ACTUARIAL NOTE

ANALYSIS OF THE FERTILITY ASSUMPTIONS
FOR THE OASDI LONG-RANGE LEVEL-COST ESTIMATES

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Last January, the Office of the Actuary re-leased a new set of long-range cost estimates showing the OASDI system to be overfinanced by .74% of taxable payroll on a level-cost basis[1]. Part of the improvement in the financial situation of the program over previous estimates is due to the fact that the fertility rates assumed in the estimation procedure had been *increased* to more realistic values.

Since fertility in the United States has been decreasing rapidly in the last 8 to 9 years, the use of higher fertility assumptions could be viewed, at first sight, as a factor of over-optimism in the cost estimates. However, this first impression is not correct. The following analysis in this note demonstrates the assump-tions to be reasonable--or perhaps slightly on the conservative side, which is a proper practice in regard to developing future cost factors that are difficult to predict.

Before analyzing the fertility assumptions in the new cost estimates, it would be con-venient to discuss briefly some actuarial prin-ciples involved in the estimation of the cost of the OASDI system. As will be seen shortly, a large portion of the underlying reason for the change in fertility assumptions was due to changes in the financing principles of the system.

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[1] See *Actuarial Study No. 63* — "Long-Range Cost Estimates for Old-Age, Survivors, and Disability Insurance System, 1966".

[2] The "level-cost" concept has been used by Con-gress and by the Administration as the index of long-range cost of the OASDI system in the evalua-tion of its actuarial soundness.

Up to the year 1961, the OASDI cost esti-mates were prepared on the basis that the pro-gram would be financed over perpetuity--i.e., that for all intents and purposes, the system would be soundly financed into the long and indefinite future. In the actuarial techniques, it was assumed that the cost projections could be prepared up to the year 2050 and that for years thereafter the experience would be similar to that projected for this year. The leveling-off in the year 2050 of the projection, not only assisted in reducing the amount of calculations needed for the cost estimates, but also made possible the concept of "long-range level-cost into perpetuity". Under this actuarial concept, the cost experiences projected for all future years are grouped into a single value, which is referred to as "level-cost" and which is used as an index to judge the long-range actuarial soundness of the program[2].

One of the few disadvantages of the "level-cost" concept is that in the grouping of the yearly costs of the system too much weight may be assigned to years far in the future, if the projections contemplate ever-increasing taxable payrolls and benefit payments. In theory, there could even be cases in which the experience of the early years would not count very much be-cause of too strong and continuing increases in payrolls and benefits. Technically speaking, in order to have a long-range index of costs, it is necessary to assume that after a certain date everything levels off--or, even better, that the experience from a certain point far away in the future should not be taken into consideration.

The first of the two possible solutions--that is, a leveling-off in the experience--was used

for long-range cost estimates of the OASDI system prepared up to and including the 1961 Amendments. Then, according to the recommendations of the latest Advisory Council on Social Security Financing, the cost estimates began to be prepared on a 75-year financing basis[3]. This means that the second solution was adopted and that the experience after the 75th year in the future was not used to estimate the long-range cost of the OASDI system. After this change in financing principles, it is no longer necessary to force the leveling-off of various factors in the cost projections. Without this purely mathematical constraint, the estimates can be based on more realistic population assumptions. Previously, it was necessary to assume that the population would level off—that is, that fertility rates would be reached in the future such that the number of babies to be born would be only enough to replenish the deaths.

It could be said that the change in financing concept from the perpetuity basis to the 75-year basis has freed the actuary from a technical limitation and has allowed him in this way to adopt more realistic fertility assumptions.

Now, let us go back to the discussion of the reasonableness of the new fertility assumptions that have been made. First, it should be observed that projecting fertility is an extremely hazardous undertaking. It is not easy to predict what women will do in the future in regard to fertility. In this sense, we must define "reasonableness" in terms of what other experts would project.

In Table 1, a comparison is made of the total fertility rates projected in previous cost estimates and those used in the new projec-

tions[4]. By total fertility rate is meant the total number of children born to 1,000 women by the end of their child-bearing period if they experience the age-specific rates that are projected. It will be noted that for the low fertility assumptions the previous projection is lower than the new one. Both of them show a rapidly decreasing rate. However, the difference between them decreases up to 1985, and thereafter becomes more pronounced with time.

For the high fertility assumptions, the previous projection is higher in the early years than the new projection. The difference becomes smaller with time, until it is reversed in 1990. It should be observed that an ultimate value of 2,052 is projected under both high and low previous projections; this total fertility rate is the level necessary to produce a population that remains constant in total number of persons, if there is no migration and if females are assumed to survive to the end of their child-bearing period.[5] The new projections assume ultimate values of 2,300 (which can be regarded as a "very low" level) and 2,800 (which could be viewed as "moderately high" fertility).

In order to have a clearer comparison between the two series (previous and new) of fertility projections, an intermediate projection has been calculated for each one, as the average of the high and the low fertility assumptions (see Table 1). It will be noted that before 1990 the new projection on this intermediate basis is lower than the previous projection. This means that the new OASDI long-range cost estimates are based on lower fertility-rate assumptions for the next 20 years than was the case for the previous cost estimates. The first impression of the use of lower rates in the cost estimates, which was discussed at the begin-

[3]The OASDI long-range cost estimates for the 1961 Amendments were prepared on both a perpetuity basis and a 75-year basis. The two different estimates were published together so as to inform interested persons about the effect on the cost of the change in the financing basis. However, the 75-year basis was the guide used to evaluate the actuarial soundness of the amendments.

[4]The previous cost estimates were based on the population projections contained in *Actuarial Study No. 46*. That study was published in 1955. In its preparation, account was taken of the actual fertility

experience up to 1955. The new cost estimates are based on the population projections contained in *Actuarial Study No. 62*, for which the experience up to 1965 was taken into consideration. The fertility experience reached a peak early in this 10-year span and has been declining ever since.

[5]The total fertility rates needed for a constant population if females are assumed to experience the ultimate mortality projected in *Actuarial Study No. 46* would be 2,092 for low mortality and 2,113 for high mortality.

ning of this note, is therefore not correct with respect to the first two decades of projected operations of the system.

For years after 1990, the new projections are higher, as indicated by the intermediate fertility assumptions, than the previous projections. This is not due to our believing now in a trend toward higher fertility, but instead, as was discussed earlier, it is due to the unrealistic nature of the previous projections, which were required by the actuarial techniques used to be excessively low.

Table 2 presents a similar comparison on the basis of the "crude birth rate". This rate is defined as the annual number of births per 1,000 persons in the population. It should be indicated that the crude birth rate, although easily understood by most people, has some disadvantages. The principal one is that it compares the number of births to the entire population regardless of their age and sex. In its simple calculation are included all male persons and also those very young and those old females who are not within their child-bearing period. A high proportion in the population either of children or of middle-aged and older persons (persons aged 45 and over) tends to produce a low crude birth rate. This might erroneously be interpreted by some persons as an indication of a decrease in fertility.

The reverse situation can also occur, and in fact it is observable in most current population projections. In Table 2, for example, it will be noted that the crude birth rate increases in the early years under the new projections even though a rapid decline in fertility is being assumed. This phenomenon can be observed also in the Bureau of the Census projections contained in Table 5. This unusual movement is due principally to the fact that the babies born during the "baby boom" of the post-World War II period are now entering their child-bearing years, so that we should expect to have a sizable crop of new babies, even if the fertility rates decrease.

The projected annual numbers of births are presented in Table 3. It can be seen from this table, as well as from Table 2, that in the early years the new projections assume lower fertility than the previous projections.

Tables 4 and 5 compare the new fertility assumptions with those used by the Bureau of the Census in its latest population projections, which were published in February.[6] The total fertility rates assumed for the new OASDI cost estimates are, in general, lower than those assumed by the Bureau of the Census. The high-fertility rates, which are used for the lower cost estimate of the system, are somewhat below what could be regarded as "intermediate Census rates" (average of assumptions B and C). The low rates assumed for the high-cost projections start somewhere between the Census projections C and D, but then decline faster than the Census projections until becoming lower than the lowest values assumed by the Bureau of the Census.

As a final point, it should be indicated that the decline in fertility is not something that has been observed just recently. As will be observed from Table 6, the birth rates in the United States have been declining for almost 10 years. Any series of population projections prepared in the recent past would have had to take into consideration this experience. There is no question in the minds of demographers and population experts about this fact. The real question is about its implications in regard to future levels. No one knows when a leveling-off in the rate will start or what is the lowest level that fertility will reach.

We in the Social Security Administration have projected fertility rates that are somewhat lower than what we believe most demographers would project. We do not consider it to be prudent to assume fertility that would have a large probability of being too high. If this were done, the projected cost of the OASDI system would be unduly lowered, and we do not believe that it is advisable to be overly optimistic about the cost of the program.

The actual crude birth rates in the last few years have been decreasing very rapidly. The rate of 19.4 for 1965 was slightly above the range of values for 1965-70 used in the new

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[6] *Population Estimates, Series P-25, No. 359.*

cost estimates, while the rate of 18.5 for 1966 was slightly below such range (see Table 5). Thus, it cannot be said that the projections are far from the mark for 1965-66, although it is difficult to say what actual experience in 1967-69 will show.

Summarizing, we can say that the new cost estimates are based on fertility rates that are lower in the early years than those assumed in the previous cost estimates. This situation continues for about two decades before it is reversed. The reversal is due to the unrealistically low rates that were assumed in the previous projections in order to satisfy technical actuarial limitations. The rates assumed by the Bureau of the Census in its latest population projections are significantly higher than those assumed in our projections.

Table 1

COMPARISON OF PROJECTED TOTAL FERTILITY RATES
FOR OASDI LONG-RANGE COST ESTIMATES
(Rates per 1,000 women)

Calendar Year	Low Fertility Projection		High Fertility Projection		Intermediate Fertility Projection[1]	
	Previous	New	Previous	New	Previous	New
1970	2,538	2,683	3,309	2,832	2,924	2,758
1975	2,418	2,543	3,173	2,805	2,796	2,674
1980	2,361	2,450	3,047	2,800	2,704	2,625
1985	2,305	2,386	2,921	2,800	2,613	2,593
1990	2,249	2,345	2,795	2,800	2,522	2,572
1995	2,192	2,322	2,669	2,800	2,430	2,561
2000	2,136	2,309	2,543	2,800	2,340	2,504
Ultimate	2,052	2,300	2,052	2,800	2,052	2,500

[1] Computed as the average of the low projection and the high projection.

Note: The previous projections were presented in *Actuarial Study No. 46*, and the new projections are presented in *Actuarial Study No. 62*.

Table 2

COMPARISON OF PROJECTED CRUDE BIRTH RATES
FOR OASDI LONG-RANGE COST ESTIMATES
(Rates per 1,000 population)

Calendar Year	Low Fertility Projection		High Fertility Projection		Intermediate Fertility Projection[1]	
	Previous	New	Previous	New	Previous	New
1970	18.7	19.4	23.2	20.5	21.0	20.0
1975	18.6	19.9	23.4	21.8	21.0	20.8
1980	18.1	20.0	23.1	22.5	20.6	21.2
1985	17.1	19.2	22.3	21.9	19.7	20.6
1990	16.2	17.9	21.4	20.8	18.8	19.4
1995	15.6	17.2	20.6	20.6	18.1	18.9
2000	15.2	17.1	19.8	20.9	17.5	19.0
2005	14.7	17.0	18.8	21.1	16.8	19.0
2010	14.2	16.7	18.1	20.9	16.2	18.8
2015	13.9	16.3	17.6	20.5	15.8	18.4

[1] Calculated as the average of the low and high projections.

Note: The previous projections were presented in *Actuarial Study No. 46*, and the new projections are presented in *Actuarial Study No. 62*.

Table 3

COMPARISON OF PROJECTED AVERAGE ANNUAL NUMBER OF BIRTHS
FOR OASDI LONG-RANGE COST ESTIMATES
(in thousands)

Period	Low Fertility Projection		High Fertility Projection		Intermediate Fertility Projection[1]	
	Previous	New	Previous	New	Previous	New
1965-70	3,750	3,879	4,822	3,994	4,286	3,936
1970-75	3,937	4,334	5,289	4,689	4,613	4,512
1975-80	4,139	4,683	5,729	5,268	4,934	4,976
1980-85	4,148	4,887	6,013	5,672	5,080	5,280
1985-90	4,104	4,898	6,183	5,853	5,144	5,376
1990-95	4,093	4,901	6,342	6,067	5,218	5,484
1995-00	4,122	5,041	6,506	6,492	5,314	5,766
2000-05	4,140	5,255	6,619	7,021	5,380	6,138
2005-10	4,104	5,447	6,630	7,505	5,367	6,476
2010-15	4,128	5,583	6,789	7,911	5,458	6,747

[1] Calculated as the average of the low and high projections.

Note: The previous projections were presented in *Actuarial Study No. 46,* and the new projections are presented in *Actuarial Study No. 62.*

Table 4

COMPARISON OF PROJECTED TOTAL FERTILITY RATES
(Rates per 1,000 women)

Calendar Year	Social Security Adm.[1]		Bureau of the Census[2]			
	Low	High	A	B	C	D
1970	2,683	2,832	3,354	3,029	2,722	2,446
1975	2,543	2,805	3,458	3,111	2,715	2,343
1980	2,450	2,800	3,442	3,133	2,753	2,383
1985	2,386	2,800	3,400	3,129	2,781	2,435
1990	2,345	2,800	3,370	3,117	2,787	2,457
1995	2,322	2,800	3,356	3,107	2,781	2,456
2000	2,309	2,800	3,351	3,102	2,777	2,451
Ultimate	2,300	2,800	3,350	3,100	2,775	2,450

[1] Values presented in *Actuarial Study No. 62.*
[2] Values presented in *Series P-25, No. 359.* For 1970, 1980, 1985, and 1995, values are from unpublished data obtained from the Bureau of the Census.

Table 5

COMPARISON OF PROJECTED CRUDE BIRTH RATES
(Rates per 1,000 population)

Calendar Year	Social Security Adm.[1]		Bureau of the Census[2]			
	Low	High	A	B	C	D
1970	19.4	20.5	24.2	21.9	19.6	17.5
1975	19.9	21.8	26.3	24.0	21.1	18.3
1980	20.0	22.5	26.4	24.7	22.3	19.7
1985	19.2	21.9	25.0	23.7	21.9	20.0
1990	17.9	20.8	24.4	22.8	20.8	18.9
1995	17.2	20.6	25.2	22.9	20.3	17.9
2000	17.1	20.9	26.0	23.5	20.4	17.5

[1] Calculated from the values presented in *Actuarial Study No. 62.*
[2] Values for years up to and including 1990 are presented in *Series P-25, No. 359;* unpublished values for years after 1990 obtained from the Bureau of the Census.

Table 6

CRUDE BIRTH RATES IN THE UNITED STATES[1]
(Rates per 1,000 population)

Calendar Year	Crude Birth Rate
1955	24.6
1956	24.9
1957	25.0
1958	24.3
1959	24.0
1960	23.7
1961	23.3
1962	22.4
1963	21.7
1964	21.0
1965	19.4
1966	18.5

[1] The rates are for the resident population and are not adjusted for under-registration of births or for under-enumeration of population.