

# FORECASTING POPULATION AND EMPLOYMENT

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The focus of this paper is on ways in which the Bureau of the Census data, programs, and related activities can be useful in small-area population and employment projections. It also notes the research under way that is designed to bridge the gap between economic and demographic approaches to projections. These comments are limited to the relatively large geographic areas such as states and standard metropolitan statistical areas (SMSA's). Projections for traffic zones, census tracts, and the like have a literature and methodology of their own and do not fit within the general scope of data and techniques for metropolitan areas. Yet one would not attempt projections with such very fine detail without some SMSA projection to provide the framework and overall control.

## SCOPE OF CENSUS PROGRAM

### Population Projections

The program of the Bureau of the Census in projecting geographic area population is fairly modest. At the state level, the bureau has published, at irregular intervals, projections of total population by age groups for target dates 15 to 25 years ahead. These projections have been demographic in nature, with separate projections made of each of the components of population change, such as births, deaths, and net migration. Projections for metropolitan areas have not been part of the regular program, although such projections were prepared and published several years ago as part of a special project. These extended only 10 to 15 years into the future. These, too, were demographic projections and were designed to be consistent with previously prepared state projections.

These demographic population projections depend very heavily on census data. Age, sex, and race composition of the population of areas are basic to such projections, and the census provides the initial bench mark. There is also a great need for some basis for projecting net migration, which is the most important component in small-area projections and the one with the largest degree of uncertainty. Census data, directly or indirectly, are the primary inputs. Census-derived net migration rates by age, sex, and race for areas as small as counties are available for the 1950 to 1960 period and are also planned for the 1960 to 1970 period (1).

Although in most projection reports the emphasis is on net migration, computer technology now permits more sophisticated methodology using gross migration data collected in the past few censuses. Particularly useful in this connection are the data covering the 1955 to 1960 period from the 1960 census and the 1965 to 1970 period forthcoming from the 1970 census. The latter will be especially interesting because for the first time plans are being made to provide significant detail on the characteristics of migrants at the county level, both by county of origin and by county of destination (but not county migration streams).

Much gross migration data will be available in the regular census volumes for states and SMSA's (or state economic areas, as in 1960) but the corresponding county detail

will undoubtedly be tabulated only if sufficient resources become available from interested agencies outside of the Bureau of the Census. Our planning at this point is merely to permit us to generate the information at a reasonable cost at a later date. It is too costly to attempt to reconstruct the detailed gross migration data at the county level for the 1955 to 1960 period because no such arrangements were made at the time of the 1960 census processing.

The strong preference and endorsement in favor of gross migration over net migration data for geographic area projection purposes suggested here are not mere whims to introduce complexity for complexity's sake. Past experience in developing demographic projections involving the use of net migration has revealed some illogic in the underlying assumptions. For example, if one assumes that past trends in the migration rate will continue, as is most frequently the case in existing projection methodology, in-migration areas automatically receive more and more net in-migrants, while out-migration areas contribute fewer and fewer out-migrants as the base population in the latter areas becomes smaller as the result of net out-migration. The inconsistency of the situation is quite obvious because, under the circumstances, the net in-migrants and the net out-migrants for the country become heavily unbalanced. The effect of this inconsistency can be quite striking even in the short run when large differentials exist in rates of population growth for areas (2). The problem may not be so readily apparent when a single area is dealt with because the individual planner may not look much beyond his immediate area of concern; but "collective" consideration would reveal problems of a similar nature.

One way to overcome these problems of net migration rates in projections is to use gross migration statistics, that is, to treat in- and out-migration separately. In this procedure, the probability of out-migration is related primarily to the size of the population exposed to risk (by age, sex, and race), whereas in-migration to an area is based on a percentage of the "migration pool," that is, the projected number of out-migrants from all areas of the country who are to be distributed as in-migrants to all areas in the country. Both the 1960 and 1970 gross migration data can be so manipulated.

### Population Estimates

Another component of the census program important for developing population projections is our work on population estimation. This program is designed to provide post-censal population estimates, that is, to measure population changes that have taken place since the last census on an area basis. Such estimates, of course, provide updated bench marks for projection purposes. Yet, most projection reports prepared in the past several years that I have seen fail in this respect. Projections undertaken during the next several years may be able to rely solely on the 1970 census as a source. Beyond that, some updating will be necessary to provide realistic bench marks. The program of the Bureau of the Census provides estimates of state and local population for the largest SMSA's on a regular, annual basis. The bureau has developed an extensive methodology for deriving population estimates for geographic areas and conducts continuous research for methods improvement. Yet, except for a one-time special project in the mid-1960's, its program does not provide the extensive estimates needed for small-area projections.

In recognition of the need for a set of estimates that cover all counties and SMSA's in the country and that are comprehensive, consistent, comparable, and of relatively high quality, the bureau has undertaken a new program in cooperation with the states to generate just such estimates. Under this program, generally referred to as the Federal-State Cooperative Program for Local Population Estimates, the states will prepare estimates of population (of counties initially) by a set of recommended and preferred procedures that are standardized largely for data input and application and are mutually agreed to by the states and the bureau. The estimates will be accepted and published by the bureau and be recommended for use for federal programs requiring such estimates. No competing or conflicting estimates will be issued by the bureau.

The best methods to use for such estimates are being determined by tests and evaluation of estimates prepared by alternative methods (and data). Analysis of these

comparative estimates against the 1970 census results will provide the basis for selection of methods to be used by the states in the 1970's. As of mid-1970, the governors of 46 states have agreed to participate officially in the program and have designated an official state agency to work with the bureau in carrying out the technical aspects of the program. This program will provide population estimates on a regular, continuing basis for all (or most) counties in the country in the 1970's. (Estimates for 1968 and 1969 prepared as part of this program have already been published for several states.) A list of the states and their agencies participating in the program is given in Table 1; these agencies will be important sources of updated population estimates. I cannot stress too strongly the potential usefulness of this program for small-area population projections (3, 4).

The need to disseminate information about the availability of estimates through this program was clearly demonstrated to the writer in a recent project involving a review of some 250 published reports from state and local agencies presenting population projections for their areas. The bulk of these reports used the 1960 census as the population bench mark even though the majority of them were prepared in the middle or late 1960's. Significant changes in population and migration patterns have taken place between 1960 and the date of preparation of the projections; yet no attempt was made to incorporate the pattern into the report. Many of the projected population figures were significantly different from the latest current estimates available. It is hoped that in the future technicians will consider it prudent to review their needs for population estimates (and projections) for specific areas with those state agencies associated with us in the cooperative program and officially charged with preparing current estimates.

### EMPLOYMENT PROJECTIONS

Although the organizers of this conference saw fit to include employment and population projections as a single, integrated entry, unfortunately this has not been the situation in the real world. Employment projection has not been within the scope of programs of the Bureau of the Census. Rather, the Regional Economics Division of the Office of Business Economics in the U. S. Department of Commerce is engaged in such work. Briefly, this division focuses on projections of income and employment for 165 economic areas—areas that are combinations of complete counties grouped around important cities without regard for state boundaries. The division's model for projecting employment distinguishes between "basic" employment, which is projected by a shift-share technique, and "residential" employment, which is developed as a function of total employment in the area. Population is obtained as a derivative of the income and employment projection by a simplistic ratio technique (5, 6, 7).

Employment projections for metropolitan areas are also prepared by the National Planning Association (NPA), a nonprofit private research organization located in Washington, D. C. (8, 9). The SMSA employment projections are developed within a regional and national economic framework. They have some of the same underlying logic as the projections of the Office of Business Economics (OBE) in that they identify and work with several elements of employment—basic industry employment, export component, and residential employment—but they are significantly different in the methodological detail and application. Nonetheless, here too population is a derivative of the employment projections but derived by a simple overall employment-population ratio.

Yet this wealth of metropolitan-area projection data on population and employment turns out to be more apparent than real as the consumer struggles with problems of comparability and consistency among the various sets. There are 2 main issues confronting the consumer or analyst when he tries to interpret and integrate these various sets of projections.

1. Lack of common geography. The OBE's economic areas bear no correspondence to states or to SMSA's, the conventional units understood and used by most planners; NPA's SMSA's introduce a flexible definition of metropolitan area boundaries, implicitly assuming that the geographic boundaries of SMSA's will expand with expanding population, but the new boundaries are not defined. The work of the Bureau of the Census relates to SMSA's as defined by the most recent criteria of the Bureau of the Budget.

TABLE 1

FOR STATE-DESIGNATED AGENCIES AGREEING TO WORK TOWARD A FEDERAL-STATE COOPERATIVE PROGRAM  
FOR LOCAL POPULATION ESTIMATES

State and Official Agency	State and Official Agency	State and Official Agency
Alabama: Alabama Program Development Office*, 304 Dexter Avenue, Montgomery, 36104; Center for Business and Economic Research, Graduate School of Business, University of Alabama, University 35468	Maryland: Division of Biostatistics, State Department of Health and Mental Hygiene, 301 West Preston Street, Baltimore 21201	Oklahoma: Research and Planning Division, Oklahoma Employment Security Commission, Will Rogers Memorial Office Building, Oklahoma City 73105
Arizona: Unemployment Compensation Division, Employment Security Commission, P. O. Box 6123, Phoenix 85005	Massachusetts: Bureau of Research and Statistics, Department of Commerce and Development, State Office Building, 100 Cambridge Street, Boston 02202	Oregon: Center for Population Research and Census, Portland State College, 614 Montgomery Street, P. O. Box 751, Portland 97207
Arkansas: Industrial Research and Extension Center, University of Arkansas, Little Rock 72203	Michigan: State Bureau of the Budget, Budget Division, Lewis Cass Building, Lansing 48913; Center for Health Statistics, Michigan Department of Public Health, 3500 North Logan Street, Lansing 48913	Pennsylvania: State Planning Board, P. O. Box 191, Harrisburg 17120
California: Population Research Unit, State Department of Finance, 1623 10th Street, Sacramento 95814	Minnesota: Vital Statistics Division, State Department of Health, Minneapolis 55414	Rhode Island: Statewide Planning Program, Suite 300, 36 Kennedy Plaza, Providence 02903
Colorado: State Planning Office, State Capitol, Denver 80203	Mississippi: Department of Sociology and Rural Life, Mississippi State University, Drawer C, State College 39762	South Carolina: Division of Research and Statistical Services, Budget and Control Board, P. O. Box 11333, Columbia 29211
Delaware: State Planning Office, Thomas Collins Building, 530 South DuPont Highway, Dover 19901	Missouri: Administrative Services Section, Office of Comptroller and Budget Director, P. O. Box 809, Jefferson City 65101	South Dakota: Division of Public Health Statistics, State Department of Health, Pierre 57501
Florida: Bureau of Economic and Business Research, College of Business Administration, University of Florida, Gainesville 32601	Montana: Bureau of Business and Economic Research, University of Montana, Missoula 59801	Tennessee: Tennessee State Planning Commission*, Division of State Planning, C2-208, Central Services Building, Nashville 37219; Center for Business and Economic Research, University of Tennessee, Knoxville 37916
Georgia: State Planning Bureau, 116 Mitchell Street, S. W., Atlanta 30303	Nebraska: Nebraska Department of Economic Development*, Division of State and Urban Affairs, P. O. Box 94666, State Capitol, Lincoln 68508; Bureau of Business Research, University of Nebraska, Lincoln 68508	Utah: Utah Department of Development Services*, State Capitol, Salt Lake City 84114; Reports and Analysis Section, Utah Department of Employment Security, 174 Social Hall Avenue, Salt Lake City, 84111
Hawaii: Department of Planning and Economic Development*, State Capitol, Honolulu 96813; State Department of Health, P. O. Box 3378, Honolulu 96801	Nevada: Bureau of Business and Economic Research, University of Nevada, Reno 89507	Vermont: Division of Public Health Statistics, State Department of Health, 115 Colchester Avenue, Burlington 05401
Idaho: State Department of Health, Statehouse, Boise 83707	New Hampshire: Office of Planning and Research, Department of Resources and Economic Development, State House Annex, Concord 03301	Virginia: Bureau of Population and Economic Research, University of Virginia, Lambeth House, Charlottesville 22903
Illinois: Division of Health Planning and Resource Development, Department of Public Health, Springfield 62706	New Jersey: Department of Conservation and Economic Development, P. O. Box 1889, Trenton 08625	Washington: Office of Program Planning and Fiscal Management, Population and Enrollment Section, Insurance Building, Olympia 98501
Indiana: State Board of Health, 1330 West Michigan Street, Indianapolis 46206	New Mexico: Bureau of Business Research, University of New Mexico, 1821 Roma Street, N. E., Albuquerque 87106	West Virginia: State Planning Division*, Governor's Office of Federal-State Relations, 1703 Washington Street, E., Charleston 25311; Office of Research and Development, Center for Appalachian Studies and Development, West Virginia University, Morgantown 26505
Iowa: Office of State Planning and Programming, State Capitol, Des Moines 50319	New York: Office of Planning Coordination*, Room 229, State Capitol, Albany 12201; State Health Department, 84 Holland Avenue, Albany 12208	Wisconsin: Department of Health and Social Services, P. O. Box 309, Madison 53701; Applied Population Laboratory, University of Wisconsin, Madison 53706
Kansas: Division of State Plans Coordination, State Department of Economic Development, State Office Building, Topeka 66612	North Carolina: State Planning Division, Department of Administration, Raleigh 27601; Carolina Population Center, University of North Carolina, 123 West Franklin Street, Chapel Hill 27514	Wyoming: Division of Business and Economic Research, College of Commerce and Industry, University of Wyoming, Box 3925, University Station, Laramie 82070
Kentucky: Kentucky Program Development Office, Capitol Building, Frankfort 40601	Ohio: Economic Research Division, Ohio Development Department, 65 South Front Street, Columbus 43215	
Louisiana: Division of Business and Economic Research, School of Business Administration, Louisiana Polytechnic Institute, P. O. Box 5796, Tech Station, Ruston 71270		
Maine: State Department of Health and Welfare, State House, Augusta 04330		

Note: Participating states as of March 1970. Asterisk denotes coordinating agency as opposed to agency carrying out technical phases of program.

2. Projected trends of population versus employment. Where comparisons can be made for common areas, it seems that the pattern and the trend projected for the future are quite different for the various sets. This is particularly true when one considers using the bureau's population projections with a set of employment projections prepared by one of the other agencies. With regard to the latter, for example, a comparison was made of OBE's population projections and those of the Bureau of the Census. (The bureau had prepared projections for all counties in the country in addition to SMSA's, and it was possible to group counties according to OBE areas.) The results reveal a wide range of differences, although there were many similarities in spite of the extremely different approach. For the 160 areas reviewed, 40 percent of the areas differed by less than 5 percent, and about half differed between 5 and 14 percent. Similar differences in both population and employment exist between census and NPA figures and between OBE and NPA projections.

In general, then, although it is recognized that there is a strong association between employment and population (and migration), projections of these elements have been treated separately. OBE and NPA specifically state that they see population projection as a function for job opportunities and have given most of their attention to the employment projections, with only the roughest and simplest of techniques used to translate them to population. The Bureau of the Census, on the other hand, has limited itself to the population component, relying solely on demographic analysis and not attempting to develop the underlying economic basis. Thus, available "official" population projections for SMSA's cannot be used with the available employment projections without considerable constraint.

Recognizing this unsatisfactory status of small-area projection, the Bureau of the Census has started to investigate the economic-demographic approach to small-area projection in order to bridge the gap between employment and population. Research is being concentrated on regression analysis of migration and employment (and components thereof). Census data on gross and net migration are receiving much attention in the analysis; I think they hold the key to improved and consistent small-area projections. In effect, if the research is successful, the bureau might look to others to provide acceptable economic projections and use the results of its research to project migration and population consistent with the projected employment. If suitable economic projections are not forthcoming, the bureau will consider developing its own as a means of providing more meaningful small-area population projections.

#### REFERENCES

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