

CURRENT POPULATION REPORTS

POPULATION ESTIMATES

October 12, 1953

Washington 25, D. C.

Series P-25, No. 81

COORDINATION OF POPULATION ESTIMATES USED BY FEDERAL, STATE, AND LOCAL AGENCIES*

By

Henry S. Shryock, Jr.
Assistant Chief, Population and Housing Division

In the field of population estimates, the main problem is not one of a plethora of conflicting figures from different sources but rather of a lack of official estimates of any kind for most areas. The demands for population estimates, however, are many and urgent. We are dealing throughout this article with estimates computed from various available statistics and not with estimates based on sample surveys. In fact, sample surveys have rarely produced estimates of total population and are not well designed to do so.

I think we may find it useful to begin with the kinds of official estimates that are published with some regularity by the Bureau of the Census. Most of these now appear in pamphlet form in a series of "releases" entitled Current Population Reports, Population Estimates, Series P-25. The postcensal, or current series, include the following:

1. Total population of the United States including Armed Forces abroad, monthly.
2. Total population of the United States excluding Armed Forces abroad, monthly.
3. Civilian population of the United States, monthly.

4. The above three series by sex, color, and age, annually as of July 1.

5. Total and civilian population of States, Territories, and the larger possessions, annually as of July 1.

6. Population in selected age groups, by States:

- | | |
|----------------|-------------------------|
| a. Under 18 | } annually as of July 1 |
| b. 5 to 17 | |
| c. 65 and over | |

d. 21 and over, biennially as of November of congressional election years.

In addition, (7) estimates of the civilian noninstitutional population 14 years old and over, by age and sex, are published in the "Monthly Report of the Labor Force," Series P-57.

It may be seen that this program does not cover even the total population of cities and counties nor detailed age groups for areas below the national level.

The lags between the date to which the estimate applies and the date of publication have not been constant. The advent of the decennial census has increased the lags temporarily because series had to be revised to be made consistent with the results of the enumeration.

* Paper read at the annual meeting of the American Statistical Association, Chicago, Illinois, December 27, 1952.

The schedule to which we now hope to adhere is about as follows:

1. 1½ months
2. 6½ months
3. 6½ months
4. 1 year
5. Provisional (total only), 6 months;
revised (total and civilian), 1 year
6. (a)-(c) 14 months
7. 1 month

When the results of a decennial census become available, some of these postcensal estimates are replaced by intercensal estimates and intercensal estimates of other types may also be prepared. Furthermore, at irregular intervals, forecasts and other projections of the population are published for the United States and States.¹ This paper will be concerned mainly with postcensal estimates, those that are made for dates intermediate between the time of the last census and the present.

The Bureau of the Census is the Federal agency responsible for population estimates and projections. The above program has been evolved over the years as meeting the most urgent needs. No competing figures of these types are now published by other Federal agencies. Some competing State estimates and forecasts are published by State and local agencies, however. There are, of course, other kinds of estimates that the Bureau of the Census would like to prepare, and there are many others for which it receives urgent and frequent requests. Some of these requests come from other Federal agencies and may represent either regular or sporadic needs. The method of handling such requests is discussed later on.

In the field of population estimates, the relationship of the Bureau of the Census to other Federal agencies is not solely that of producer to consumer. It is dependent on several of them for basic data. These agencies include mainly the National Office of Vital Statistics, the Immigration and Naturalization Service, and the Department of National Defense. Final population estimates cannot be prepared until final data are supplied by these agencies.

¹ As the result of my own search for a useful terminology, I have come to use the term "forecast" to denote any projection that the producer regards as the probable future population at the given date. It may not be always possible to choose such a projection, however. Projections may be usefully prepared on the basis of simple, and even unrealistic, assumptions to show the outcome of a particular set of conditions that are easily understood.

The National Office of Vital Statistics supplies statistics of births and deaths. Its life tables are used principally for projections, since for current estimates current death statistics by age are more satisfactory. This agency also furnishes annual estimates of the underregistration of births. In 1940 and 1950 measures were established by Birth Registration Tests, and these formed the basis of postcensal estimates of underregistration that allowed for continuing improvement. There are no measures of the underregistration of deaths. This situation represents a source of inaccuracy in all population estimates.

If estimates were attempted for counties and cities, some difficulty would arise from the different treatment of the institutional population in the population census and in vital statistics. In the former, inmates of such institutions as prisons, mental hospitals, and homes for the aged are considered as usual residents of the institutions and therefore are enumerated as residents of the political area where the institution is located. In the latter, however, deaths of inmates in such institutions are allocated in tabulations "by place of residence" to the area in which the decedent lived previous to his institutionalization. This inconsistency has actually increased in extent in the last few years. It represents a potential source of bias both in population estimates and in vital rates.

The first current estimate published for a given population is based on preliminary vital statistics. Monthly births and deaths for the United States as a whole are obtainable on a preliminary basis with a lag of about five weeks, e.g., NOVS can give us January figures by about the second week in March. These preliminary figures are also available by States on an occurrence basis. When our provisional postcensal estimates by States are first published, vital statistics by State of residence have to be estimated on the basis of past relationships between occurrence and residence figures. Deaths by age, sex, and color necessary for the computation of corresponding national population estimates do not become available until about a year after the end of the calendar year to which they relate. Ordinarily there is not much difference between preliminary and final vital statistics. Current population estimates are revised from time to time, final figures being substituted for preliminary figures. It should be emphasized that we do not have to wait for published reports; NOVS regularly sends us the necessary figures promptly after tabulation.

The situation is not nearly so satisfactory with respect to current figures on immigration and emigration. The first monthly statistics sent to us by the Immigration and Naturalization Service usually have a lag of about two months. These statistics pertain only to certain classes of migrants. Data for all the classes needed are furnished annually about 6 to 12 months after the end of the fiscal year concerned. This delay means that our monthly population estimates rest on a net immigration component that is partly projected.

Furthermore, coverage is not complete. Best statistics are probably available for "immigrant" and "emigrant" aliens, next best for "nonimmigrant"² and "nonemigrant"³ aliens, and the worst for citizens. For our bookkeeping type of operation, we have found it best to ignore questions of intent and to count all reported arrivals and departures except temporary trips across land frontiers. (Most arrivals and departures that do not represent changes in usual residence should cancel each other in less than a year's time.) The bulk of the gross movement in recent years has been that of United States citizens. There seems to be a persistent net in-movement of citizens in the reported figures that suggests better reporting of arrivals than of departures. Records of movements between continental United States and its Territories and possessions are inadequate and have been getting worse. The absence of records of migration across the Alaskan-Canadian border has usually prevented the Bureau of the Census from making postcensal estimates for Alaska. The number of Mexicans who enter and remain illegally may be substantial. Figures for aliens are tabulated by color, sex, and age; but the classification of citizens has to be guessed. It is realized that statistical requirements may conflict with considerations of the difficulties of collecting records at many different points of entry and with the facilitation of travel. Nevertheless, it should be pointed out that the reported figure of 1,800,000 net civilian immigration during the forties may have been in error by as much as 50 percent.

From the Department of Defense, the Bureau of the Census obtains periodic information on

² Aliens who enter the United States for a temporary stay and resident aliens returning after a temporary stay abroad.

³ Resident aliens going abroad temporarily and aliens leaving the United States after having been admitted for a temporary stay.

the size of the Armed Forces; their distribution between continental United States and overseas; and, within continental United States, station strength for States, inductions by State, and separations by State of preservice residence. The time lag varies from six weeks to five months, depending upon the type of information and the branch of service giving the information. Data on size and distribution published monthly usually have a time lag of from six to eight weeks; other information based on sample data has time lags of from four to five months.

Despite "unification" very little information on the combined strength of the Armed Forces is available from any one source. Such information usually has to be obtained separately from five different sources; namely, the Army, Air Force, Navy, Marines, and Coast Guard. Information from these different sources is not all of the same quality or in the same detail. For example, age distributions come from quarterly sample surveys of different sizes and dates or from complete inventories taken only twice a year.

Some of the problems of obtaining statistics on the Armed Forces are directly related, of course, to the present emergency. Security regulations require a tightening of control on the type of information being released or published. Also, the number of reports prepared by each branch of service for its own internal operations and control has grown tremendously since July 1950 so that little time is left for special compilations. Finally, security considerations also are partly responsible for the time lags in the publication of population estimates by the Bureau of the Census.

In the thirties, information on school enrollment needed to estimate net migration for States⁴ was sometimes obtained from the United States Office of Education. Nowadays, to obtain such data more rapidly and with fuller explanations, the Bureau of the Census communicates directly with State Departments of Education as will be discussed below.

About 50 Federal agencies are on the mailing list for the P-25 series. Moreover, just as the Bureau of the Census needs and obtains data from several other agencies in advance of

⁴ U. S. Bureau of the Census. Current Population Reports, Population Estimates, Series P-25, No. 20, "Illustrative Examples of Two Methods of Estimating the Current Population of Small Areas," May 6, 1949.

publication, so other Federal agencies are frequently supplied with population estimates in advance of publication. Furthermore, certain details are supplied that are never published and other details are estimated especially because of the regular needs of a given agency. Most of these are rather closely related to the regular estimates program, however, and may be considered by-products thereof. For instance, the National Office of Vital Statistics has sometimes asked for a classification of the nonwhite population by specific races. Monthly estimates of the population of the United States by age and sex are furnished to the Bureau of Labor Statistics. Although such estimates are published only annually by the Bureau of the Census, they are computed monthly as "controls" in the tabulation of the Current Population Survey. In some cases, estimate series that began as special projects for a particular agency were eventually deemed to be of enough public interest to warrant their regular publication. Examples here are the annual estimates of the population under 18 and 65 and over by States, which were made for several years just for the Bureau of Public Assistance.

The National Office of Vital Statistics has long been one of the leading consumers of population estimates. The main use here, of course, is in the computation of vital rates. This agency probably has the most lively needs for intercensal estimates of population.⁵ Population estimates by age, sex, and color are also necessary for the computation of the annual life tables.

The computation of rates and per capita is, in general, one of the main uses of population estimates. The Treasury Department receives monthly national totals for this purpose. The National Income Division of the Office of Business Economics, Department of Commerce, requires annual State totals for the computation of estimated per capita income.

Current estimates also serve as the basis, or a partial basis, for the allocation of Federal funds to the States. The annual estimates of the number of children 5 to 17 years old by States must be certified to the Department of Agriculture for use in the school lunch program. In fact, Federal laws setting up a grant-in-aid program are coming to specify frequently that

⁵ National Office of Vital Statistics. Vital Statistics Rates in the United States 1900-1940, U. S. Government Printing Office, Washington, D. C., second edition, 1947.

the latest population estimates certified by the Bureau of the Census shall be used in the formula. In some cases, however, this provision means simply that recourse must be made to the proportionate distribution existing at the last census.

Population estimates and forecasts serve, furthermore, in planning and research by such agencies as the Council of Economic Advisors, the Joint Committee on the Economic Report, the Department of Defense, the Department of Agriculture, the Bureau of Labor Statistics, the Bureau of Employment Security, and the Office of Industry and Commerce, to name only a few. Here, again, there are many requests for additional estimates either regularly or on a one-time basis and only a fraction of these can be satisfied. Other things being equal, however, priority is given to requests from other Federal agencies over those from outside sources.

Among the unsatisfied requests, there are several types that the Bureau of the Census would like to satisfy by additions to its regular publication program if it had the resources. At the other extreme, some types of estimates and forecasts are demanded for which the Bureau feels it has no dependable method and where the results would represent sheer guesswork. Although there are some advantages to consumers, Federal and other, in having an official estimate, in general, the Bureau is reluctant to allow such figures to be attributed to it, feeling that their existence may discredit its published estimates, of which there has been some validation. Furthermore, the resources of the Estimates and Forecasts Unit of the Population and Housing Division are too meager to warrant their diversion into a mere computing "pool."

There have been occasions, however, when figures have been transmitted as unofficial, sometimes with a request that they not be attributed to the Bureau. Sometimes also staff members have published estimates in journal articles as experiments in methodology or as illustrative studies. The situation frequently arises when an official in an agency "just has to have a figure" for an important project and insists that "the Census Bureau can make a better estimate than I can." There is a knotty problem of policy involved here, and I am sure that we have not yet found a really satisfactory solution.

Our staff frequently advises other agencies on how to make their own estimates and

projections. A very large proportion of professional staff time--from one-quarter to one-third--is taken up in conferences, telephone conversations, and letters for this purpose. Several published reports deal with the methodology of current population estimates and forecasts for States and local areas, and staff members have given papers on the subject.⁶ The particular advice may represent the application of existing methodology to new areas or simply a statement that linear extrapolation or a pro-rata adjustment is all that the given purpose warrants. A few cooperative projects have been set up such as one with the Office of Industry and Commerce for population projections for river-basin areas.⁷

Let us turn now to the Census Bureau's relationships with State and local agencies in this field. Again, we will consider first the data that the Bureau obtains from these sources.

Such data include mostly the school data that are used in the estimation of net migration in "Migration and Natural Increase Method II." These are mostly annual figures on elementary school enrollment with a few series on enrollment by age and a few school censuses. Some of the difficulties in securing reliability and validity in these series were described in an article a few years ago by Lawrence and the writer.⁸ The Bureau writes at least once a year to State Departments of Education to collect the necessary data. We urgently request that any changes in the series be brought to our attention. The provisional State estimates are usually made when few enrollment figures for the last school year are available. A great effort is made to obtain all these figures, however, for purposes of the final estimates. Long-distance telephone calls are frequently neces-

sary. Occasionally field trips to trouble spots have been both necessary and possible. These sources usually yield data on public school enrollment only. Similar data for private schools are obtained by writing to Diocesan offices of the Catholic Church and elsewhere.

At a time when the outlook for an expanded estimates program was brighter than at present, we collected school data covering the whole decade of the forties for the largest standard metropolitan areas and cities. It is desirable to develop and study a series for several years before embarking on population estimates that will rest upon it. As previously mentioned, however, postcensal estimates for such areas have not yet been begun. The school data for counties were usually obtained from the State Departments of Education, but those for cities were obtained from city departments.

As is often the case with census data, we do not have a complete picture of how State and local agencies use our population estimates. About 27 State agencies, 3 county agencies, and 12 city agencies are now on the mailing list for the P-25 series. About one-third of these are health agencies. Libraries account for six, planning boards and social security agencies for four each, and the remainder represent nine different kinds of governmental functions.

Some State agencies use our current estimates of State population, but others make their own or use those made by another agency in the same State. One State, Kansas, is fortunate enough to have an annual complete census conducted by assessors and does not need estimates of total population.⁹ Reasons for not using the Census Bureau's annual estimates also include ignorance of their existence, lack of faith in the figures, insistence on a uniform method--however simple--for the State and its counties, and the necessity of earlier publication. The lack of faith may represent disbelief in the reasonableness of the trend shown or may stem from knowledge of defects in the State's school enrollment figures and a resulting conviction that no population estimate partly based on them can be accurate. As to the uniform method, an adjustment of their own county estimates to make them total to the Bureau's State estimate would seem to remove the difficulty, provided that the error of closure is not too frightful.

⁶ U. S. Bureau of the Census. Op. cit. Population, Special Reports, Series P-47, No. 4, "Suggested Procedures for Estimating the Current Population of Counties," by Hope Tisdale Eldridge, April 30, 1947.

⁷ Current Population Reports, Population Estimates, Series P-25, No. 56, "Projections of the Population by States: 1955 and 1960," January 27, 1952.

Jacob S. Siegel. "Forecasting the Population of Small Areas," Land Economics 29(1):72-87, February 1953.

⁸ See, for example: Office of Industry and Commerce. Population Report, Arkansas-White-Red River Basins, Section I, Number of Inhabitants, by David Brown, August 1951.

⁹ Henry S. Shryock, Jr., and Norman Lawrence. "The Current Status of State and Local Population Estimates in the Census Bureau," Journal of the American Statistical Association 44(246):157-173, June 1949.

⁹ Kansas State Board of Agriculture. ... Biennial Report, A Review of the Progress of Agriculture and the Agricultural People of Kansas, State Printer, Topeka.

We know that at the present time the Census Bureau's current State estimates are used by at least one agency in each of 27 States. On the other hand, in 24 States, at least one agency publishes its own figures. A few States are in both lists, and the situation in some States is not known.

The Bureau of the Census as yet offers no competition in the realm of current estimates for counties and cities. Agencies that publish such estimates include Departments of Health and of Business Research and Development, Planning Boards, and Census Boards, mainly at the State but sometimes at the county, city, or metropolitan level. One University Bureau of Population and Economic Research also makes estimates. Of these agencies, State Departments of Health, and within them Divisions of Vital Statistics, are by far the most active. It is apparent, however, that no official postcensal figures at all are published for counties and cities in many States. (No account is taken here of population estimates published by private agencies, national or local in scope, but published figures are available from several such sources.)

A questionnaire sent out by the National Office of Vital Statistics in late 1951 to all States and the District of Columbia was returned by 45 of them. In addition to a report on their own activities, these health departments were also asked whether another State agency supplied estimates. Hence the replies were supposed to cover all State agencies. Of those replying, 30 make estimates for areas below the State level.

The methods reported were as follows:

Arithmetic progression.....	8
Apportionment using Census Bureau's State estimate.....	5
Migration and Natural Increase Method I.....	7
Other methods.....	13

The apportionment method involved holding constant the percentage distribution at the last census. The other methods included the addition to the last enumerated figure of natural increase only, at least one case of Migration and Natural Increase Method II, and some use of special censuses and utility data.

Recently the Bureau of the Census has corresponded with two State agencies that are working on county estimates to be prepared by our Migration and Natural Increase Method II. In view of the demonstrated superiority of this

method, on the average,¹⁰ its very limited use is a source of real disappointment to us. Some of the reasons given above for disregarding our State estimates may also apply here. In addition, this method is also relatively expensive and requires some technical proficiency. On the basis of long experience and fairly comprehensive time records, we have estimated that it will require, on the average, roughly 11 man-hours the first time a population is estimated by this procedure. A substantial part of this cost consists of establishing the necessary contacts for source data and accumulating the necessary benchmark figures. Once the procedure has been operating for several years, the time required for the average city or county estimate should drop to about 5 man-hours. These figures comprise both professional and clerical time but make no allowance for subjecting the estimates to a local review, which would be a desirable part of any estimating procedure.

The kinds of communication that have been described between the Bureau of the Census and other Federal agencies also exist between the Bureau and many State and local agencies. Here correspondence tends to be more frequent than other types of contact, and the interest shifts to counties and cities and away from national figures. Furthermore, we not only give technical advice but seek it, although so far not many new ideas have been received. It should be clear from the rather fragmentary picture of State and local activities presented above that there is need for a complete and continuing inventory. The Bureau of the Census tries to maintain a sort of clearing house of information in this field; but it has not had the time to send representatives to, or even correspond with, all the agencies that may be active; and the situation frequently changes.

One important and promising step in the direction of coordination is represented by the Public Health Conference on Records and Statistics. This conference is held periodically in Washington at the call of the National Office of Vital Statistics. It is attended by registrars, vital statisticians, and other public health statisticians and administrators. Interested technicians from various Federal agencies are

¹⁰ Shryock and Lawrence. Op. cit.
Henry S. Shryock, Jr., and Jacob S. Siegel. "The Accuracy of Postcensal Estimates of Population for States and Cities." Unpublished paper read to annual meeting of the American Sociological Society, Berkeley, Calif., Sept. 1, 1953.

also invited to participate in some of the work groups. The work group concerned with our subject is the one on "Population Statistics." Here for several years, there has been a lively discussion of needs, resources, problems, and experiments in the field of population estimates. The results of the questionnaire described above were first presented to this group. It is only fair to add, however, that many members of this work group are discouraged about the prospects for adequate postcensal population estimates in the foreseeable future.

What are the Census Bureau's own plans for the future in this field? Here both limited funds and personnel and the absence of generally available and pertinent symptomatic data constitute major barriers. Even within its present budget, however, the Census Bureau hopes by next year to begin annual State estimates for four broad age groups: under 5, 5 to 17, 18 to 64, and 65 and over. With more resources, it is felt that useful estimates could be published for the following: State population by sex, and by color for selected States; total population of the largest standard metropolitan areas; total population of the largest cities. These estimates, on the average, would be more accurate than those now being published elsewhere.

The tests of various methods for States and cities against the 1950 Census, which were reported by Siegel and the writer, to the Public Health Conference on Records and Statistics in 1951 and to the American Sociological Society in 1953, are now being considerably expanded. We hope to publish shortly an article summarizing the results. Continuing research in methodology is certainly desirable. We are interested in investigating methods suggested by Bogue, Frisén, Schmitt, and several others. The favorable references above to Migration and Natural Increase Method II are to be taken as mainly relative. Its accuracy can be improved by more realistic assumptions on comparative rates of net migration for the school-age group and for other age groups over varying periods of time since the last census. For example, the Bureau of the Census is now actively exploring the feasibility of measuring net migration for the adult popula-

tion on the basis of records of the Bureau of Old-Age and Survivors Insurance. These estimates could be fitted into the general framework of Method II. We should be glad to replace the method entirely by one of greater proven accuracy. Furthermore, we do not insist on using the same method for all areas.

We should like to be able to send staff members on fairly frequent field trips to State and local offices. One purpose would be an "on the spot" investigation of school data now received by correspondence, particularly where we have had reason to suspect their reliability or validity. Another purpose would be to discuss our present estimate series with the leading consumers and get their criticisms. Finally, we could consult directly with other technicians who cannot come to Washington and investigate new sources of symptomatic data that may be available in a particular area.

We should also like to submit our State estimates to the judgment of informed persons in the State concerned before publication. We already do this on a very limited basis. Unfortunately, the time between computation and publication is so restricted that we usually cannot make recommended changes, especially since, with a fixed national estimate, a change in one State usually requires a change in all the others. Convincing criticisms of preliminary figures are, however, taken into account in the revised State estimates. Errors in the latter can also be corrected retroactively the following year.

There has been considerable talk but no definite proposal about cooperative estimating projects involving the Bureau of the Census and State or local agencies. Such projects could involve either the sharing of work or a contract between the Bureau and another agency, or group of agencies, with the latter contributing the needed additional funds. Given the number of agencies that are working in the field and the existence of some duplication of effort, cooperative arrangements with even a few States might well add appreciably to our stock of useful population estimates through the pooling of resources.