

ILLUSTRATIVE U.S. POPULATION PROJECTION, 1946

By

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This study has been prepared for the use of the staff of the Social Security Administration and for limited circulation to other administrative, insurance, and research persons concerned with the subject treated. It has not been submitted to the Commissioner for Social Security for official approval.

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FOREWORD

Actuarial Study No. 24 presents the two population projections underlying the latest long-range cost estimates for the old-age and survivors insurance program (as contained in Actuarial Study No. 23 and in the Seventh and Eighth Annual Reports of the Board of Trustees of the Federal Old-Age and Survivors Trust Fund). In addition, two other population projections are set forth in this actuarial study so as to indicate the range possible in the total population over the long-range future.

Although the long-range cost estimates for the old-age and survivors insurance program extend only to the year 2000 with conditions thereafter being assumed to be "mature", these population projections have been carried on for another 50 years solely for illustrative purposes, as indicating the wide divergency that might develop if the demographic bases assumed were to continue into the future. Although half a century is a long time, population projections for only the period up to the year 2000 will not show a very wide spread because so many of the persons who will be living at that time have already been born (and this is completely the case for the aged population). The birth rate, as has been evidenced in the past two decades, is subject to wide variations, and its future trend can not be predicted with any great precision. Therefore, the population of the country a century hence can well be subject to a very wide range of variation.

ILLUSTRATIVE U.S. POPULATION PROJECTIONS, 1946

A. Introduction

The fundamental base of a long-range cost estimate for the old-age and survivors insurance program is a projection into the future of the United States population. In general, it is necessary to have data for future quinquennial calendar years showing the population by sex and 5-year age groups. These projections must be carried forward for 40 years or more, since, even with a stationary population, the old-age and survivors insurance program cannot possibly reach a stage of even relative maturity before that time.

In 1934-35, when the Committee on Economic Security made its original cost estimates for the old-age benefits program to be incorporated in the Social Security Act, no population projection was available in the particular form necessary, so that development of a projection was of primary importance. The resulting population projection was based on rather simple assumptions, namely, the continuance of mortality rates according to 1920-29 patterns and birth rates such that the total population would follow an arbitrary growth curve leveling off at 150 million after 1975. This population projection is summarized in a number of places, one of the best being on page 207 of Issues in Social Security, A Report to the Committee on Ways and Means of the House of Representatives by the Committee's Social Security Technical Staff, January 1946 (the "Calhoun Report").

After the Social Security Act had been enacted, the Social Security Board, continuing its cost studies in 1937, then had available a set of more comprehensive population projections made by Thompson and Whelpton under the auspices of the National Resources Committee (Population Statistics, National Data, October 1937). The published data were given in detail for 6 projections varying in regard to the assumptions as to fertility, mortality, and immigration. New cost estimates for the old-age insurance plan (presented in Actuarial Study No. 8) were developed on the basis of the "medium" NRC projections, which involved medium fertility, medium mortality, and 100,000 net annual immigration. These new cost estimates did not supersede the original ones but rather supplemented them as indicating the potential range in old-age insurance costs.

Thompson and Whelpton prepared new population projections for the National Resources Planning Board (Estimates of Future Population of the United States, 1940-2000, August 1943). In this report, 12 detailed population projections were presented, again varying the factors of fertility, mortality, and immigration; in addition, deduction factors were given to allow for whatever number of military losses might occur and to allow for fewer births than normal during the later war years. The assumptions underlying these population projections differed from the earlier ones prepared for the National Resources Committee in that somewhat higher birth

rates and somewhat lower mortality rates at the younger and middle ages were predicted on the basis of the actual experience in the later 1930's and the early 1940's. In addition, the mortality improvement assumed at the advanced ages was decreased appreciably. Although it is conceivable that there may be considerable improvement in the future in mortality beyond age 60, to date there has been relatively little improvement, so that forecasting in this range of ages presents great difficulties.

The various cost estimates for the old-age and survivors insurance program made before the enactment of the amended program in 1939 (Actuarial Study No. 14) and subsequently through the war years (Actuarial Studies Nos. 17 and 19) were all based on the two population projections that had been developed for the original old-age insurance system, namely, the Committee on Economic Security projection and the National Resources Committee medium projection. The 1943-44 cost studies presented in Actuarial Study No. 19 were developed before the National Resources Planning Board report was released and could be used.

In part because the latest population data were not used as a base and in part to take into account recent wage trends, new cost estimates for the old-age and survivors insurance system were developed in 1946, in Actuarial Study No. 23. However, at that time, since the war was over and fairly adequate data as to battle losses and wartime fertility were available, it seemed advisable to develop the new population projections presented here, using the projections of the NRPB as the base, but allowing for the actual recent experience.

As it turned out, war losses were relatively lighter than many had expected, while at the same time civilian mortality was very favorable. Moreover, the birth rate during the war years held up remarkably well; the number of children under age 5 in 1945 was about 10% higher than the NRPB estimate based on high fertility (and low mortality) assumptions. As evidence of the very favorable mortality in the quinquennium 1940-45, despite the war losses, the actual 1945 population for both sexes combined was higher than the NRPB estimate based on low mortality, for all quinquennial age groups except for the 15-19 and 20-24 age groups in which there was a deficit of less than $\frac{1}{2}\%$ (even considering males alone there was a deficit only between ages 15 and 30). In addition to taking into account the increased fertility of the war years (and the possibility of its continuance to some extent into the future) and war losses, it was considered advisable to allow for the effect of a wider spread in mortality rates by assuming greater improvement at the older ages.

Incidentally, the population projections prepared by Thompson and Whelpton are currently being revised by the Bureau of the Census to allow for the actual wartime experience as to mortality and fertility. The first revision, that for the medium population projection, was released as Population Special Reports, Series P-46, No. 7, September 15, 1946.

B. Methodology and Assumptions

The population estimates presented in this report were prepared by exactly the same method as that used by Thompson and Whelpton in their two reports cited previously. This method consists of beginning with a population at a census date, with subdivision into quinquennial age groups, sex, and race. Each of these population groups is then projected into the future by the use of quinquennial survival rates that give the probability of persons in a particular quinquennial age group surviving for 5 years.

At the same time, the number of births within the next 5-year period are obtained by applying age-specific birth rates (i.e. births in a 5-year period per 1000 women of a specified 5-year age group at the end of the period) to the female population. The resulting number of births are then subdivided by sex according to a fixed sex ratio at birth (a very stable quantity), and are projected by appropriate survival factors to the end of the 5-year period and then to subsequent years in the same fashion as the original population. Carrying these various steps forward, population estimates are developed by quinquennial age groups, race, and sex for various 5-year dates in the future.

When an assumption involving immigration is introduced, the above procedure is modified slightly in that the survivors of the immigrants during a 5-year period are added to the survivors of the population existing at the beginning of the 5-year period. Both groups combined are then projected into the future.

The population projections of this report were all based on the population of the United States on July 1, 1945, as estimated by the Bureau of the Census and contained in Population Special Reports, Series P-46, No. 2, January 27, 1946. This estimate took into account substantially all the war losses that occurred as well as the actual civilian mortality and fertility experience since 1940. In the published estimate no subdivision by quinquennial age groups was given for those aged 75 and over, but this was readily estimated by projecting the appropriate 1940 census age groups and adjusting to the given total.

As will be discussed in more detail subsequently, four population projections were made:

Projection A used the low fertility assumptions of the NRPB report, high mortality (namely, level mortality into the future at the 1939-41 experience), and no immigration.

Projection B used high fertility (namely, 10% higher than the NRPB high assumptions^{a/}), low mortality (namely, the same as the NRPB low assumptions up to age 65 but allowing for greater improvement thereafter), and net

^{a/} The actual differential used resulted in about a 10% average increase, but varied by age as follows: Ages 15-19, 8%; 20-24, 10%; 25-29, 11%; 30-34, 10%; 35-39, 9%; 40-44, 2%; and ages 45-49, no change.

immigration of 100,000 per year distributed by age and sex as in the NRPB estimates. Beyond age 65 the NRPB assumed relatively little improvement in mortality, but here a somewhat greater amount has been hypothesized. For the year 2000, as contrasted with the 1979-41 rates, there is an improvement in mortality rates for white males of 35% at age 70, grading down to 20% at age 85 and 10% at age 95; correspondingly, the NRPB assumed reductions were 25% at age 70 and none at all beyond age 80.

Projection C used the same high fertility assumptions as Projection B, the same high mortality assumptions as Projection A, and no immigration.

Projection D used the NRPB medium fertility assumptions, the low mortality assumptions of Projection B, and no immigration.

C. Resulting Projections

Projections A and B were prepared for the basic purpose of presenting population estimates that would show a plausible range in the absolute number of persons involved. The assumptions of Projection A (see Table 1 for general summary) were "pessimistic" in predicating low fertility and high mortality, while the assumptions of Projection B were "optimistic" in utilizing high fertility and low mortality with augmentation by immigration.

However, population projections that furnish a reasonable range in regard to the absolute populations involved may not necessarily be suitable as projection bases for cost estimates for the old-age and survivors insurance system. For such a purpose the most important factor is the relationship between the aged population and the productive population^{b/}. Therefore a second pair of projections was developed. Projection C involves high fertility and high mortality which assumptions produce a relatively low total cost for the old-age and survivors insurance program, while Projection D involving medium fertility and low mortality has the opposite results.

It should be emphasized that both pairs of projections are not the extreme outside limits possible for the particular type of projection developed. For instance, fertility conceivably could be even lower than the low assumptions or higher than the high assumptions (as apparently will actually be the case for the quinquennium 1945-50, although most authorities feel that the current level is abnormally high).

All of the projections have been carried out for a century (i.e., until the year 2050) as contrasted with the various projections discussed previously, all of which concluded with the year 2000. The carrying forward of the projections of this report for another 50 years was not done because it was felt that such long-range projections could be accurately made, but rather to indicate that the population would not reach a stage of absolute or relative maturity in the year 2000 and thus to show the trends that might be anticipated thereafter. In carrying forward the projections beyond the year 2000, it was assumed that mortality and birth rates remained level thereafter. Although this is not likely to occur, it seems a reasonable assumption for the somewhat academic project of carrying the population forward for the last half of the next 100 years.

Table 2 summarizes the four illustrative projections for four broad age groups for various years in the future, while Tables 2a and 2b give the

^{b/} Although the old-age and survivors insurance program includes both monthly old-age benefits (including those to aged survivors) and monthly benefits for surviving orphans and their widowed mothers plus lump-sums for other deaths, the cost for the old-age monthly benefits predominates. Therefore, estimates based on low mortality assumptions, which yield relatively more aged persons, would show a higher total cost, since the larger cost for old-age benefits would far more than offset the lower cost for young survivor benefits.

Table 1

General Bases of Four Illustrative Population Projections

	<u>Fertility</u>	<u>Mortality</u>	<u>Immigration</u>
Projection A	Low	High	None
Projection B	High	Low	100,000 per year
Projection C	High	High	None
Projection D	Medium	Low	None

Note: See text for detailed description of above bases and other ones used.

Table 2

Population by Age Groups for Four Illustrative Projections^{a/}, 1950-2050
(In thousands of persons)

<u>Year^{b/}</u>	<u>Under 20^{c/}</u>	<u>20-44</u>	<u>45-64</u>	<u>65 & Over</u>	<u>Total</u>
Actual Data ^{d/}					
1945	47,658	54,186	28,530	10,110	140,484
Projection A					
1950	47,618	55,522	30,551	11,240	144,931
1960	45,553	55,016	33,882	13,966	148,417
1970	38,858	56,321	37,215	15,961	148,355
1980	35,143	53,815	36,912	17,892	143,762
1990	30,019	47,819	37,795	19,578	135,211
2000	25,693	42,346	37,137	19,025	124,201
2025	17,497	29,260	27,462	17,740	91,959
2050	11,912	19,925	18,659	13,025	63,521
Projection B					
1950	50,572	56,026	30,755	11,385	148,738
1960	57,324	56,886	35,148	14,881	164,239
1970	60,280	62,207	40,307	18,482	181,276
1980	66,795	68,911	41,955	22,820	200,481
1990	72,997	75,228	44,317	27,366	219,908
2000	79,125	81,671	50,945	29,308	241,049
2025	98,477	101,616	62,847	37,745	300,685
2050	122,346	125,862	77,558	46,989	372,755
Projection C					
1950	50,092	55,522	30,551	11,240	147,405
1960	55,435	55,016	33,882	13,966	158,299
1970	56,561	58,716	37,215	15,961	168,453
1980	60,911	63,333	36,912	17,892	179,048
1990	64,499	66,997	37,795	19,578	188,869
2000	67,717	70,579	42,200	19,025	199,521
2025	78,021	81,405	48,001	22,374	229,801
2050	89,794	93,626	54,852	25,742	264,014
Projection D					
1950	48,432	55,679	30,736	11,383	146,230
1960	49,530	55,720	35,073	14,868	155,191
1970	46,681	58,410	39,965	18,443	163,499
1980	46,488	59,445	40,938	22,739	169,610
1990	44,663	58,072	42,725	27,079	172,539
2000	43,010	56,924	44,828	28,550	173,312
2025	39,492	52,543	42,505	31,354	165,894
2050	36,285	48,230	38,787	29,896	153,198

^{a/} See Table 1 and text for bases of the various projections.

^{b/} As of July 1.

^{c/} Adjusted for underenumeration of children.

^{d/} Official census estimate.

Table 2a

Total Population by Quinquennial Age Groups for Four Illustrative Projections^{a/}, 1945, 1970, 2000, and 2050
(Figures in thousands of persons)

Age Group	1970				2000				2050			
	A	B	C	D	A	B	C	D	A	B	C	D
0-4c/	14,011	16,376	15,213	11,969	5,822	21,282	18,003	10,505	2,680	32,684	23,680	8,887
5-9	11,346	15,091	14,128	11,636	6,233	20,170	17,200	10,730	2,863	31,160	22,771	8,992
10-14	10,649	14,368	13,531	11,362	6,620	19,190	16,504	10,784	3,074	29,858	22,036	9,130
15-19	11,652	14,445	13,689	11,714	7,018	18,483	16,010	10,891	3,295	28,644	21,307	9,276
20-24	12,157	14,666	13,892	12,413	7,558	18,097	15,676	11,198	3,527	27,543	20,514	9,430
25-29	11,470	14,031	13,382	13,641	8,295	17,536	15,193	11,586	3,770	26,383	19,648	9,563
30-34	11,007	11,455	10,770	11,038	8,846	16,499	14,283	11,736	4,000	25,156	18,730	9,670
35-39	10,152	9,966	9,966	10,247	8,892	15,206	13,126	11,390	4,213	23,956	17,818	9,744
40-44	9,400	10,706	10,706	11,071	8,755	14,333	12,301	11,014	4,415	22,824	16,916	9,823
45-49	8,551	11,594	10,893	11,397	9,045	14,165	12,083	11,208	4,618	21,674	15,916	9,906
50-54	7,884	10,607	9,883	10,523	9,722	13,966	11,747	11,654	4,757	20,330	14,646	9,902
55-59	6,789	9,759	8,919	9,720	10,614	12,864	10,614	12,418	4,752	18,709	13,048	9,725
60-64	5,307	8,347	7,520	8,325	7,756	9,950	7,756	9,548	4,532	16,845	11,242	9,254
65-69	4,070	6,913	6,074	6,895	6,253	8,482	6,253	8,141	4,116	14,781	9,353	8,536
70-74	2,962	5,149	4,516	5,136	5,441	7,392	5,441	7,641	3,531	12,379	7,297	7,564
75-79	1,786	3,506	3,024	3,500	3,977	6,296	3,977	6,179	2,710	9,356	4,952	6,146
80-84	860	1,904	1,579	1,902	2,157	3,884	2,157	3,847	1,661	5,953	2,677	4,224
85-89	335	751	584	751	897	1,928	897	1,918	732	3,011	1,081	2,254
90+	96	259	184	259	300	826	300	824	275	1,509	382	1,172
Total	140,484	148,355	168,453	163,499	124,201	241,049	199,521	173,312	63,521	372,755	264,014	153,198

a/ See Table 1 and text for bases of the various projections.

b/ Official census estimate, with subdivision by quinquennial age groups for those 75 and over estimated by this office.

c/ Adjusted for underenumeration of children.

Table 2b

Total Male Population by Quinquennial Age Groups for Four Illustrative Projections^{a/}, 1945, 1970, 2000, and 2,050
(Figures in thousands of persons)

Age Group	1945 ^{b/}	1970				2000				2050			
		A	B	C	D	A	B	C	D	A	B	C	D
0-4 ^{c/}	7,156	4,805	8,385	7,762	6,128	2,971	10,907	9,184	5,435	1,368	16,741	12,078	4,553
5-9	5,777	4,878	7,723	7,203	5,952	3,178	10,335	8,767	5,496	1,459	15,959	11,604	4,605
10-14	5,399	4,905	7,351	6,894	5,808	3,373	9,834	8,407	5,523	1,566	15,295	11,222	4,676
15-19	5,896	5,215	7,389	6,968	5,983	3,572	9,475	8,148	5,576	1,677	14,678	10,841	4,750
20-24	6,035	5,845	7,511	7,063	6,332	3,842	9,291	7,968	5,731	1,793	14,130	10,425	4,828
25-29	5,590	6,798	7,187	6,798	6,947	4,210	9,010	7,710	5,926	1,914	13,544	9,969	4,895
30-34	5,386	5,450	5,858	5,450	5,605	4,482	8,476	7,236	6,000	2,027	12,916	9,488	4,948
35-39	5,015	5,014	5,411	5,014	5,176	4,495	7,803	6,635	5,817	2,130	12,290	9,005	4,984
40-44	4,661	5,361	5,764	5,361	5,574	4,410	7,338	6,197	5,615	2,224	11,695	8,518	5,021
45-49	4,275	5,327	5,714	5,327	5,618	4,530	7,231	6,052	5,701	2,313	11,088	7,968	5,057
50-54	3,977	4,708	5,100	4,708	5,075	4,824	7,104	5,829	5,909	2,359	10,377	7,265	5,044
55-59	3,455	4,210	4,674	4,210	4,675	5,196	6,507	5,196	6,263	2,324	9,512	6,381	4,935
60-64	2,678	3,517	3,987	3,517	3,991	3,712	4,989	3,712	4,772	2,172	8,513	5,389	4,668
65-69	2,006	2,788	3,263	2,788	3,263	2,903	4,189	2,903	4,009	1,921	7,404	4,367	4,267
70-74	1,424	2,034	2,381	2,034	2,379	2,440	3,807	2,440	3,681	1,595	6,088	3,295	3,713
75-79	846	1,333	1,586	1,333	1,585	1,676	2,888	1,676	2,838	1,174	4,491	2,146	2,945
80-84	393	679	840	679	840	845	1,679	845	1,670	682	2,768	1,099	1,960
85-89	145	239	317	239	317	330	796	330	796	281	1,345	415	1,004
90+	38	69	102	69	102	101	322	101	322	96	634	134	490
Total	70,152	73,175	90,543	83,417	81,350	61,090	121,981	99,336	87,080	31,075	189,468	131,609	77,343

a/ See Table 1 and text for bases of the various projections.

b/ Official census estimate, with subdivision by quinquennial age groups for those 75 and over estimated by this office.

c/ Adjusted for underenumeration of children.

total population and that for males by quinquennial age groups for 1945, 1970, 2000, and 2050^{c/}. The total population shows rather diverse trends under the four projections (see Chart 1). As would be expected from the assumptions made, Projection A shows only a gradual increase from the present 140 million persons to a maximum of almost 149 million in 1965, with a fairly rapid decrease thereafter until a century hence when the resulting population is shown to be less than half its present size and in fact less than in 1900. Under this projection, the population would within a relatively short time (1 or 2 centuries) be virtually extinguished^{d/}.

Both Projections B and C show continuously increasing populations--the former to considerably higher magnitudes because of the assumptions of low mortality and immigration as against high mortality and no immigration in the latter. Under Projection B, the population a century hence is more than 2½ times its present size, whereas under Projection C it is almost doubled.

Projection D comes closest to producing a stationary population. Its peak is reached in about 60 years at almost 175 million, about a 25% increase over the present size. In the succeeding half century there is a slow decline, amounting to about 20 million, so that the population in the year 2050 is only slightly higher than at present.

The population under age 20, as shown in the various projections, is, of course, materially affected by the fertility assumptions made. Thus in Projection A, which is a declining population with low fertility, only 12 million persons are under age 20 in the year 2050, as contrasted with more than 10 times this number in the increasing population of Projection B. In fact, an apparent extreme case is reached in Projection B in which there are shown as many persons under 20 in the year 2050 as there were of all ages in the 1930 census.

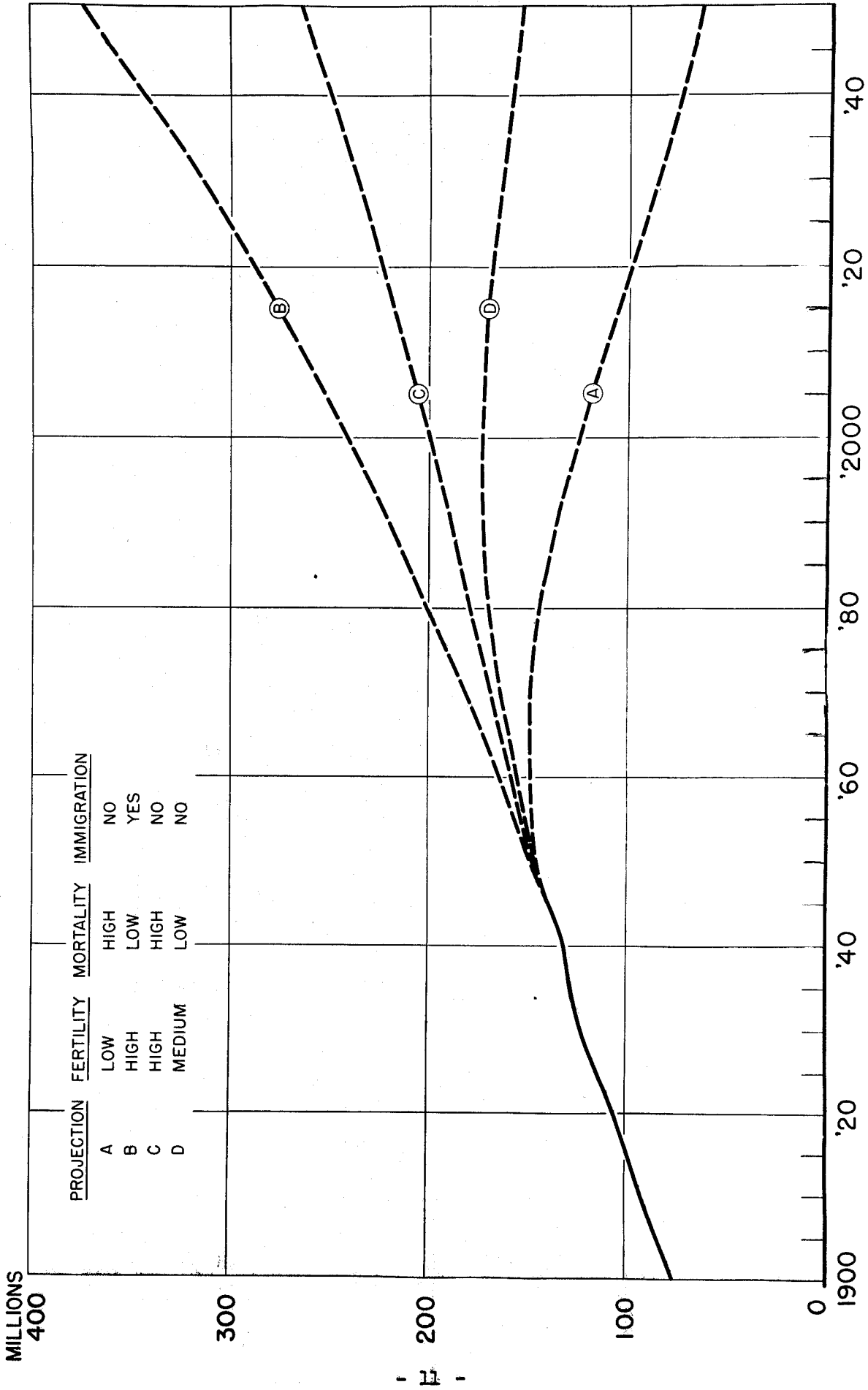
Correspondingly, the productive age groups 20-44 and 45-64 show the same general trends, except that they are deferred for a number of years. For instance, the age group 45-64 shows relatively little variation among the four projections up to the year 1990, since all persons in that group are already born. However, after that time the varying birth assumptions have a considerable effect.

Next, there may be considered in more detail the age group 65 and over, since it is of the most importance in regard to old-age benefit costs. Projections A and C produce identical figures for the next 65 years (i.e., until the year 2010), since they involve the same mortality assumptions and since all those who will be over 65 before then are already born (see Chart 2). Likewise Projections B and D are virtually the same until the year 2010 although the former is somewhat higher after 1980 because of the immigrants

c/ As indicated previously, detailed figures by quinquennial age groups, sex and race were prepared for each future quinquennial year for each projection. Such detailed data may be obtained from this office on request.

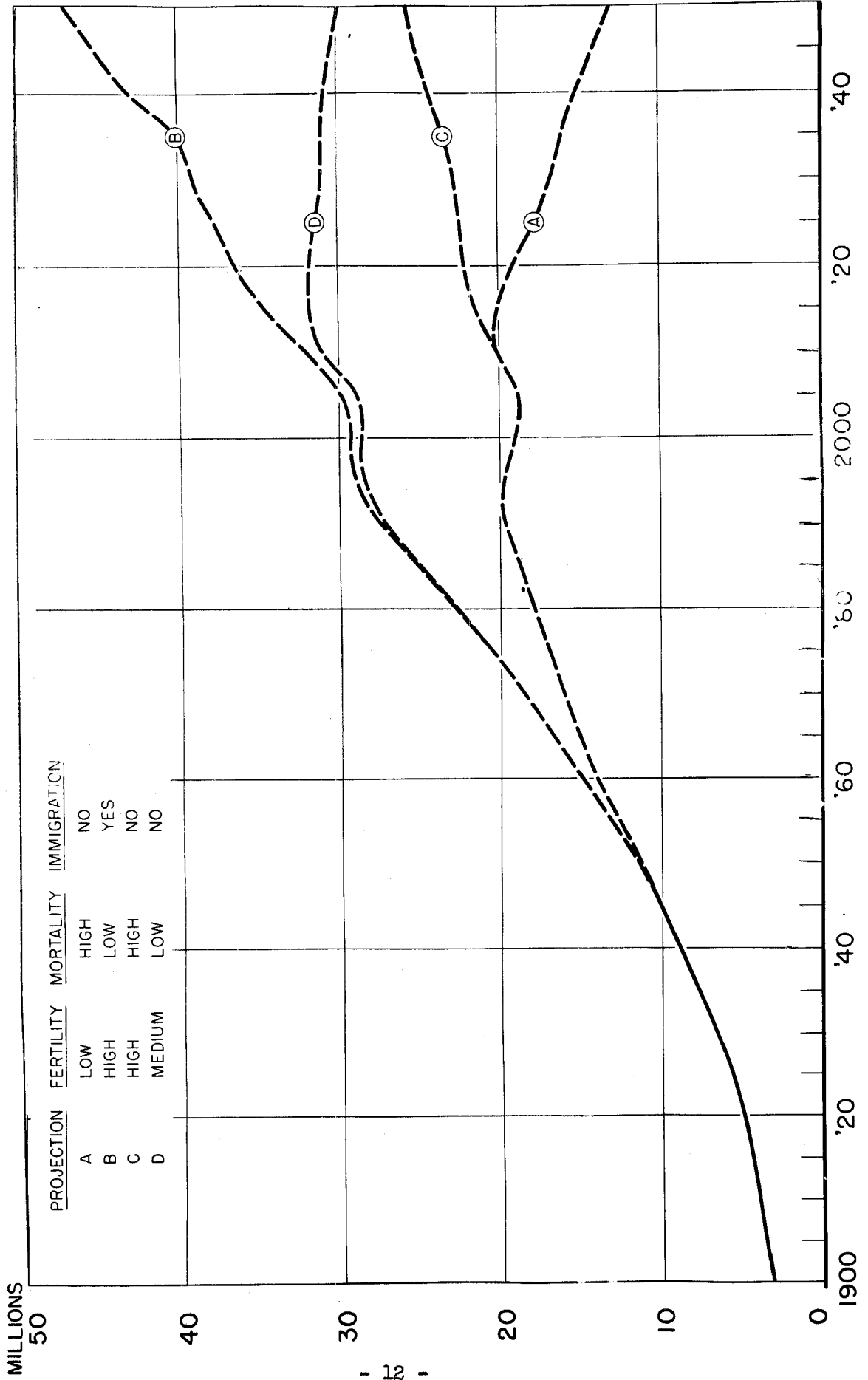
d/ No attempt is made here to discuss the possible artificiality of the assumptions being continued indefinitely in such fashion as to produce depopulation of the country. It seems likely that very strenuous measures would sooner or later be taken to prevent this potential situation.

U.S. TOTAL POPULATION, 1900-2050



U.S. POPULATION AGED 65 AND OVER, 1900-2050

CHART 2



since 1945 who become 65 and over. All curves have a hump at about 1995, with a trough 10 years later and then a subsequent rise. This is the effect of the great variance in the number of births during the last 25 years, namely, relatively few births during the depression and relatively many since 1940 (to be discussed in more detail later).

With the exception of the dip at about the year 2005, Projection B shows a steadily increasing number of aged persons, with the figure for the year 2050 being almost 50 million or 5 times the present number. In contrast, Projection D shows almost a level trend after the year 2000 at about 30 million, while Projection C shows a steady rise after a level of almost 20 million during 1990-2010 to more than 25 million 50 years later. Projection A, after a peak in the year 2010 due to the large number of births in the past few years, shows a steady decline in the number of aged persons; in the year 2050 there are 13 million, which number is nevertheless about a third more than at present even though the total population then is less than the present one.

Perhaps more important than the absolute numbers of persons involved in the various projections are the relative age distributions, as shown in Table 3 for the four broad age groups previously considered. Projection A, which involves the declining population, naturally shows a continually decreasing trend for the younger age groups, with those under age 20 accounting for less than 20% of the total population a century hence as contrasted with almost 35% at present. Conversely, in Projection A the aged group makes up over 20% of the population in the year 2050 as contrasted with only 7% at present (see Chart 3).

Projections B and C are relatively stable populations in that their percentage distribution by age shows little variation. Both show about a third of their population in each of the age groups 0-19 and 20-44, about a fifth in the age group 45-64, and the remainder in the group aged 65 and over. Within the latter relatively small group, there is an increase after about 50 years from the present level of 7% to about 12½% under Projection B and 10% under Projection C.

Projection D, which for the total population is the most nearly stationary, shows a considerable variation in relative composition by age--corresponding somewhat to Projection A, although the variations are not as marked. The proportion of the aged population increases to almost 20% in the next century.

It will be noted that although Projections A and D differ rather widely as to their basic assumptions they show roughly the same proportion of aged persons in all years. This results from counteracting factors. In Projection A, despite high mortality which results in relatively fewer aged persons, the low assumed fertility results in a smaller total population base. On the other hand, in Projection D the low assumed mortality results in a sizable number of aged persons who weigh rather heavily against the somewhat larger total population resulting from medium fertility assumptions.

Table 4 shows the sex ratios (i.e., the number of males per 1000 females) for the total population and for the aged population for the four projections. For the total population, the present sex ratio is only slightly

Table 3

Percentage Distributions of Population by Age Group for Four Illustrative Projections^{a/}, 1950-2050

<u>Year</u> ^{b/}	<u>Under 20</u> ^{c/}	<u>20-44</u>	<u>45-64</u>	<u>65 & Over</u>	<u>Total</u>
Actual Data ^{d/}					
1945	33.5	38.9	20.4	7.2	100.0
Projection A					
1950	32.9	38.2	21.1	7.8	100.0
1960	30.7	37.1	22.8	9.4	100.0
1980	24.4	37.5	25.7	12.4	100.0
2000	20.7	34.1	29.9	15.3	100.0
2025	19.0	31.8	29.9	19.3	100.0
2050	18.8	31.3	29.4	20.5	100.0
Projection B					
1950	34.0	37.6	20.7	7.7	100.0
1960	34.9	34.6	21.4	9.1	100.0
1980	33.3	34.4	20.9	11.4	100.0
2000	32.8	33.9	21.1	12.2	100.0
2025	32.8	33.7	20.9	12.6	100.0
2050	32.8	33.8	20.8	12.6	100.0
Projection C					
1950	34.0	37.7	20.7	7.6	100.0
1960	35.0	34.8	21.4	8.8	100.0
1980	34.0	35.4	20.6	10.0	100.0
2000	33.9	35.4	21.2	9.5	100.0
2025	34.0	35.4	20.9	9.7	100.0
2050	34.0	35.4	20.8	9.8	100.0
Projection D					
1950	33.1	38.1	21.0	7.8	100.0
1960	31.9	35.9	22.6	9.6	100.0
1980	27.4	35.1	24.1	13.4	100.0
2000	24.8	32.8	25.9	16.5	100.0
2025	23.8	31.7	25.6	18.9	100.0
2050	23.7	31.5	25.3	19.5	100.0

^{a/} See Table 1 and text for bases of the various projections.

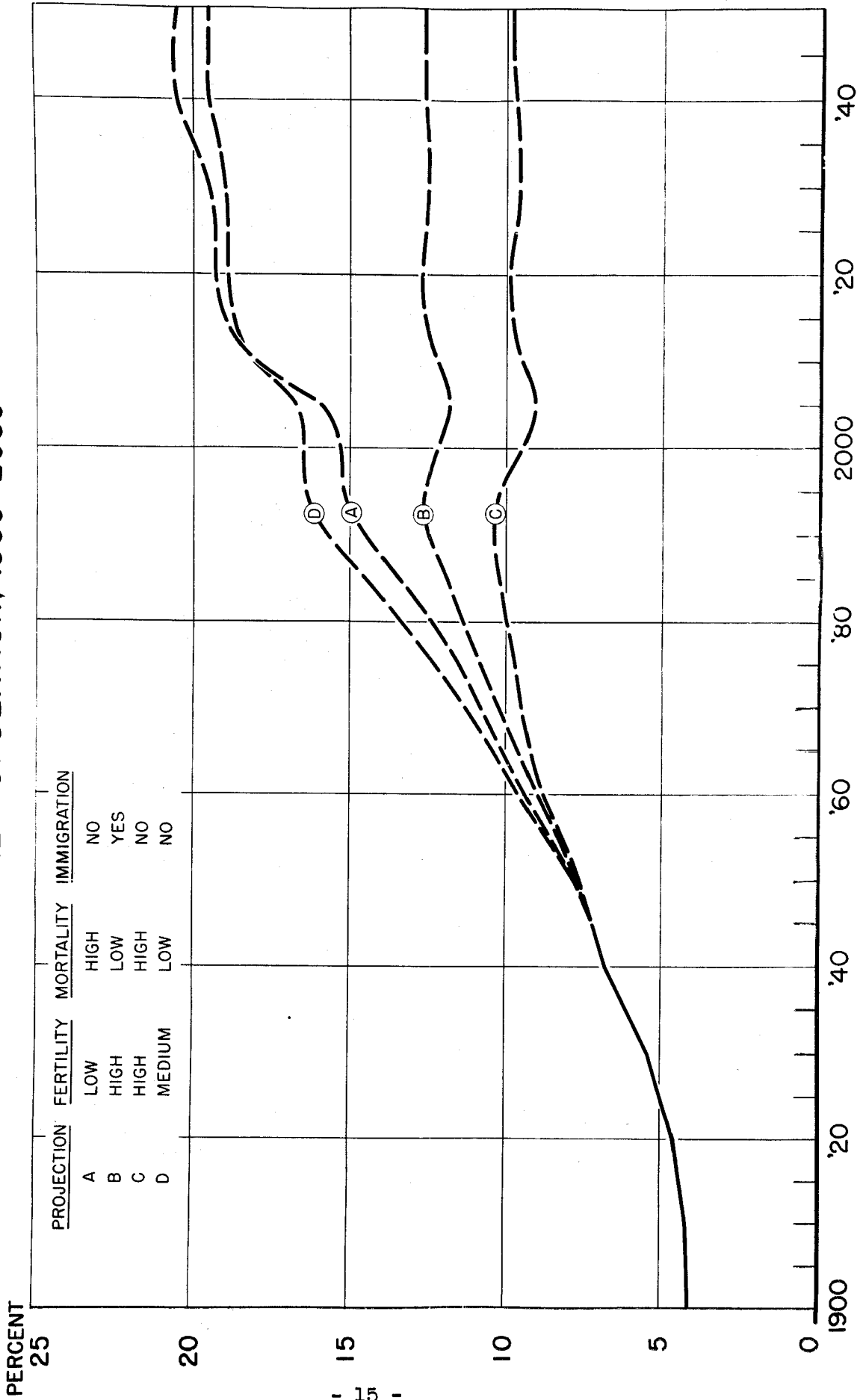
^{b/} As of July 1.

^{c/} Adjusted for underenumeration of children.

^{d/} Official census estimate.

U.S. POPULATION AGED 65 AND OVER AS PERCENTAGE OF U.S. TOTAL POPULATION, 1900-2050

CHART 3.



PROJECTION	FERTILITY	MORTALITY	IMMIGRATION
A	LOW	HIGH	NO
B	HIGH	LOW	YES
C	HIGH	HIGH	NO
D	MEDIUM	LOW	NO

Table 4

Sex Ratios^{a/} of Total Population and Aged Population for Four Illustrative Projections^{b/}, 1950-2050

<u>Year</u>	<u>Projection A</u>	<u>Projection B</u>	<u>Projection C</u>	<u>Projection D</u>
Total Population				
1950	991	995	992	993
1960	981	994	984	989
1980	969	1006	983	995
2000	968	1024	992	1010
2025	961	1033	994	1019
2050	958	1034	994	1020
Aged Population, 65 and Over				
1950	907	910	907	911
1960	866	883	866	884
1980	771	832	771	838
2000	773	875	773	874
2025	791	931	801	920
2050	790	937	802	927

a/ Males per 1000 females.

b/ See Table 1 and text for bases of the various projections

Note: Actual 1945 ratios: total population - 997 and aged population - 923.

under 1000. Under Projection C and to some extent under Projection A there is little variation in the sex ratio of the total population in future years. On the other hand, both Projections B and D, particularly the former, show an increasing sex ratio, so that a century hence there are slightly more males than females. Projection B shows an increasing sex ratio, in part because of the immigration assumptions which predicate that the immigrants will be 55% male and only 45% female.

In the population aged 65 and over, there are now about 920 males per 1000 females. Under all four projections this ratio is expected to decrease during the next few decades, since the effect of the heavy immigration before the first World War, which was predominately male, is gradually wearing off. A century hence the sex ratio for the aged is shown to be about 800 for Projections A and C and about 930 for Projections B and D, which is very close to the present ratio of 923. This diverse effect results from the basic assumptions, namely, that in the latter two estimates the relative superiority of female mortality over male mortality will decrease in the future (although absolute improvement is shown for both sexes).

Table 5 shows the proportion of the total population and aged population accounted for by nonwhites according to the detailed breakdowns of the four projections. For the total population, all estimates show an increasing proportion of nonwhites. For Projections B and D the mortality improvement assumed is relatively greater for this category, more than offsetting the assumed decrease in the higher nonwhite fertility differential. For Projections A and C the wearing off of the effect of past immigration, predominately white, tends to lower the proportion of white persons. In contrast with the present proportion of nonwhites--about 10½%--the projections show that a century hence the ratio may well be 15-18%. Correspondingly, for the aged population the proportion of nonwhites rises steadily although it never becomes as high as the similar proportion for the total population for any particular year because none of the mortality assumptions predicate that nonwhite mortality will improve to the level of white mortality.

Table 5

Non-Whites as Percentages of Total Population and Aged Population for Four Illustrative Projections^{a/}, 1950-2050

<u>Year</u>	<u>Projection A</u>	<u>Projection B</u>	<u>Projection C</u>	<u>Projection D</u>
Total Population				
1950	10.7	10.7	10.7	10.7
1960	10.9	11.2	11.1	11.2
1980	11.4	12.7	12.2	12.6
2000	11.7	14.4	13.2	14.2
2025	11.9	16.4	14.1	16.0
2050	11.8	18.4	14.9	17.6
Aged Population				
1950	6.7	6.7	6.7	6.7
1960	6.8	6.8	6.8	6.8
1980	7.4	8.4	7.4	8.4
2000	7.9	10.1	7.9	10.3
2025	9.2	12.7	9.1	13.3
2050	9.7	15.0	10.1	15.5

^{a/} See Table 1 and text for bases of the various projections.

Note: Actual 1945 percentages: total population - 10.4 and aged population - 6.7

D. Birth and Death Rates

As a subsidiary part of the population projections, it is possible to compute crude birth and death rates, averaged over 5-year periods, for each of the four illustrative projections. It is hardly necessary to emphasize that these crude rates are subject to many limitations, but they do possess considerable interest as a measure of current population change.

Under both Projections A and D the crude birth rate drops steadily over the next century, while the crude death rate increases continuously (see Table 6); this trend on the basis of the assumptions set forth would continue indefinitely. As the extreme case, in Projection A in the year 2050, the birth rate is only about a third of the death rate. On the other hand, in Projections B and C a fairly stable condition occurs by 1970. Thereafter under Projection B the birth rate is practically level at 18 per 1000, while the death rate is level at about 10 per 1000, resulting in an annual increase in population of more than $\frac{3}{4}\%$. Correspondingly, under Projection C the birth rate levels off at about 19 per 1000 as compared with $13\frac{1}{2}$ per 1000 for the death rate, leaving the residual constant percentage rate of growth of about $\frac{1}{2}\%$.

Charts 4 and 5 show the birth and death rates for the four projections and in addition give past experience data back to 1915. As has been noted, the present high birth rate will very likely result in the actual rate for 1945-50 exceeding the birth rates shown, even for Projections B and C which are based on high fertility assumptions. The factor of future fertility is by far the most uncertain item in population projections.

On the other hand, the actual crude death rate for 1945-50 will probably fall somewhere with the range of the four estimates, probably toward the lower portion (Projections B and D). It seems very likely that over the next 10 or 20 years the crude death rate will remain relatively constant at about 10 per 1000 but will then begin an upward trend. However, should conditions parallel those of Projection B, an almost level crude death rate could occur over the next 100 years.

As a supplement to this report, Table 6a gives a series of estimated annual births and deaths since 1920, after adjustment for incompleteness of the registration areas prior to 1933 and for under-reporting. The two series are taken from estimates of Thompson and Whelpton for the earlier portion of the period and from official Census estimates for later periods. The annual number of births was relatively constant in 1920-26 at about 2.8 million, but this, coupled with an increasing total population base, depressed the birth rate. After 1926 the annual number of births decreased steadily to a minimum of 2.3 million in 1933 and then increased slowly to 2.6 million in 1940; the birth rate likewise decreased sharply from 1926 to 1933 and then increased slowly until 1940. After 1940 the annual number of births increased sharply to 3.1 million in 1943, declined slightly in 1944-45, then increased very sharply in 1946 to 3.4 million and then again in 1947 to over 3.9 million, according to a preliminary estimate.

Table 6

Crude Birth and Death Rates^{a/} for Four Illustrative Projections^{b/}, 1950-2050

<u>Five-Year Period Ending^{c/}</u>	<u>Birth Rate</u>	<u>Death Rate</u>	<u>Excess of Birth Over Death Rate</u>	<u>Birth Rate</u>	<u>Death Rate</u>	<u>Excess of Birth Over Death Rate</u>
	Projection A			Projection B		
1950	17.5	11.3	6.2	21.1	10.4	10.7
1960	13.9	12.5	1.4	18.6	9.7	8.9
1970	13.4	13.9	-.5	19.0	9.5	9.5
1980	11.3	15.4	-4.1	18.8	9.5	9.3
1990	10.3	17.0	-6.7	18.3	9.6	8.7
2000	9.7	18.7	-9.0	18.4	9.6	8.8
2025	8.7	22.5	-13.8	18.2	9.8	8.4
2050	8.6	23.8	-15.2	18.3	10.0	8.3
	Projection C			Projection D		
1950	21.0	11.4	9.6	18.4	10.3	8.1
1960	18.6	12.2	6.4	15.5	10.0	5.5
1970	19.4	13.0	6.4	15.2	10.1	5.1
1980	19.4	13.5	5.9	13.8	10.7	3.1
1990	19.0	13.7	5.3	12.9	11.5	1.4
2000	19.3	13.7	5.6	12.5	12.3	.2
2025	19.2	13.6	5.6	11.8	14.4	-2.6
2050	19.2	13.6	5.6	11.7	15.1	-3.4

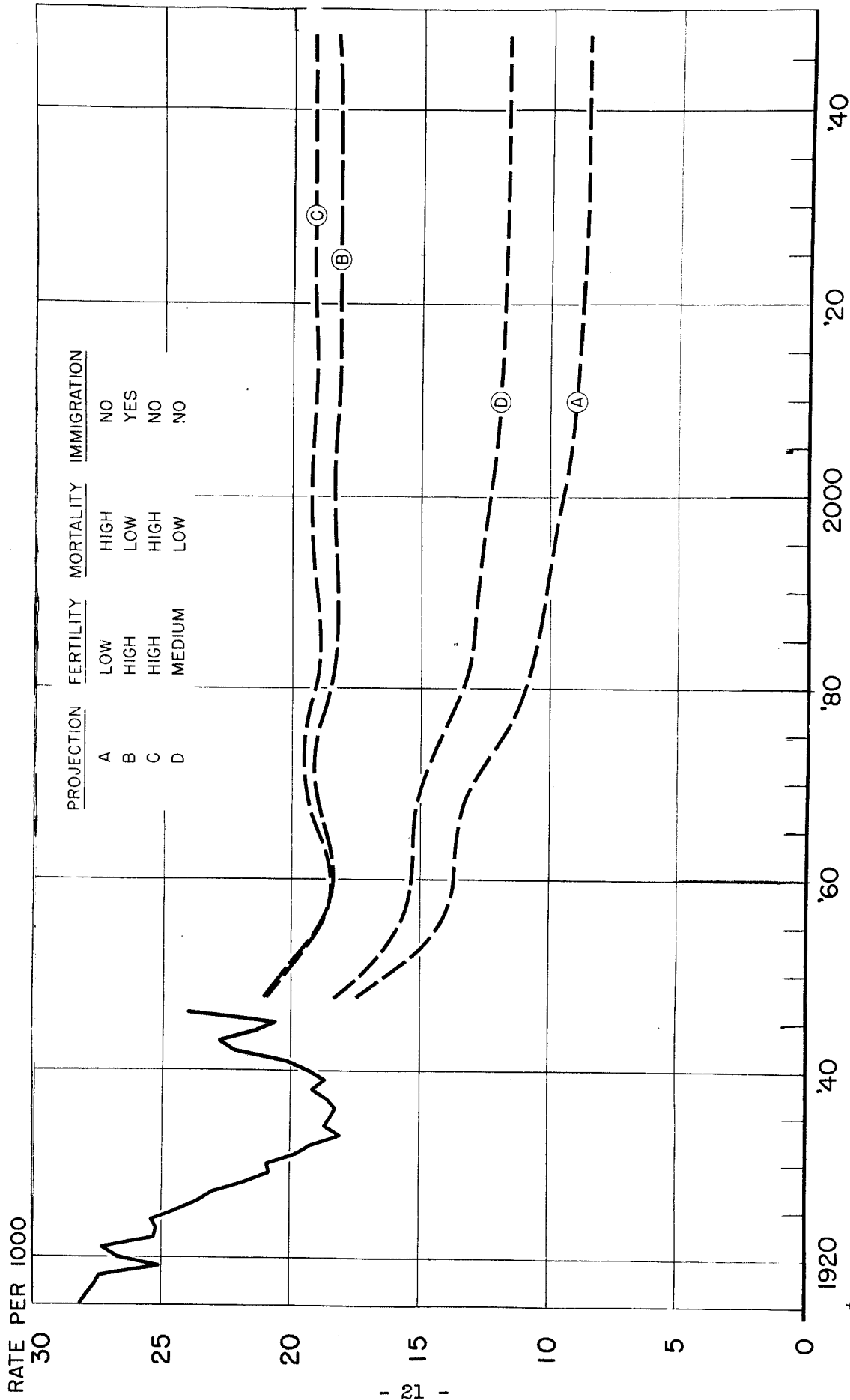
a/ Average annual births (or deaths) in the five-year period per 1,000 mean population in the period.

b/ See Table 1 and text for bases of the various projections.

c/ As of June 30 of year shown.

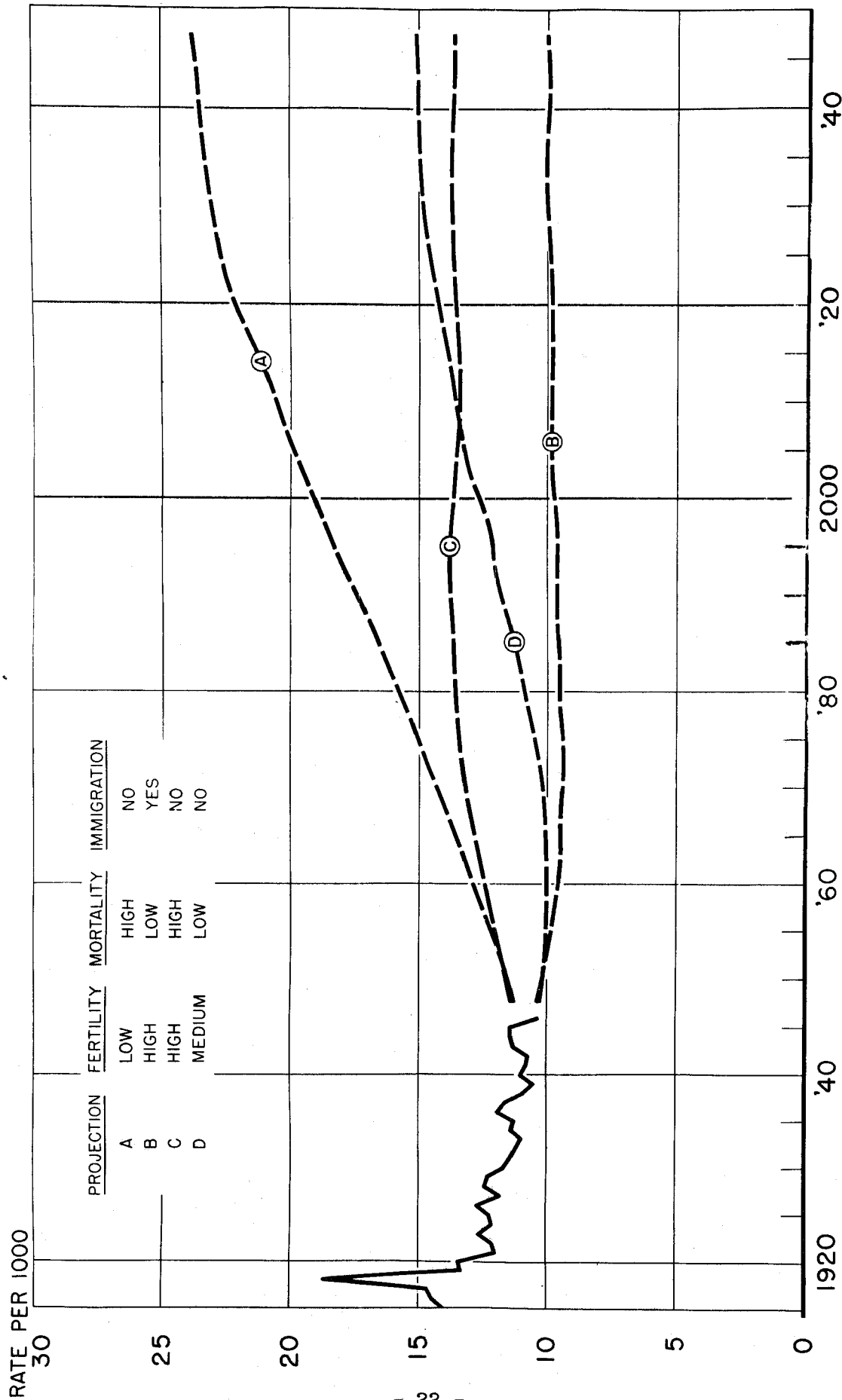
Note: Actual 1945 rates: birth - 20.6 and death - 11.2, or excess of birth over death - 9.4 (see Table 6a)

U.S. CRUDE BIRTH RATE, 1915-2050†



† FOR 1915-46, ACTUAL DATA ADJUSTED FOR INCOMPLETE REGISTRATION AREA AND UNDER-REGISTRATION OF BIRTHS. AFTER 1945, ESTIMATED DATA FOR 5-YEAR PERIODS PLOTTED IN MIDDLE OF PERIOD.

CHART 5. U. S. CRUDE DEATH RATE, 1915-2050†



†FOR 1915-46, ACTUAL DATA (INCLUDING WAR DEATHS) ADJUSTED FOR INCOMPLETENESS OF REGISTRATION; FOR 1946 AND UNDER-REGISTRATION OF BIRTHS. AFTER 1946, ESTIMATED DATA FOR 5-YEAR PERIODS PLOTTED IN MIDDLE OF PERIOD

Table 6a

Estimated Births and Deaths, 1920-46^{a/}

Year	Births (in thousands)	Deaths (in thousands)	Rates per 1000 Population ^{b/}	
			Birth	Death
1920	2,848	1,433	26.6	13.4
1921	2,950	1,294	27.2	12.0
1922	2,781	1,331	25.2	12.1
1923	2,809	1,403	25.1	12.6
1924	2,875	1,367	25.3	12.1
1925	2,813	1,406	24.4	12.2
1926	2,750	1,476	23.5	12.7
1927	2,715	1,397	22.9	11.8
1928	2,612	1,490	21.7	12.4
1929	2,527	1,494	20.7	12.3
1930	2,569	1,439	20.8	11.6
1931	2,465	1,416	19.8	11.4
1932	2,411	1,401	19.2	11.2
1933	2,290	1,384	18.1	11.0
1934	2,390	1,440	18.8	11.3
1935	2,382	1,436	18.6	11.2
1936	2,355	1,525	18.3	11.8
1937	2,413	1,495	18.6	11.5
1938	2,496	1,424	19.1	10.9
1939	2,466	1,431	18.7	10.8
1940	2,558	1,461	19.3	11.0
1941	2,710	1,443	20.2	10.8
1942	3,003	1,434	22.2	10.6
1943	3,127	1,548	22.8	11.3
1944	2,969	1,580	21.4	11.4
1945	2,894	1,576	20.6	11.2
1946	3,442	1,413	24.2	9.9

^{a/} Adjusted for under-reporting and incompleteness of registration areas (1920-32). Includes deaths among armed forces overseas. Based on estimates of Thompson and Whelpton (in Population Trends in the United States) for 1920-30, extension of their method for 1931-34 for births and 1931-40 for deaths, and official census estimates for later periods. The corresponding numbers of deaths (and rates) excluding the armed forces overseas are: 1942 - 1,428 (10.6); 1943 - 1,513 (11.2); 1944 - 1,455 (10.9); 1945 - 1,408 (10.6); 1946 - 1,408 (10.0).

^{b/} Population base adjusted upward to allow for underenumeration of children in decennial censuses.

The annual number of deaths has been remarkably constant over the period since 1920, with a maximum of 1.58 million in 1944 and 1945, including deaths^{e/}, as compared with a minimum of 1.29 million in 1921. Excluding war deaths, the maximum number was 1.52 million in 1936, closely followed by 1943 (1.51 million); preliminary figures for 1947 indicate that the total number of deaths will be slightly above the 1.41 million deaths in 1945 and 1946. Under the influence of the increasing total population base, the crude death rate has decreased slowly since 1920 until at the present time it is only about 10 per 1000.

^{e/} Annual deaths were probably highest in 1918 as a result of the influenza epidemic. The number then was about 1.9 million.