ON ESTIMATION OF SCHOOL POPULATION

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Never before in the history of the United States has the need for estimating school population been greater than at the present time. Never before has such estimation been more difficult. For the forces determining school population in a given locality have never before assumed the complexity, the scale, or the variability of those now at work on the American scene.

More specifically, efforts to estimate school population today must, among other things, reckon with great population and community changes, and changes also, in proportions of children enrolled in school. These changes include among the population factors: resurgent national growth; increased concentration in Standard Metropolitan Statistical Areas; accelerating decentralization within metropolitan areas; great waves of in-migrant peoples of diverse race, cultural background and school enrollment practices; and rapidly changing age structure. Simultaneously, almost unprecedented community changes are under way, including changes in patterns and densities of land use arising from urban renewal programs, public housing projects, federal and local highway construction, increased utilization of physical planning techniques, and ever increasing traffic flows. Furthermore, the problem of estimating school population for specific local educational purposes is not made easier by the differential rates of expansion of public, private and parochial schools, respectively, and by the increasing need to replace obsolescent or obsolete school structures even while grappling with problems of rapid growth.

The interplay of these factors is by no means uniform and it requires a separate evaluation city by city, community by community and school district by school district to estimate school population. Most American communities are faced with problems of rapid growth; but some also face actual decline, not only in total population but, also, in school population. In some areas, trends may be stable enough for reasonably accurate and useful projection; in others, the erratic character or the magnitude of population and community changes may defy all efforts and all available techniques to predict.

Efforts to estimate school population must necessarily take into account each of the changes of the type to which reference has been made and their interaction as they affect particular metropolitan areas, cities, or subdivisions thereof. In general, the larger the area for which the estimate is being made, the more accurate is it likely to be. The smaller the area, the greater is the likelihood of error. Moreover, any number of special circumstances may affect small areas, particularly individual school districts, including matters of policy of various local administrative units.

Let us turn to a consideration of the types of methods that are available for estimating school population in different types of situations, with the national trends in mind. Because of the difficulties inherent in attempting to predict the actual course of future events--especially births and migration--that affect the size of school enrollment at future dates, the term "projection" rather than "prediction" has been attached to most figures computed for this purpose. For the same reason, short-term projections are subject to less error than long-term projections. In fact, if the projection period extends no more than five years into the future, all of the children who will be enrolled in school at that time are already born and there is no need to estimate future births, and one potential source of error is eliminated. In general, it can be ventured that local projections beyond ten years into the future are subject to such a wide range of error as to be of little use for planning purposes.

In general, three approaches have been used by persons or agencies to estimate future school populations: (1) Establish grade progression ratios from one grade to the next in successive years in the past, and apply these ratios to the numbers currently enrolled in each grade to obtain estimates of enrollment for successive years in the future; statistics on births for appropriate years are used to estimate kindergarten and first grade enrollment in this procedure. (2) Obtain projections of the population of school age for desired future dates, estimate enrollment rates for the same dates and apply them to the population projections. (3) Obtain projections of dwelling units for desired future dates, and estimate school enrollment from projected ratios of population and students to dwelling units. The use of grade progression ratios is less complicated and time-consuming than the cohort-survival method of obtaining population projections, and it usually should give as accurate results providing reliable statistics on school enrollment are available for a series of consecutive recent years. The third method is particularly applicable to new or rapidly expanding communities, where only rough approximations to future enrollments can be expected. The three approaches to school enrollment projections are discussed below, for the elementary and high school grades.

I. GRADE PROGRESSION METHOD

The procedure to be followed to obtain projections of school enrollment by this method can be described in three steps.

Step 1. Compute grade progression ratios for each grade of elementary and high school, from data on school enrollment for successive years in the area for which the projection is to be made. For example, dividing the number of students enrolled in the third grade in 1951 by the number enrolled in the second grade in 1950 gives the grade progression ratio for grades 2 to 3 from 1950 to 1951. Similar ratios are computed for the other elementary and high school grades, using data for the same years. If there has been

no migration into the area during the two-year period, the ratios will be less than unity (assuming enrollment data for the two years are comparable and accurate), since there will be some losses due to mortality or drop-outs from one grade to the next. Grade progression ratios in excess of unity usually indicate migration into the area (although the ratio for kindergarten to grade one may be an exception, and there may be other special cases). For this reason, it is preferable to compute a series of grade progression ratios for a span of the last five or ten years, or longer if the basic data are available. This gives some indication of the trend in the ratios over time, and permits extrapolation of ratios from the observed time series into the future. Before grade progression ratios are utilized in this fashion, care should be taken to ascertain: (1) that the enrollment data are compiled for the same area and on a comparable basis during the time period covered, preferably a count of enrollment as of October of each year; (2) that the figures are reasonably complete and accurate; (3) that enrollment in parochial and other private schools are added to public school statistics before the ratios are computed. If the necessary enrollment statistics are not available for parochial or other private schools, ratios may have to be based on statistics for public schools only, but in this case the proportion of enrollment in public schools on the projection date must be estimated if total enrollment projections are to be obtained (see step 3).

Step 2. Estimate grade progression ratios for the projection period. For example, if projections up to October 1963 are the objective and if the latest enrollment statistics are for October 1958, it is necessary to estimate grade progression ratios for 1958-59, 1959-60, 1960-61, 1961-62, and 1962-63. These five ratios for each grade sequence--from grade two to grade three, from grade three to grade four, etc.--may be estimated by extrapolating from the time series of observed ratios for that grade sequence. For instance, if in step 1 ratios have been computed from enrollment statistics for 1950 through 1958, the eight ratios for progression from grade two to grade three in successive years--1950-51, 1951-52, etc. to 1957-58--may be plotted on a graph. If the 1950-58 statistics are comparable and reliable, changes in the ratios from one year to the next during this period should be due primarily to migration, at least in the elementary grades where drop-outs are very low. Hence, for each elementary grade, the 1959-1963 grade progression ratios may be extrapolated from the observed 1950-58 ratios by postulating an increase in the ratio after 1959 if it is assumed that migration will be higher in 1959-63 than in 1950-58, or by postulating a decrease in the ratio if it is assumed migration will be lower in 1959-63. Extrapolation of grade progression ratios for high school grades may be more difficult. Job opportunities and the military draft influence drop-out rates at the high school level and, especially for boys, migration may not be the major influence on changes in grade progression ratios over time.[1] As a result, ratios for these grades should be extrapolated with assumptions that take into account these two factors as well as migration.

Step 3. Apply the estimated grade progression ratios to current enrollment figures to obtain projections of future enrollment. Projections of school enrollment in each grade on October 1959 are obtained by multiplying the October 1958 enrollment in the preceding grade by the estimated 1958-59 grade progression ratio between the two grades. For example, the projected enrollment in grade five on October 1959 is computed by multiplying the observed October 1958 enrollment in grade four by the estimated 1958-59 grade progression ratio for grades four to five.

Similarly, projections of enrollment in each grade on October 1960 are computed by multiplying the estimated October 1959 enrollment in the preceding grade by the estimated 1959-60 grade progression ratio between the two grades. Hence, projected 1960 enrollment in grade six is obtained by multiplying the projected 1959 enrollment in grade five by the estimated 1959-60 grade progression ratio for grades five to six.

In this way enrollment in each grade is estimated for each year from the current date to the last projection date. If the observed grade progression ratios computed in step 1 are based on enrollment statistics for public schools only, an analysis of recent trends in the proportion of elementary and high school enrollment in parochial and other private schools can be used to estimate the proportion expected to be in such schools on the projection dates. This proportion can be used to inflate the projections obtained for public school enrollment using the grade progression ratios computed for public schools.

Special procedure for kindergarten, grades one and two. Factors such as the popularity and availability of kindergarten facilities, and changes in the tendency to retard first grade pupils, greatly influence trends in grade progression ratios for these grades. As a result, enrollment projections for kindergarten and grade one may be based on extensions of observed trends of the relationship between births and enrollment in these grades, and the progression pattern for grades one to two can be adjusted on the basis of expected school policy regarding retardation.[2] If ratios of kindergarten enrollment in a given year to the number of births five years earlier, and ratios of first grade enrollment to births six years earlier, are to provide the basis for making projections of future enrollment in these two grades, it is necessary not only to compute these ratios for a number of recent years and to estimate corresponding ratios for the projection dates, but if the projection period extends more than five years into the future, it is also necessary to estimate the number of births in future years. For example, if the projection period extends ten years into the future, births for the first five of those years must be estimated in order to project kindergarten and first grade enrollments for the last five years of the period.

II. ENROLLMENT RATES APPLIED TO POPULATION PROJECTIONS

While the procedure to be followed in making enrollment projections by the grade progression

method is more or less clear-cut and can be illustrated by one example, this is not true of the second approach. There are several different methods for making projections of future populations, and the appropriate method in a given situation depends on a number of factors, including the length of the projection period, the kind and quality of available data, the size and location of the community or area for which the projection is to be made, and the rate of net migration to the area.

The problem is further complicated by the fact that if several years have elapsed since the last census of the area, it is advisable first to make estimates of the current population, by age, before making projections of the population as of a specified future date. Because methods for estimating the current population of an area utilize one or more series of current data that are "symptomatic" of population change in the area since the last census (for example, annual statistics on births, deaths, school enrollment, residential construction, electric meters, telephones, etc.) projections made from current population estimates based on such data are probably subject to less error than projections made directly from the recorded population of the last census. Thus, the person who wishes to make projections of school enrollment at some future date by first making population projections for the date, and then applying enrollment rates to these projections, not only has to choose a projection method appropriate to his situation but, if a number of years have elapsed since the last census, he must also select (from a variety of methods) an appropriate procedure for making current population estimates.

It is not our purpose here to describe in detail the various methods that have been used to make estimates of current population, or the techniques for obtaining projections of future population. References to available source materials on both subjects are cited below, together with brief summaries of the approach in several commonly-used methods. These sections are followed by a description of the procedure for converting projections of school-age population to projections of school enrollment.

Estimates of current population. The United States Bureau of the Census has published the results of a survey of the sources and types of local population estimates prepared by state and city agencies (Current Population Reports, Series P-25, No. 178, June 27, 1958). The report includes brief explanations of the various methods for making current population estimates, and cites references to more detailed source materials that can be used as guides for computation purposes. It also gives some evaluation of the accuracy of different methods. The table below indicates how often each method was used by state agencies to make county estimates, and by city agencies to make city estimates.

Method used	Number of state agencies	Number of city agencies
Agencies reporting, total. .	62	32
Migration & natural increase . .	28	7
Bureau of Census, Method I. . .	3	
Bureau of Census, Method II . .	15	
Combination with other method .	5	
Other	5	
Composite method	5	2
Natural increase alone	5	2
Censal ratio	7	17*
Simple form	5	
Complex form.	2	
Proration.	6	-
Arithmetic extrapolation	4	2
Other.	7	2

*Principally the dwelling unit method

The brief explanations given for these methods in the Census Bureau report are repeated below:

Migration-and-natural-increase methods are those in which the components of population change (i.e., natural increase and net migration) are estimated separately. In Method I of the Bureau of the Census, the net migration rate for a given area is estimated, on the basis of school enrollment or school census data, as the difference between the percentage change in the population of school age for the area and the corresponding change for the United States.[3] In Method II of the Bureau of the Census, net migration is estimated, using school enrollment or school census data, from the difference between the actual population of elementary school age and the population expected on the basis of the 1950 Census and births, and from current data on the variation of migration rates by age.[4] In the other migration-and-natural-increase methods, net migration is estimated in various other ways, e.g., by the use of data on school enrollment for successive school years and grades (grade-progression method), by the use of estimates of net migration for previous periods, etc.

The composite method makes use of several series of "indicator" data--births, deaths, school enrollment, etc.--to estimate the size of the various age segments of the population to which these basic indicators are most applicable. Summing the estimates for separate age groups yields an estimate of the total population. In one form of the composite method--the age-specific death rate method--deaths from all causes or from selected causes are used as an indicator series for all or most age groups.

The natural increase method involves merely adding postcensal natural increase (births minus deaths) to the census figure. It assumes, therefore, that postcensal net migration equals zero.

The simple form of the censal ratio method involves (1) computation of ratios of population to a single symptomatic element (school enrollment, births, deaths, etc.) at the last census date for each county, and (2) application of these ratios to the corresponding postcensal symptomatic element to obtain postcensal estimates of county population. Sometimes, these county estimates are adjusted to make them add to an independent estimate for the state as a whole. In the complex form of the censal ratio method,

specific allowance may be made for the postcensal change in the ratio of population to symptomatic data or two or more simple ratio estimates may be averaged. The vital rates method, for example, averages two estimates based respectively on birth and death statistics, and allows for the postcensal change in the birth and death rates. In the dwelling unit methods, data on building permits issued or data on electric, gas or water meter connections are used to measure postcensal changes in the number of dwelling units, and assumptions are made regarding postcensal changes in the number of persons per occupied dwelling unit and vacancy rates.5/

The proration method involves commonly the distribution of the postcensal state total on the basis of current "symptomatic" data such as school data, births, and deaths. This procedure implicitly assumes that the ratio of population to the symptomatic item is the same for all areas in the state. The state estimate may also be prorated on the basis of local population at the last census.

In arithmetic extrapolation, it is assumed that the yearly amount of population change in an area in the postcensal period equals the average yearly amount of change in the area in a recent past period, usually the most recent intercensal period. In geometric extrapolation, the average yearly rate of change is assumed to remain the same as in the past period.

Most of the methods described in the preceding paragraphs yield estimates of the total population currently resident in an area. However, in order to obtain projections of the future population by the cohort-survival method it is also necessary to know the age composition of the present population. In this respect, the composite method of estimating current population has the advantage that the age composition is obtained as part of the estimating procedure. When other methods are used, the age composition may have to be estimated by additional assumptions after the total population estimate has been obtained. For example, the estimated current age distribution for the United States as a whole, which is published annually by the Census Bureau, might be used as a guide or it may be adjusted on the basis of the relationship between the age distribution of the local area and the age distribution of the United States at the last census.

Projections of future population. The three most commonly used methods for making projections of the future population of small areas are the ratio method, the cohort-survival method, and a simpler type of component method in which separate allowance is made for births, deaths, and migration but without taking age into account. Other methods include graphic extrapolation and mathematical extrapolation, and generalized types of projections, for example of dwelling units.6/

The cohort-survival method involves separate projections of the three components of population change--births, deaths and migration--with age taken into account. That is, after careful analysis of past trends, and on the basis of general assumptions concerning future economic, military and health conditions, projections are made of age-specific mortality rates, age-specific fertility rates, and age-specific migration rates throughout the projection period. These age-specific rates are then applied to the estimated age distribution of the current population (or the recorded age distribution at the last census if only a short time has elapsed) to obtain population projections by age for the desired dates. Often, several alternative assumptions for the components of population change are projected, and a range of population projections rather than a single projection is the end product.

The procedure used by the Census Bureau for its latest projections of the United States population, by age and sex, for 1960 to 1980, is described in their Current Population Reports, Series P-25, No. 187 (November 10, 1958). This report discusses in detail the fertility and mortality assumptions used by the Bureau, and provides useful guides for persons who may wish to make similar assumptions for local areas. Along this line, the Census Bureau has also made projections of the population of each state to 1970, using fertility and mortality assumptions derived by multiplying the projected birth rates for the nation (that is, the rates used to make the United States projections) by a factor expressing the expected ratio of the state's birth rate to the nation's (see Current Population Reports, Series P-25, No. 160, August 9, 1957). In computing these factors it was assumed that the state differences in fertility would disappear in 50 years, and the expected ratio for a given state on a specified projection date was the result of an interpolation between the observed ratio for the state in 1950-55 and an assumed ratio of unity 50 years later. Mortality assumptions for states were derived from United States life tables for whites and nonwhites, using the racial composition of each state to obtain a weighted average of age-specific white and nonwhite mortality rates. A similar approach could be used by local areas to derive fertility and mortality assumptions for the cohort-survival method. However, the migration assumptions for a local area will usually require special analysis of the local situation. A method for estimating the net migration rate in local areas since the last census is described in the Census Bureau's Current Population Reports, Series P-25, No. 133 (March 16, 1956), pages 4-9. This net migration rate may provide some basis for extrapolating migration rates in the future.

A more complete description of the computation procedure for the cohort-survival method, after the fertility, mortality and migration assumptions have been determined, is given in an earlier Census publication, Current Population Reports, Series P-25, No. 43 (August 10, 1950), "Illustrative Projections of the Population of the United States, 1950 to 1960."

The ratio method provides a simpler approach to the problem of making population projections. Briefly, this method derives projections of the future population of an area on the basis of a series of observed historical ratios between the population of the given area and the population of a larger area for which projections are already available. For example, in 1952 the Census Bureau used the ratio method to make projections of the population of the 48 states to 1960 as follows:

(1) projections for the nine geographic divisions of the United States were first obtained by extrapolating ratios of the division's total population to the national total on the basis of observed ratios computed from the 1920 to 1950 censuses, and then applying these extrapolated ratios to already available population projections for the United States; (2) projections for the 48 states were prepared next, by extrapolating the ratio of each state's total population to the appropriate division total on the basis of observed ratios for 1920 to 1950, and then applying the extrapolated ratio to the population projection for the appropriate division. The assumptions used in making the extrapolations are described in the Census Bureau's Current Population Reports, Series P-25, No. 56 (January 27, 1952).

When the ratio method is used to make population projections for a city, several successive stages may be used to obtain the final projections, for example, to the two stages described above for obtaining projections for states might be added a third stage in which the historical series of ratios of the city's population to the appropriate state's population is extrapolated and applied to the projected population of the state. Such a procedure was used by the Philadelphia Planning Commission to project the population of the Philadelphia-Camden Industrial Area to the year 2000. In this case, the projection was carried through the following four stages of a ratio-estimation process, using the already available total United States projections as the starting point: (1) United States urban population projections were obtained by extrapolating the historical ratios of the U.S. urban to the U.S. total population and multiplying the extrapolated ratio by the total population projections of the U.S.; (2) the Northeastern Industrial Region's urban population was then projected by extrapolating ratios of its urban population to the U.S. urban population, and applying them to the U.S. urban population projections; (3) the Philadelphia-Camden Industrial Area's urban population was next projected by extrapolating from ratios of its urban population to the urban population of the Northeastern Industrial Region, and applying them to the projected urban population of this Region; (4) lastly, projections for the total population of the Philadelphia-Camden Area were obtained by extrapolating ratios of its total population to its urban population and applying them to the projected urban population of the Philadelphia-Camden Area.[7] The combination of stages to be used to make projections for a particular community will depend on the available data, and some investigation into ratios that are likely to produce reasonable results.

While the ratio method is less complicated and less time-consuming than the cohort-survival method, it does assume that reliable population projections are already available for a larger political or geographic area, and that a time series of historical ratios of the population of the area for which the projection is desired to this larger population can be computed from past censuses (or other materials). One disadvantage of this method, for purposes of making school enrollment projections, is that it yields projections of the total population only; additional assumptions and computations are required to estimate the age composition of the population on the projection dates, and this composition is necessary to obtain projections of school enrollment.

The simpler type of components approach mentioned earlier differs from the cohort-survival method in that the mortality, fertility and migration assumptions applied to the current population estimates (or the last census count) do not take account of age; rather, general rates for these three components are applied to total population figures, and the resulting population projections are for the total population. These projections, like those obtained by the ratio method, require additional work to estimate the age composition of the projected population.

Projections of school enrollment. Once population projections for persons of school age have been obtained, projections of school enrollment on the same dates may be computed by applying enrollment rates--representing the proportion of persons of a given age who are enrolled in school--to appropriate age groups of the population. The enrollment rates selected for this purpose may be the same as those observed at the time of the last census, or they may be extrapolations of past trends in enrollment rates for the particular area, or for an area presumed to have a similar population. Generally, enrollment rates at the elementary level--where school attendance is compulsory--are so high that rates for the last census can usually be used. Rates at the high school level are not so uniform from one geographic area to another, nor so stable from one time to another, so that some allowance may be made for possible changes in these rates if it seems advisable in the local situation.

The particular form in which school enrollment rates should be computed depends on the detail of the enrollment projections desired, and also on the amount of age detail available in the population projections to which the enrollment rates are to be applied. For example, if enrollment projections by single grades are desired, grade-specific enrollment rates for each year of age should be computed and multiplied by the projected population in each year of age. So detailed a projection is probably warranted only if the projection is for a short span of years--no more than five years, perhaps--and if reasonably reliable projections of the school age population by single years of age have been obtained. In this connection, it should be noted that reliable short-term projections by single years of age can be computed for many large well-established communities but are probably unreasonable for new communities or those currently experiencing a spurt of rapid population growth.

When enrollment projections are desired for longer periods of time, or when population projections are not available by single years of age, projections of total elementary school enrollment and total high school enrollment may be obtained as follows: (1) compute an enrollment rate expressing the ratio of elementary enrollment in grades 1-8 to the number of persons 6-13 years of age, from statistics for the last

census; (2) compute another enrollment rate expressing the ratio of high school enrollment to the number of persons 14-17 years old at the time of the last census; (3) if desired, adjust the high school enrollment rate on the basis of assumptions as to future trends in job opportunities, the military draft, or other factors which affect the rate of drop-outs at the high school level; (4) multiply the elementary enrollment rate by the estimated population 6-13 years of age on the projection date, and multiply the adjusted high school enrollment rate by the estimated population 14-17 years old on the projection date. The resulting products are the estimated elementary school enrollment and the estimated high school enrollment on the projection date. If it is desired to include kindergarten enrollment in the elementary school projection, the ratio of grades kindergarten-8 to persons 5-13 years old may be used in the first step and multiplied by the projected population 5-13 in the last. However, as mentioned earlier, kindergarten enrollment rates are not as stable as those for other elementary grades.

III. PROJECTIONS OF DWELLING UNITS, POPULATION AND PUPIL-POPULATION RATIOS

The third approach to projection of school enrollments is perhaps the only feasible one for rapidly expanding communities which are in their early period of growth and which still have relatively large parcels of unused land available for residential development. In this approach, a local survey is undertaken to obtain some of the following kinds of information: the composition of households living in various types of dwelling places at the present time; the type of housing recently constructed in the area; the types of families moving into the new housing, including the number of persons per family and the number of elementary and high school students per family; the amount of land available for residential construction and the type of construction likely to be undertaken on this land (zoning ordinances may help here but are not the only determining factors); and any other information that seems relevant to the future development of the particular area.

The information obtained in the local survey should provide a basis for (1) estimating the rate of land utilization and the rate of construction of dwelling units, which can then be converted into projections of numbers of dwelling units on specified future dates; (2) estimating the population per dwelling unit and pupil-population ratios--separate ratios should be obtained for elementary and high school pupils--which when applied to the projected number of dwelling units will give the projections of total population and school enrollment. (In the second step, estimates of pupils per dwelling unit may be made directly and applied to the projections of dwelling units without the intermediate step of estimating total population, but this will cut out the total population estimate which may be of interest in itself.)

This approach to school enrollment projection was used in studies, made by the Committee on Field Services of the University of Chicago Department of Education, of school enrollment in two suburban communities of the Chicago Metropolitan Area.[8]

PREDICTING SCHOOL NEEDS IN DIFFERENT TYPES OF COMMUNITIES

The best method for predicting school needs in a particular community or school district depends to a great extent on the characteristics of the community itself, including its age, size, location and the rate of net migration to the area. Of course, the kinds and quality of data available must also be taken into account. Below are suggestions for approaching the problem in five different types of communities, the first four representing communities in various stages of development and growth, and the last one a school district situation which may present special problems. Needless to say, in a particular situation methods other than those suggested for the general type of community may prove to be more useful.

Exploding community. Most of the areas falling in this category are in the suburban part or outlying fringe of large metropolitan areas. Most of them are either new communities or areas of rapidly expanding residential development in older communities with large parcels of vacant land. Projection of school needs for communities of this type is exceedingly difficult without a special survey of the local area; the third approach to school enrollment projection described in the preceding section of this report is recommended for these communities; in fact, it was discussed in terms of its applicability to this type of situation.

Older community still experiencing growth. The grade progression method of making enrollment projections may be used for these communities, providing: (1) a recent time series of grade progression ratios is available, based on comparable statistics of enrollment, preferably as of October of each year; and (2) this time series of ratios covers a sufficiently long period to give some indication of fluctuations in the ratios due to migration into the area, thus permitting adjustment of the ratios on the basis of the level of migration that is assumed for the projection period. If the necessary data for the grade progression ratio approach are not available, the second approach is suggested, that is, computing projections of population by age, and applying enrollment rates to these population projections.

Stable, well-established community. The grade progression method is recommended for these communities, providing the kinds of data specified for this approach in the preceding paragraph are available. If the data are not available, again the second approach is recommended.

Declining community. There is less need to project school enrollment in these areas since present facilities are more likely to be sufficient. However, the changes in age structure of the population as a result of the extended period of high birth rates since the last war, may make it worthwhile to project enrollments; either the first or second approach described in the preceding section of this report may be used for this purpose.

Rural and consolidated school district. The grade progression method is recommended for this situation. If some difficulty is experienced in obtaining the required birth statistics for projection of kindergarten and first grade enrollments by this method--the available counts of births may not correspond to school district boundaries--a special analysis of the birth records, available in the local office where they are recorded and filed, may be necessary, that is, the births may be allocated to school districts using the residence of the mother that appears on each certificate. Before computing grade progression ratios for a consolidated school district, the enrollment statistics for all of the individual schools in the district should be added; if the boundaries of the consolidated district changed during the time period for which the ratios are computed, the ratios should be adjusted accordingly.

When the grade progression method cannot be used because of deficiencies in the enrollment statistics, some difficulty may be experienced in trying to use the second approach, because the population projections and the estimated enrollment rates needed in the second approach require Census statistics for the area as a starting point. If the school district boundaries do not correspond to the geographic areas tabulated in the census statistics the latter will have to be adjusted for this discrepancy before the method can be used; often there is little basis for such an adjustment.

CONCLUDING OBSERVATIONS

Few communities in the United States during the coming years can avoid the task of estimating school population. In the nation as a whole, the need to expand elementary school facilities as a result of the postwar baby boom became most acute during 1959, the year in which practically all elementary school children were postwar babies. In the years which lie immediately ahead, to 1964, high schools will be absorbing the postwar baby crop.

In many communities, however, and especially in rapidly developing suburbia, elementary as well as high school facilities will prove inadequate for some time to come. In the materials which have been presented, some of the major forces producing needs for additional schools have been indicated and techniques for estimating school enrollment have been described. Moreover some indication has been given of the techniques best adapted for estimating school population in different types of local situations. These materials should be helpful to agencies and persons faced with the task of setting policy, providing school facilities and administering school programs. The social statistician, who has played an active role in the development of methods of estimation has already been called upon and may be expected to be called upon with increasing frequency for the important social engineering task of estimating future school population.

FOOTNOTES

1/See California Department of Finance, Financial Research Section, Projections of Public School Enrollment in California to 1960 and 1965 (Sacramento, April 1954), p. xii. This report discusses in some detail the influence of migration on changes in grade progression ratios over time.

2/This approach was used in the California projections cited in footnote 1, although details of the procedure are not elaborated in this report.

3/For a more detailed explanation and illustrative example, see U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 20, May 6, 1949.

4/For a more detailed explanation and illustrative example, see U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 133, March 16, 1956. Series P-25, No. 165, November 4, 1957, describes a recent amendment in one of the steps of the method.

5/For additional explanation, see Current Population Reports, Series P-25, No. 156, April 30, 1957, p. 2.

6/For a discussion of the various methods and citation of relevant source materials, see Jacob S. Siegel, "Forecasting the Population of Small Areas," Land Economics, February, 1953, pp. 72-87.

7/Population Estimates 1950-2000, Philadelphia-Camden Area (Philadelphia City Planning Commission, April 1948).

8/A Study of the Problems Related to Future Expansion of the Glenbrook High School, Northbrook, Illinois (Board of Education, Northfield Township High School District 225, December, 1957); A Study of the Problems Related to Future Expansion of the New Trier Township High School, Winnetka, Illinois (Board of Education, New Trier Township High School District 203, December, 1957).