VALIDITY OF CENTENARIAN DATA IN THE 1960 CENSUS

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RESUMEN

Este trabajo examina el asunto de cuántos auténticos centenarios (personas que tienen más de 100 años) hay actualmente en los Estados Unidos, en comparación con aquellos informados en el censo. Se concluye que el número de centenarios mostrados en varios de los censos de los Estados Unidos, son afirmaciones definitivamente exageradas del número de los verdaderos centenarios. Parece ser probable que en vez de 10,326 centenarios informados en el censo de 1960, hubo solamente cerca de 3,700. Afirmaciones exageradas de edades, parece ser particularmente el caso entre aquellos que reclaman estar en la edad de 110 o más, y se cree que probablemente no hay ninguna persona que tenga actualmente esa edad.

El análisis se efectuó proyectando—a través del uso de factores de supervivencia en tablas de vida—la población reportada en varios grupos de edad avanzada en un censo al siguiente y entonces comparando los resultados con el número correspondiente reportado en el último censo para los mismos grupos de edad. En general, poblaciones enumeradas en edades bajo 95 son razonablemente cercanas a las poblaciones proyectadas, especialmente para las personas blancas. Por otro lado, en las edades de más de 95 años—especialmente para centenarios—las poblaciones enumeradas exceden significativamente las proyectadas.

Este trabajo también discute la situación de las personas centenarias en relación a los beneficios de la seguridad social y concluye que los datos actuales no pueden ser considerados sustancialmente exactos en cuanto a los genuinos centenarios, particularmente los más viejos. En el futuro los datos de las operaciones de este programa proveerán excelente datos, porque los individuos comprometidos habrán estado beneficiados por muchos años y habrán tenido sus edades comprobadas con precisión razonable.

SUMMARY

This paper examines the question of how many genuine centenarians there actually are in the United States as compared with those reported in the census. It is concluded that the numbers of centenarians shown in various United States censuses are definite overstatements of the number of true centenarians. It seems likely that instead of the 10,326 centenarians reported in the 1960 census there were at most only about 3,700. Overstatement of ages seems to be particularly the case among those who claim to be aged 110 or over, and it is believed that there probably are no persons who are actually this old.

The analysis has been made by projecting, through the use of population life table survival factors, the populations reported at various advanced age groups in one census to the next census and then comparing the results with the corresponding number reported in the latter census for the same age cohort. In general, the enumerated populations at ages below 95 are reasonably close to the projected populations, especially for white persons. On the other hand, at ages 95 and over—especially for centenarians—the enumerated populations significantly exceed the projected ones.

As a subsidiary part of the analysis, the paper points out the significant differences at the older ages between the "full count" age distribution in the 1960 census and the corresponding "inflated 25 per cent sample" one. This is a subject that bears further investigation and explanation.

The paper also discusses centenarians on the social security benefit rolls and concludes that the present data cannot be considered of substantial accuracy with regard to genuine centenarians, particularly the oldest ones. In a number of years, however, this program will provide excellent data, because the individuals involved will have been on the benefit rolls for many years and will have had their ages proved with reasonable accuracy.

The subject of centenarians is of great interest to most people. Extensive publicity is frequently given to many aspects of the life of these oldest members of our population, such as whether or not they smoke, whether or not they drink, their diet, and to what they attribute their longevity. This paper will consider the number of genuine centenarians in the United States in contrast with the number reported in the census. As a matter of fact, the faith of the general public in the census is such that any data on centenarians appearing there are generally taken as the "truth."

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CENTENARIANS REPORTED IN THE CENSUS

Table 1 shows the number of centenarians reported in each of the last four censuses (together with the proportions that are male and that are non-white), compared with the estimated numbers of true centenarians, derived as discussed later. In the 1960 census, more than 10,000 centenarians were reported, in sharp contrast with the level of about 4,000 in each of the previous three censuses. In all four censuses, only about 35 percent of the reported centenarians were male, which is not surprising in view of the well-known lower mortality of women at all ages. In the 1960 census, 27 percent of the reported centenarians were non-white, a much higher proportion than that for persons of all ages (about 10 percent) but a much lower level than prevailed in the preceding three censuses (over 50 percent).

Although it is not recognized by the general public, the number of centenarians in the last two censuses was not based on an actual count of the census returns but was an estimate obtained by inflating a sample. In both these censuses, the full count grouped persons aged 85 and over. The question may then be raised regarding the accuracy of the estimate from the inflated sample, compared to the actual data that would have been obtained from a complete enumeration of the alleged centenarians.

Table 2 compares the full count from

Table 1.—NUMBER OF CENTENARIANS AND SEX-RACE COMPOSITION REPORTED IN VARIOUS CENSUSES AND AS ESTIMATED

Census	Number of centenarians			Proportion of reported centenarians	
	Reported	Estimated [1]		Male Percent	Nonwhite Percent
		Number	Percent		
1930.....	3,964	400	(10)	35.4	66.0
1940.....	3,679	1,000	(27)	36.4	61.6
1950.....	4,475[2]	1,700	(38)	36.3	55.2
1960.....	10,326[3]	3,700	(36)	37.0	27.1

[1] Figures in parentheses are estimated number as percentage of reported number.

[2] Based on 20 percent sample, inflated to universe.

[3] Based on 25 percent sample, inflated to universe.

Table 2.—COMPARISON OF 1950 CENSUS FULL COUNT AND SAMPLE, BY AGE GROUPS FOR AGES 45 AND OVER

(In Thousands)

Age	Full count	20 percent sample	Excess of sample over full count	
			Absolute	Relative percent
45 - 49.....	9,070	8,997	- 73	- .8
50 - 54.....	8,272	8,175	- 97	-1.2
55 - 59.....	7,235	7,163	- 72	-1.0
60 - 64.....	6,059	6,011	- 48	- .8
65 - 69.....	5,003	4,998	- 5	- .1
70 - 74.....	3,412	3,407	- 5	- .1
75 - 84.....	3,278	3,275	- 3	- .1
85 and over....	577	577	0	.0
45 and over....	42,906	42,603	-303	- .7

the 1950 census with the estimate based on the inflated sample for age groups at age 45 and over. In general, there is a relatively close agreement between these two sets of figures, with the differences by five-year age groups generally being less than 1 percent; in fact, for the group aged 85 and over, there is exact correspondence.

On the other hand, when we make a similar comparison for the 1960 census in Table 3, an entirely different picture is presented. For the population aged 45 and over, the full count yields a total that is very close to that derived from the inflated sample, but within each of the age groups significant variations occur. For persons aged 65 and over, the full count shows about 350,000 more persons than the inflated sample, a relative difference of somewhat more than 2 per cent. Moreover, this differential increases steadily by age and is as much as 7 percent for persons aged 85 and over. It would thus appear that, if the full count had been tabulated so as to show the number of centenarians, there would have been about 10 per cent more than the reported figure based on the inflated sample.

As yet no explanation has been published by the Bureau of the Census of these increasing differentials by age between the full count and the inflated sam-

Table 3.—COMPARISON OF 1960 CENSUS FULL COUNT AND SAMPLE BY AGE GROUPS FOR AGES 45 AND OVER
(In Thousands)

Age	Full count	25 percent sample	Excess of sample over full count	
			Absolute	Relative percent
Total persons				
45 - 49.....	10,879	10,929	50	.5
50 - 54.....	9,606	9,697	91	.9
55 - 59.....	8,430	8,596	166	2.0
60 - 64.....	7,142	7,112	- 30	- .4
65 - 69.....	6,258	6,187	- 71	-1.1
70 - 74.....	4,739	4,661	- 78	-1.6
75 - 79.....	3,054	2,977	- 77	-2.5
80 - 84.....	1,580	1,518	- 62	-3.9
85 and over..	929	864	- 65	-7.0
45 and over..	52,617	52,541	- 76	- .1
65 and over..	16,560	16,207	-353	-2.1
Men				
45 - 49.....	5,358	5,375	17	.3
50 - 54.....	4,735	4,765	30	.6
55 - 59.....	4,127	4,185	58	1.4
60 - 64.....	3,409	3,384	- 25	- .7
65 - 69.....	2,931	2,883	- 48	-1.6
70 - 74.....	2,185	2,139	- 46	-2.1
75 - 79.....	1,359	1,318	- 41	-3.0
80 - 84.....	665	635	- 30	-4.5
85 and over..	362	333	- 29	-8.0
45 and over..	25,132	25,018	-114	- .5
65 and over..	7,502	7,308	-194	-2.6
Women				
45 - 49.....	5,522	5,554	32	.6
50 - 54.....	4,871	4,932	61	1.3
55 - 59.....	4,303	4,411	108	2.5
60 - 64.....	3,733	3,727	- 6	- .2
65 - 69.....	3,327	3,303	- 24	- .7
70 - 74.....	2,554	2,522	- 32	-1.3
75 - 79.....	1,694	1,659	- 35	-2.1
80 - 84.....	915	883	- 32	-3.5
85 and over..	567	530	- 37	-6.5
45 and over..	27,486	27,521	35	.1
65 and over..	9,057	8,897	-160	-1.8

ple. The differences might have occurred not only because of sampling variation but also because the full count and the sample were conducted on a two-stage basis, so that the latter was not a random sample of the information in the former but instead contained revised information.

Thus it can be stated that the number of centenarians reported in the 1960 census is by no means as definite and precise a figure as one might at first believe. Much depends upon whether this figure is derived from the full count or whether it is derived from the inflated sample.

ACCURACY OF AGE REPORTING OF CENTENARIANS

There remains the even more important question of whether the persons who report themselves to be centenarians really are this old.[1] Demographers are familiar with the story of persons at the oldest ages who become some fifteen years older between each decennial census.[2]

One analytical method of testing the accuracy of age reporting at the older ages is to project the population reported in one census to the next census by using appropriate mortality rates to derive survival proportions. The effect of immigration and emigration can be safely ignored for these age groups. One weakness of this approach is that, in part, the mortality rates used are dependent on the census information itself. This, however, is not a significant adverse criticism of the methodology, because the mortality rates in the population life tables are derived from the actual census data after appropriate graduation and adjustment, particularly at the very oldest ages, where the experience seems somewhat questionable (as will be discussed later). As a matter of fact, the mortality rates used at the oldest ages are derived from the experience of Civil War veterans who had been on the pension rolls for many years, so that reasonably reliable data were available.[3]

The populations at various quinquennial age groups in the 1930, 1940, and 1950 censuses were projected for ten years according to probabilities derived from the appropriate United States life tables and were compared with the population group ten years older in the next census. The mortality factors for a given decennial period were obtained by averaging the appropriate survival factor for the life table based on the initial year of the decennial period with the corresponding factor for the life table based on the final year of the period. For example, the probability of a person aged 70–74 in 1930 surviving to age 80–84 in 1940 was taken as the average of (*a*) the probability of survival for ten years for persons aged 70–74 according to the United States life tables for 1929–31 and (*b*) the corresponding probability for the United States life tables for 1939–41. It will be noted that mortality at these oldest ages did not vary greatly in the period 1930–60. This procedure should, therefore, produce reasonably good results.

Table 4 shows the ratios of the enumerated populations to the projected populations for the last three censuses by sex and race for the oldest age groups. In general, the enumerated populations at ages below 95 are reasonably close to the projected populations, especially for white persons. The "lower than 1" ratios for non-white persons at ages 75–94 for the 1950 and 1960 censuses can be attributed

[1] That this same problem exists in other countries may be seen from an analysis of the situation in the 1959 U.S.S.R. census in "Analysis of Mortality in the Soviet Union According to 1958–59 Life Tables," by Robert J. Myers, *Transactions of the Society of Actuaries*, Vol. XVI (1964).

[2] For an interesting anecdote about this escalation of age (and for other information on the general subject of centenarians), see Walter G. Bowerman, "Centenarians," *Transactions of the Actuarial Society of America*, XL (1939), 378.

[3] "Methods of Constructing the 1949–51 National, Divisional, and State Life Tables," *Vital Statistics: Special Reports*, XLI, No. 5 (July 31, 1959) (National Office of Vital Statistics, Public Health Service, U.S. Department of Health, Education, and Welfare), 158.

to understatement of the mortality rates of the life tables and to increasing overstatement of age from one census to the next. On the other hand, at ages 95 and over—especially for centenarians—the enumerated populations significantly exceed the projected ones. These differentials are far greater than could possibly arise from the use of higher mortality rates in the projections than was actually the case. In other words, there is clear evidence of significant overstatement of age by persons who report themselves at ages 95 and over.

Considering only centenarians, the ratio of the enumerated population to the projected population was about 1½ to 2 for white persons in the 1940 and 1950 censuses, while the 1960 census showed somewhat higher ratios. For non-white persons the ratios have always been considerably higher than for white persons, ranging from 5 to almost 12, with the ratios for the 1960 census being significantly higher than those for the previous two censuses.

The preceding analysis seems to make it quite clear that the numbers of centenarians shown in various United States censuses are definite overstatements of the number of true centenarians in the country. It seems likely that, on the basis of the projected data (which, if anything, is probably a high estimate), instead of the 10,326 centenarians reported in 1960 on the basis of the inflated sample data, there were actually at most only about 3,700 and that, instead of the approximately 2,800 non-white centenarians reported, there were only about 250 (see

Table 4.—RATIOS OF ENUMERATED TO PROJECTED POPULATIONS AT OLDER AGES IN VARIOUS CENSUSES

Age	White male	White female	Nonwhite male	Nonwhite female
1940 Census				
70 - 74.....	1.05	1.03	1.09	1.20
75 - 79.....	1.03	1.03	1.02	1.07
80 - 84.....	1.05	1.09	1.02	.99
85 - 89.....	1.07	1.13	1.23	1.08
90 - 94.....	1.02	1.12	1.34	1.09
95 - 99.....	1.20	1.24	2.13	1.72
100 and over	2.21	2.09	7.80	5.18
1950 Census				
70 - 74.....	1.03	1.04	1.17	1.22
75 - 79.....	1.02	1.02	.84	.78
80 - 84.....	1.06	1.08	.89	.88
85 - 89.....	1.07	1.13	.89	.92
90 - 94.....	1.07	1.15	.95	.95
95 - 99.....	1.38	1.36	1.81	1.99
100 and over	1.74	1.55	5.77	5.16
1960 Census				
70 - 74.....	1.08	1.06	1.28	1.34
75 - 79.....	1.02	.98	.94	.83
80 - 84.....	.99	.98	.83	.85
85 - 89.....	1.01	1.04	.85	.88
90 - 94.....	.95	1.05	.81	.89
95 - 99.....	1.10	1.33	2.25	1.92
100 and over	3.47	1.82	11.60	10.36

Note: See text for description of methodology for projected population and for sources of data.

Table 1). Similarly, the number of centenarians in the 1950 and 1940 censuses may be estimated by this method at about 1,700 and 1,000, respectively. An earlier study[4] estimated that the number of centenarians in the 1930 census was only about 400. There seems to be a clear indication that the accuracy of the reported centenarian data has been improving over the years, although there is still a wide margin of bias present.

MORTALITY RATES FROM RAW DATA UNDERLYING 1959–61 LIFE TABLES

The fact has been mentioned that the death rates derived from the raw data in producing the United States population life tables do not seem to be reliable at the very oldest ages, and so the experience for a closed group of Civil War veterans who had been under observation for many years was substituted. The ungraduated mortality rates for ages 80 and over underlying the United States life tables for 1959–61 are presented in Table 5. As would be expected, the mortality rates increase steadily and significantly with age for the first ages considered, but, for persons aged 100 and over (and for nonwhite males aged 95 and over), the mortality rates derived are actually lower than those for the preceding age group. This is, of course, unreasonable and seems to be further indication of overstatement of age among those at the very oldest ages in the census; apparently, there may be less of this overstatement on the death certificates.

[4] Robert J. Myers, "Errors and Bias in the Reporting of Ages in Census Data," *Transactions of the Actuarial Society of America*, XLI (1940), p. 399.

CENTENARIANS UNDER SOCIAL SECURITY

The Social Security Administration has interviewed more than 500 beneficiaries of the Old-Age, Survivors, and Disability Insurance system who were centenarians, according to their own statements at the time of filing claim.[5] These interviews were conducted to obtain information of general public interest rather than to attempt to verify the reported age. Among the almost 300 interviews published, there were certainly some genuine centenarians, because they had such good "evidence" as having graduated from a university in a certain year or some other valid base point for attesting age. On the other hand, many of the beneficiaries, although undoubtedly well beyond age 72 at the time of filing claim (and thus legally qualified for benefits without being subject to the earnings test), did not prove their exact ages by the statements that they gave. More than ten beneficiaries reported dates of birth that would have made them age 110 or over as of 1965 or as of the date of their death, if earlier. In none of these

[5] "America's Centenarians—Reports of Interviews with Social Security Beneficiaries Who Have Lived to 100" (Social Security Administration, U.S. Department of Health, Education, and Welfare [December, 1963]) gives an account of almost 300 of these interviews (in those cases where the beneficiary granted permission for it to be published).

Table 5.—COMPARISON OF UNGRADUATED MORTALITY RATES[1] AT OLDER AGES UNDERLYING THE UNITED STATES LIFE TABLES FOR 1959–61

Age	White male	White female	Nonwhite male	Nonwhite female
80 - 84.....	134	105	106	84
85 - 89.....	193	164	131	106
90 - 94.....	293	269	196	164
95 - 99.....	358	336	169	180
100 and over	145	198	160	170

1/ Annual death rate per thousand for persons in specified age group.

cases was there any real and convincing proof of such advanced age—merely statements correlating their age with some childhood memory, such as being a certain age at the time of entry into the United States or at the time of some historic event of the Civil War period.

In the next few years it will be possible to make some meaningful analyses of centenarians among social security beneficiaries, because many of them will have been on the roll since 1940, the first year that benefits were payable. As it happens, many of the present "centenarian" beneficiaries came on the rolls during the 1950's, when agricultural and domestic workers and the self-employed were first covered; these categories include many relatively uneducated persons who might be prone to exaggerate their ages. However, when we consider persons who were at least age 65 in 1940 and with whom there has been constant contact ever since, we can be certain that they are at least 90 years old now, since their original age at entry on the roll was proved with reasonable accuracy.