R=RR
  460 OSDP(1,S,R)=(OBTH(1,S,R)+F(1)*ODP(1,S,R))*TD(1,S,R)
C
C-----EQUATION 3.6
C
      DO 470 AA=2,LA-1; A=AA
      DO 470 SS=1,LS; S=SS
      DO 470 RR=1,LR; R=RR
  470 OSDP(A,S,R)=((1.-F(A-1))*ODP(A-1,S,R)+F(A)*ODP(A,S,R))*TD(A,S,R)
C
C-----EQUATION 3.7
C
      DO 480 SS=1,LS; S=SS
      DO 480 RR=1,LR; R=RR
  480 OSDP(14,S,R)=((1.-F(13))*ODP(13,S,R)+ODP(14,S,R))*TD(14,S,R)
C
C-----EQUATION 3.8
C
      OSEPP=0.0
      DO 490 AA=1,LA; A=AA
      DO 490 SS=1,LS; S=SS
      DO 490 RR=1,LR; R=RR
  490 OSEPP=OSEPP+OSEP(A,S,R)
C
C-----EQUATION 3.9
C
      Z1=0.0
      IF (GET("3.9",95,-1).GT.0.0) Z1=OSEPP/GET("3.9",95,-1)
C
C-----EQUATION 3.10
C
      OSENR=Z1*GET("3.10",51,-1)
C
C-----EQUATION 3.11
C
      OSEPT=OSEPP+OSENR
C
C-----EQUATION 3.12
C
      OEMP=ODL+OIMPT
C
C-----EQUATION 3.13
C
      LS2=P4*TF1+P5*U1+P6*NLF1
C
C-----EQUATION 3.14
C
      OSL=OSEPT-Z1*GET("3.14",115,-1)
C
C-----EQUATION 3.15
C
      O1=ODL-OSL
C
C-----EQUATION 3.16
      O2=O1-LS2
C
C-----EQUATION 3.17
C
      IF (O1.LT.0.0) GO TO 520
      IF (O2.LT.0.0) GO TO 510
      NOEMG=O2+OIMPT-Z1*GET("3.17",115,-1)
      GO TO 530
  510 NOEMG=OIMPT-Z1*GET("3.17",115,-1)
      GO TO 530
  520 NOEMG=O1+OIMPT-Z1*GET("3.17",115,-1)
```

```
C
C-----EQUATION 3.18
C
  530 NOEME=E2*NOEMG
C
C-----EQUATION 3.19
      NOEMR=G2*(NOEMG-NOEME)
C
C-----EQUATION 3.20
C
      NOENR=NOEMG-NOEME-NOEMR
C
C-----EQUATION 3.21
C
      DO 540 AA=1,LA; A=AA
      DO 540 SS=1,LS; S=SS
      DO 540 RR=1,LR; R=RR
  540 N1(A,S,R)=0.0
      IF (OSEPP.EQ.0.0) GO TO 560
      DO 550 AA=1,LA; A=AA
      DO 550 SS=1,LS; S=SS
      DO 550 RR=1,LR; R=RR
  550 N1(A,S,R)=OSEP(A,S,R)/OSEPP
C
C-----EQUATION 3.22
C
  560 OSDPP=0.0
      DO 570 AA=1,LA; A=AA
      DO 570 SS=1,LS; S=SS
      DO 570 RR=1,LR; R=RR
  570 OSDPP=OSDPP+OSDP(A,S,R)
C
C-----EQUATION 3.23
C
      DO 580 AA=1,LA; A=AA
      DO 580 SS=1,LS; S=SS
      DO 580 RR=1,LR; R=RR
  580 N2(A,S,R) =0.0
      IF (OSDPP.EQ.0.0) GO TO 595
      DO 590 AA=1,LA; A=AA
      DO 590 SS=1,LS; S=SS
      DO 590 RR=1,LR; R=RR
  590 N2(A,S,R)=OSDP(A,S,R)/OSDPP
C
C-----EQUATION 3.24
C
  595 IF (NOEMG.LT.0.0) GO TO 610
      DO 600 AA=1,LA; A=AA
      DO 600 SS=1,LS; S=SS
      DO 600 RR=1,LR; R=RR
  600 NOEM(A,S,R)=(NOEME+NOEMR)*OE(A,S,R)
      GO TO 630
  610 DO 620 AA=1,LA; A=AA
      DO 620 SS=1,LS; S=SS
      DO 620 RR=1,LR; R=RR
  620 NOEM(A,S,R)=(NOEME+NOEMR)*N1(A,S,R)
C
C-----EQUATION 3.25
C
  630 IF (NOEMG.LT.0.0) GO TO 650
      DO 640 AA=1,LA; A=AA
      DO 640 SS=1,LS; S=SS
      DO 640 RR=1,LR; R=RR
  640 NODM(A,S,R)=NOEMR*OD(A,S,R)
      GO TO 670
  650 DO 660 AA=1,LA; A=AA
      DO 660 SS=1,LS; S=SS
      DO 660 RR=1,LR; R=RR
```

REFERENCES

Conopask, J. V. 1978. A Data Pooling Approach to Estimate Employment Multipliers for Small Regional Economies. U.S. Department of Agriculture. Tech. Bulletin No. 1583.

Dames and Moore. 1980. Bering-Norton Petroleum Development Scenarios. Prepared for Bureau of Land Management. Alaska Outer Continental Shelf Office.

Huskey, L., Serow, W., and Volin, T. 1979. Design of a Population Distribution Model. Prepared for Bureau of Land Management, Alaska Outer Continental Shelf Office.

Kerr, J. 1979. Population by Age, Sex, and Race. Prepared for Office of Planning and Research, Division of Community Colleges, Rural Education and Extension, University of Alaska.

Nebesky, W. and Huskey, L. 1979. Northern Gulf of Alaska Statewide and Regional Population and Economic Systems Impact Analysis. Bureau of Land Management, Alaska Outer Continental Shelf Office.

Porter, E. 1980. Bering-Norton Petroleum Development Scenarios Economic and Demographic Analysis. Prepared for Bureau of Land Management, Alaska Outer Continental Shelf Office.

Porter, E. and Huskey, L. 1979. Western Gulf of Alaska Statewide and Regional Impact Analysis. Prepared for Bureau of Land Management, Alaska Outer Continental Shelf Office.

Stenehjem, E. and Metzger, J. 1976. A Framework for Projecting Employment and Population Changes Accompanying Energy Development. Argonne National Laboratory.