ACTUARIAL NOTE

COMPARISON OF RECENT PROJECTIONS OF THE UNITED STATES POPULATION

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In this note are compared two different series of projections of the United States population that were published recently[1]. The first series, "United States Population Projections for OASDHI Cost Estimates", was published in December 1966 by the Office of the Actuary, Social Security Administration, as *Actuarial Study No. 62*. As its title indicates, it was intended for use as the basis for estimation of the long-range costs of the Old-Age, Survivors, Disability, and Hospital Insurance program. Only two independent projections (low-cost projection and high-cost projection) were prepared in this series, although an intermediate-cost projection, calculated as the average of the high-cost and low-cost projections, was also included.

The second series was published by the U.S. Bureau of the Census on February 20, 1967 in *Population Estimates, Series P-25, No. 359*, "Projections of the Population of the United States, by Age, Sex, and Color to 1990, With Extensions of Total Population to 2015". This series consist of four projections that differ only with respect to the fertility assumptions adopted in their preparation.

The comparison of the two series in this Note will be made from an actuarial point of view, or more specifically, from the point of view of the effect that the differences in the projected populations could have on the estimated costs of the OASDHI program.

Before proceeding with the comparison, it is advisable to consider first some conceptual differences of what is meant in each series by "the population of the United States". The

Bureau of the Census in its projections includes in this concept the population residing in the 50 States and the District of Columbia and also the Armed Forces abroad. The Social Security Administration projections include the preceding categories and, in addition, the residents of other geographic areas covered by the OASDHI program (Puerto Rico, Virgin Islands, American Samoa, and Guam) and also some U.S. citizens overseas who are not included in the Bureau of the Census projections. Another difference is that the SSA projections attempt to correct for net undercount in the latest census[2], while the Bureau of the Census does not include any adjustment of this nature.

The projections differ considerably in regard to the assumptions under which they were prepared. However, for both series (and for all projections within each series), the same net migration assumption was used—namely, that developed by the Bureau of the Census.

With respect to future mortality, the SSA projections are based on two different assumptions. For the high-cost projection, considerable decreases in mortality rates (by age and sex) were assumed, while for the low-cost projection, these decreases were assumed to be 50% lower. In its projections, the Bureau of the Census made a single assumption about future mortality. This assumption was based on the high mortality (low-cost) projections published by the Social Security Administration in its *Actuarial Study No. 46*.

Four different fertility assumptions (as to age-specific rates) were adopted by the Bureau of the Census. These range in decreasing order

from high fertility in Projection A to low fertility in Projection D. For the SSA projections, two different fertility assumptions were used. The high-fertility assumption was combined with the high-mortality assumption in the preparation of the low-cost population projection, while the low-fertility assumption was combined with the low-mortality assumption in the high-cost population projection. In general, as will be discussed later, the fertility assumptions used in the SSA projections are lower than those used in the Bureau of the Census projections.

A further, but minor, difference is the starting date of the projections. The SSA projections are based on the estimated population as of July 1, 1965. The Bureau of the Census used July 1, 1966 as its starting point.

From Table 1, it will be seen that the SSA projections are, at the start, about 3.8% higher than the Bureau of the Census projections. This excess in the SSA starting population is due to the differences discussed before in the geographic coverage and in the adjustment for net under-enumeration. For the low-cost projection, the excess becomes smaller with time when compared with Census Projections A and B, and eventually it is reversed. By the year 2015, the excess of Census Projections A and B over the SSA low-cost projection is about 22% and 9%, respectively.

For Census Projection C, the initial excess as compared with the SSA low-cost projection, increases slowly reaching about 5.7% in the year 2015. Such initial excess increases more rapidly for Census Projection D, and by the year 2015 it attains a value of about 22%.

A similar comparison between the SSA high-cost projection and the four projections prepared by the Bureau of the Census shows that more people are being projected by the Bureau of the Census in all its projections, except for Projections D, where the initial excess population shown by the SSA population increases slowly to about 7% in the year 2015.

In general, the projections of the total population made by the Bureau of the Census are higher than those prepared by SSA. This is due mainly to the higher fertility assumed by the Census.

Although the size of the total United States population is important for OASDHI cost estimates, especially for short-range estimates of contribution income and benefit expenditures, the long-range cost of the program is more strongly affected by the relative size of some age groups within the population. For example, the cost of the Hospital Insurance system is directly affected by the number of persons aged 65 and over in the population—or more precisely, by the relative size of the group of aged persons (potential beneficiaries) as compared to the group of young persons (potential contributors). For actuarial analysis, it is advisable to compare these two groups of persons in the projections.

A comparison is made in Table 2 of the population aged 65 and over. Only one set of figures is shown for the Bureau of the Census projections, since—due to the single mortality assumption adopted therein—all four projections show the same aged population for the period presented. It should be remembered that these projected aged populations are already born and are not affected by the fertility assumptions, and that the same migration assumption was used in all four Census projections. On the other hand, SSA projects two different aged populations, due to its two different mortality assumptions. As will be observed, SSA projects more persons aged 65 and over than the Bureau of the Census. The excess starts at 3.1% in 1965, due to the difference in geographic coverage and in under-enumeration allowance discussed previously, but increases to 4.4% for the low-cost projection and to 9.1% for the high-cost projection by the year 1990. The comparison is not made for later years because the Bureau of the Census has not yet published its projections by age groups beyond the year 1990.

The lower projection of the number of aged persons in the Census projections means that the cost estimates for OASDHI prepared recently by SSA would probably have been lower if they had been based on those population projections. However, since the costs are more precisely determined by the relative size of the aged

population as compared with the young population, it is important to compare also the projections of potential workers, as is done in Table 3. As before, only one set of figures is given for the Census projections, since every person aged 25 and over in 1990 was already born by 1966.

All the projections of the population aged 25–64 increase at about the same pace, although the increases in the SSA projections are slightly higher. This similarity in the increases for the young persons, when coupled with the higher projection for the aged population in the SSA projections, proves that the cost estimates for HI would have been lower if they had been based on the Bureau of the Census projections.

For OASDI, the same observation could probably be made, but since the long-range costs are estimated over a 75-year period, it would be necessary to analyze the projections for a period longer than the next 25 years. A direct comparison is not possible at this moment, because the Bureau of the Census has not yet published its projections of population by age groups for years after 1990. However, an indirect comparison could be made if we observe that the Bureau of the Census assumption of higher mortality has a very limited effect on the young population and a strong effect on the aged population. In addition, we could take into consideration the fact that the Bureau of the Census assumes higher future fertility than SSA. Specifically, the SSA projections were prepared on the assumption that total fertility[3]

per 1,000 females would decrease from the calendar year 1965 level of 2,928 to ultimate levels of 2,800 in the low-cost projection and 2,300 in the high-cost projection. The ultimate levels assumed by the Bureau of the Census are 3,350 in Projection A, 3,100 in Projection B, 2,775 in Projection C, and 2,450 in Projection D. This means that, in general, there are more young persons in the Census projections than in the SSA projections and that, therefore, they would produce a lower OASDI long-range cost.

Table 4 presents a comparison of the extremely important projected ratio of persons aged 65 and over to persons aged 25–64. The ratio is, in general, lower in the Census projections than in the SSA projections. It should also be observed that, based on this elementary demographic factor and aside from other demographic factors and economic assumptions that are necessary for an accurate cost estimate, the OASDI year-by-year cost relative to taxable payroll should be expected to decrease some time before the turn of the century. This period of low cost should last for about 25 years, after which a period of higher cost should be expected. We could conclude that the 75 years over which long-range cost estimates for OASDI are prepared can be divided population-wise into three roughly equal periods of 25 years. The first period is characterized by slighly increasing costs relative to taxable payroll. The second period is one of decreasing cost (or relatively lower costs), and the third period is one of rapidly-increasing or high costs.

Table 1

Comparison of Projections of Total Population
(in thousands)

Year	SSA Projections Low-Cost	SSA Projections High-Cost	Bureau of the Census Projections A	B	C	D
1965	202,059	202,059	194,583	194,583	194,583	194,583
1970	214,196	213,853	208,615	207,326	206,039	204,923
1975	229,101	227,372	227,929	223,785	219,366	215,367
1980	246,215	242,111	250,489	243,291	235,212	227,665
1985	264,710	257,388	274,748	264,607	252,871	241,731
1990	283,510	272,250	300,131	286,501	270,770	255,967
1995	302,743	286,650	328,536	309,830	288,763	269,485
2000	323,438	301,251	361,424	335,977	307,803	282,642
2005	345,846	316,204	398,407	365,254	328,679	296,420
2010	369,761	331,202	437,851	396,012	349,947	309,661
2015	394,715	345,992	482,074	430,197	373,502	324,487

[1]A third series of projections, not discussed here, were prepared by the Scripps Foundation and published in 1966 in the book, *Fertility and Family Planning in the United States,* by Whelpton, Campbell, and Patterson, but those projections were mainly intended to be realistic examples of the possible use of the data from the Growth of American Families surveys.

Table 2

Comparison of Projections of Total Population Aged 65 and Over
(in thousands)

Year	SSA Projections Low-Cost	SSA Projections High-Cost	Census Projection	Percent Excess SSA/Census Low-Cost	High-Cost
1965	18,711	18,711	18,156	3.1%	3.1%
1970	20,296	20,405	19,585	3.6	4.2
1975	22,016	22,304	21,159	4.0	5.4
1980	24,044	24,585	23,063	4.3	6.6
1985	26,051	26,921	24,977	4.3	7.8
1990	28,185	29,458	27,005	4.4	9.1

[2]In the preparation of the projections published in *Actuarial Study No. 62,* it was assumed that there was a net undercount in the 1960 Census of 2.7% for males and 1.7% for females. These percentages were assumed to apply uniformly at all ages.

Table 3

Comparison of Projections of Total Population Aged 25–64
(in thousands)

Year	SSA Projections		Census Projection	Percent Excess SSA/Census	
	Low-Cost	High-Cost		Low-Cost	High-Cost
1965	88,974	88,974	85,800	3.7%	3.7%
1970	93,541	93,618	90,093	3.8	3.9
1975	101,068	101,254	97,245	3.9	4.2
1980	109,884	110,208	105,552	4.1	4.4
1985	119,910	120,398	115,024	4.2	4.7
1990	128,910	129,576	123,883	4.1	4.6

[3]Total fertility is defined as the total number of live births that 1,000 women would have at the end of their child-bearing period if they were subject during that period to the age-specific fertility rates assumed.

Table 4

Comparison of Projected Ratios of Total Population Aged 65 and Over to Total Population Aged 25–64

Number of Persons Aged 65 and Over Per 1,000 Persons Aged 25–64

Year	SSA Projections		Bureau of the Census Projection
	Low-Cost	High-Cost	
1965	210	210	212
1970	217	218	217
1975	218	220	218
1980	219	223	218
1985	217	224	217
1990	219	227	218
1995	215	227	[1]
2000	199	215	[1]
2005	184	204	[1]
2010	181	206	[1]
2015	194	226	[1]
2020	212	253	[1]
2025	228	281	[1]
2030	231	296	[1]
2035	221	291	[1]
2040	218	291	[1]
2045	221	295	[1]
2050	226	300	[1]

[1]Not available.