

ANALYSIS OF MORTALITY IN THE SOVIET UNION
ACCORDING TO 1958-59 LIFE TABLES

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MORTALITY is one of the elements of comparison between the Soviet Union and the United States. The Soviet Union has frequently placed great emphasis on its relatively low crude death rate (number of deaths in a year divided by total population). For instance, the first report on the 1959 Census of the Soviet Union stated that its death rate is the lowest in the world [1]. As is well known to students of the subject, comparison of crude death rates between different countries is frequently meaningless because of differences in age-sex distribution.

Previous analyses of Soviet mortality were subject to a number of difficulties and inadequacies because the data available were by no means complete, and numerous adjustments had to be made in order to obtain some degree of comparability [2, 3]. Now, however, as part of the releases of the 1959 Soviet Census, there have been made available complete life tables based on this census and on deaths in 1958-59.

The summary volume (for the entire U.S.S.R.) of the All-Union Population Census of 1959 gives nine complete life tables with values for single ages from 0 through 100—separately for total persons, males and females, crossed with total country, urban, and rural—along with a brief explanation of the sources of the data, the methodology, and analysis of the results and comparisons with both the past in the Soviet Union and with other countries [4].¹

This paper will describe briefly the method of preparation of these Soviet life tables. Then they will be analyzed, particularly as they compare with tables for the same period for the United States and for a recent period for Norway, which is a neighbor of the Soviet Union and which has about the lowest mortality of any country in the world. In this connection, it is interesting to note that current mortality in the United States is, in the aggregate (after standardization for differences in age distribution), at almost exactly the same level as currently prevails in England, France, and West Germany; this is not true age by age, since the United States tends to have lower mortality at the very youngest ages and at the oldest

¹ The author of this paper has prepared a summarized "free translation" of the textual material; this, along with copies of the complete life tables, is available in limited quantities upon request.

ages and, conversely, higher mortality at the other ages, generally between ages 10 and 70 [5].

Analysis of these Soviet life tables, along somewhat different lines, has been made in a French periodical [6].

CONSTRUCTION OF SOVIET LIFE TABLES

Basically, the life tables were computed from the census of January 15, 1959, and the deaths during 1958–59. In addition, data on births during 1955–59 were utilized in developing mortality rates at the youngest ages. In general, the procedures followed were similar to those used in other countries. Recognition was given to the customary “heaping” at ages ending in 0 and 5, and to some extent in 2 and 8, by graduating the data through the use of the so-called gliding parabola method of Professor B. S. Yastremsky. It is interesting to note that these life tables and their functions use the standard international actuarial notation.

On the whole, the methodology followed seems to be reasonable, but there is the point that it assumes that the basic data are accurate (other than for minor fluctuations due to heaping). There appears to have been no attempt to determine whether the data as a whole were accurately reported by age or whether there was reasonably complete reporting of deaths and census enumeration. Considerable data on age structure in the census have been published (although relatively little by single years of age), but no detailed data on deaths are available to the foreign analyst.

ANALYSIS OF DATA FROM LIFE TABLES

The following analysis of the Soviet mortality data in the 1958–59 life tables will be devoted entirely to the tables for the entire country. There are significant urban-rural differentials—lower mortality in the urban areas at the younger ages, about the same at the middle ages, and higher at the older ages. Moreover, there is the question of comparability in considering total mortality as between the Soviet Union and other countries because of differences in concept of “urban” and “rural.”

Just as in the case of other countries, mortality in the Soviet Union has improved greatly in the past half-century, although adequate data for comparison with earlier periods are available only for the European portions of the country. As a matter of fact, the decline in mortality rates has probably been greater for the Soviet Union than for many other economically developed countries because of the very high level that prevailed there in the past. Accordingly, the most pertinent analysis is probably in regard to the current level in comparison with other countries.

Table 1 presents data on the expectation of life at various ages for the

Soviet Union, the United States, and Norway based on life tables closely corresponding to the 1958-59 period of the Soviet life tables. The published data show that the expectation of life at birth in the United States is slightly higher than in the Soviet Union for both males and females; but, with advancing age, the expectation of life in the Soviet Union tends to be higher than that in the United States; and, at age 65, there is approximately an 8 per cent differential in favor of the Soviet Union for both men and women.

TABLE 1
COMPARISON OF EXPECTATIONS OF LIFE IN U.S.S.R.,
UNITED STATES, AND NORWAY

AGE	EXPECTATION OF LIFE (YEARS)			AS PERCENTAGE OF COL. (1)	
	U.S.S.R. (1)	U.S. (2)	Norway (3)	Col. (2) (4)	Col. (3) (5)
	Males				
0.....	64.42	66.5	71.11	103%	110%
20.....	49.53	49.5	54.11	100	109
65.....	14.01	12.7	14.86	91	106
	Females				
0.....	71.68	73.0	74.70	102%	104%
20.....	56.37	55.4	56.96	98	101
65.....	16.79	15.5	15.54	92	93

Sources of data: U.S.S.R.—*Life Tables for 1958-59* (Central Statistical Bureau); United States—*Abridged Life Tables for Total Persons, 1959* (National Office of Vital Statistics, Department of Health, Education, and Welfare); Norway—*Life Tables for 1951-55* (Central Bureau of Statistics).

When the expectation of life in the Soviet Union is compared with that in Norway, the latter shows a significantly higher expectation at age 0, with this differential gradually decreasing with advancing age. Unlike the similar comparison with the United States, the differential for men continues to be in favor of Norway even at age 65 (by 6 per cent), but for women the reverse is the case, with the expectation of life at age 65 being 7 per cent lower for Norway.

A more significant comparison of mortality between these countries is made by considering probabilities of dying between certain ages, and these data are shown for males in Table 2 and for females in Table 3. For

males, mortality in the United States is lower than that in the Soviet Union up to age 50—by differentials of as much as 50 per cent at the youngest childhood ages and by 25–40 per cent at the young adult ages. After age 50, male mortality in the United States is shown to exceed that in the Soviet Union by differentials increasing to as much as 15–20 per cent at ages 65 and over.

Comparison of female mortality between the Soviet Union and the United States presents the same general picture as for males. At ages under 25, female mortality in the United States is about half (or less) that of the Soviet Union, while at the younger adult ages the differential is about 25–40 per cent. Following age 45, female mortality in the United States is shown to be higher than that of the Soviet Union, with the differential being about 15 per cent at most ages.

TABLE 2
COMPARISON OF PROBABILITIES OF DEATH FOR MALES
IN U.S.S.R., UNITED STATES, AND NORWAY

AGE INTERVAL	PROBABILITY OF DYING BETWEEN BEGINNING OF INTERVAL TO END			AS PERCENTAGE OF COL. (1)	
	U.S.S.R. (1)	U.S. (2)	Norway (3)	Col. (2) (4)	Col. (3) (5)
0-1	0.0442	0.0296	0.0253	67%	57%
1-5 . . . . .	.0162	.0045	.0063	28	39
5-10 . . . . .	.0064	.0028	.0038	44	59
10-15 . . . . .	.0049	.0029	.0030	59	61
15-20 . . . . .	.0078	.0065	.0050	83	64
20-25 . . . . .	.0116	.0088	.0070	76	60
25-30 . . . . .	.0145	.0085	.0070	59	48
30-35 . . . . .	.0177	.0103	.0081	58	46
35-40 . . . . .	.0219	.0143	.0101	65	46
40-45 . . . . .	.0286	.0229	.0134	80	47
45-50 . . . . .	.0387	.0368	.0210	95	54
50-55 . . . . .	.0576	.0606	.0339	105	59
55-60 . . . . .	.0856	.0899	.0518	105	61
60-65 . . . . .	.1209	.1301	.0783	108	65
65-70 . . . . .	.1660	.1973	.1242	119	75
70-75 . . . . .	.2316	.2732	.1927	118	83
75-80 . . . . .	.3195	.3538	.2994	111	94
80-85 . . . . .	.4350	0.4937	.4451	113	102
85-90 . . . . .	.5553	*	.6192	*	112
90-95	0.6644	*	0.7790	*	117

* Detailed data beyond age 85 are not available for United States table.

Sources of data: U.S.S.R.—*Life Tables for 1958-59* (Central Statistical Bureau); United States—*Abridged Life Tables for Total Persons, 1959* (National Office of Vital Statistics, Department of Health, Education, and Welfare); Norway—*Life Tables for 1951-55* (Central Bureau of Statistics).

Comparison of mortality in the Soviet Union with the relatively low experience of Norway produces some rather unusual results. For males up to about age 60, Norwegian male mortality is generally 40–50 per cent lower than in the Soviet Union, but at the older ages this differential gradually decreases until, for ages 80 and over, it is significantly reversed. Likewise, Norwegian female mortality is about 40–50 per cent lower than that of the Soviet Union up to age 40, with the differential gradually decreasing thereafter until at ages 70 and over Soviet mortality is shown to be lower—by as much as 25–30 per cent at ages over 85.

The foregoing analysis raises some serious questions as to the accuracy and validity of the Soviet life tables at the older ages. In the extreme case of a woman aged 90, it does not seem possible that the probability of survival for five years should be as high as 0.41, when the corresponding fig-

TABLE 3
COMPARISON OF PROBABILITIES OF DEATH FOR FEMALES
IN U.S.S.R., UNITED STATES, AND NORWAY

AGE INTERVAL	PROBABILITY OF DYING BETWEEN BEGINNING OF INTERVAL TO END			AS PERCENTAGE OF COL. (1)	
	U.S.S.R. (1)	U.S. (2)	Norway (3)	Col. (2) (4)	Col. (3) (5)
0-1	0.0368	0.0231	0.0199	63%	54%
1-5 . . . . .	.0156	.0038	.0048	24	31
5-10 . . . . .	.0048	.0020	.0022	42	46
10-15 . . . . .	.0035	.0016	.0017	46	49
15-20 . . . . .	.0047	.0027	.0022	57	47
20-25 . . . . .	.0063	.0035	.0027	56	43
25-30 . . . . .	.0072	.0044	.0040	61	56
30-35 . . . . .	.0086	.0063	.0048	73	56
35-40 . . . . .	.0109	.0089	.0066	82	61
40-45 . . . . .	.0143	.0136	.0094	95	66
45-50 . . . . .	.0187	.0203	.0144	109	77
50-55 . . . . .	.0271	.0308	.0222	114	82
55-60 . . . . .	.0397	.0463	.0350	117	88
60-65 . . . . .	.0605	.0695	.0555	115	92
65-70 . . . . .	.0994	.1157	.0925	116	93
70-75 . . . . .	.1613	.1797	.1622	111	101
75-80 . . . . .	.2516	.2596	.2707	103	108
80-85 . . . . .	.3730	0.4179	.4262	112	114
85-90 . . . . .	.4877	*	.6048	*	124
90-95	0.5852	*	0.7748	*	132

* Detailed data beyond age 85 are not available for United States table.

Sources of data: U.S.S.R.—*Life Tables for 1958-59* (Central Statistical Bureau); United States—*Abridged Life Tables for Total Persons, 1959* (National Office of Vital Statistics, Department of Health, Education, and Welfare); Norway—*Life Tables for 1951-55* (Central Bureau of Statistics).

ure for Norway is only 0.23 (and that for the United States for the 1949–51 Total Female Life Table—the latest one giving detailed data for the extreme ages—is only 0.26). Quite obviously, if for one reason or another the mortality rates at the older ages are understated, then the expectations of life shown at all ages would be overstated. Although, pending a detailed study of reporting procedures and possible errors arising therein, it is not possible to state categorically that the Soviet mortality rates at the older ages are understated; nevertheless, it seems very likely to be so from the evidence on hand. Certainly, at ages over 70, it seems most unlikely that the Soviet Union would have so much better mortality than Norway.

It could be argued that the relatively low mortality in the Soviet Union at ages 45 and over represents the experience of a select group with regard

TABLE 4
PERCENTAGE DISTRIBUTION OF POPULATION AGED 70
AND OVER, BY AGE, U.S.S.R. AND
UNITED STATES CENSUSES

Age	U.S.S.R.	United States
60–69	59.55%	57.02%
70–79	31.30	32.76
80–89	8.01	9.29
90–99	1.03	0.88
100 and over	0.110	0.044
60 and over	100.00%	100.00%

to mortality who survived the great hardships of World War II. It seems doubtful, however, that this could be the entire explanation of the very low mortality reported at the older ages in the Soviet Union. Instead, a large part of the difference appears to be due to misreporting of age—both in the death registrations and in the census. Such are the circumstances under which the mortality rate attributed to a specific older age would really be applicable to a lower age.

INDICATIONS AS TO MORTALITY ACCORDING TO CENSUS DATA

Some further analysis of the relatively low mortality at the older ages shown in the Soviet life tables can be made from data from the 1959 Soviet census. Table 4 shows the percentage distribution of the population aged 60 and over according to the Soviet census as compared with the corresponding figures for the 1960 United States census.

The age distribution of the Soviet population is somewhat younger than

that of the United States, the median ages of the total population being 26.6 and 29.5, respectively. Accordingly, it would be expected that the percentage distribution of the population aged 60 and over would show relatively higher proportions at the younger ages thereof for the Soviet Union as compared with the United States and vice versa. This is the case except for the two highest age groups, for which, strangely enough, the situation is reversed. In fact, for ages 100 and over, the proportion for the Soviet Union is about two and a half times that for the United States (despite the fact that the figure for the United States is probably too high because of misrepresentation of age by alleged centenarians).

Digressing for a moment, it may be of some interest to examine the matter of the enumerated centenarians in the Soviet census. The reported

TABLE 5
PERCENTAGE DISTRIBUTION OF CENTENARIANS
REPORTED IN U.S.S.R. CENSUS, BY AGE

Age	Distribution
100-104.	60%
105-9.	19
110-14.	6
115-19.	2
120 and over.	3
Not known exactly, but 100 or over.	10
100 and over.	100%

number aged 100 and over was 21,708, and it has been stated with respect to this category that there was documentary verification of age in all cases, which eliminated some 6,307 other persons who had claimed to be centenarians [7]. These 21,708 centenarians are twice the 10,326 centenarians reported in the 1960 United States census (although the total Soviet population was only about 15 per cent larger).

The age distribution of the centenarians reported in the Soviet census is also very interesting, as shown by Table 5. At least 30 per cent of the Soviet centenarians were reported at ages 105 or above, whereas in the United States Total Population Life Table for 1949-51, the corresponding figure is only 5 per cent. Moreover, based on an estimate of the stationary population from the Soviet life tables for ages 100 and over,² the proportion of the centenarians therein who are aged 105 or over is only about 20

² The author of this paper has extended the Soviet life table for the total population by projecting the q 's beyond age 100—based on the trend up to this age, which showed essentially constant second differences—in such a manner that T_{100} was exactly duplicated.

per cent. Of course, the proportion would be expected to be lower in a population that is not yet mature (i.e., whose age distribution is significantly younger than that of a life table population).

Perhaps the most meaningful analysis of the Soviet census data can be made by considering the reported population in age groups at 60 and over, by sex, relative to life table populations adjusted so that they show the same total population aged 60 and over as in the census. This has been done in Table 6, using for the adjusted life table population both the Soviet 1958-59 life tables and the United States 1949-51 life tables (the latest official complete life tables giving values for all single years of age).

Normally, it would be expected that, in a population which has not reached a mature condition, the ratio of the actual population to the adjusted life table population would be a decreasing one with age. Of

TABLE 6
POPULATION AGED 60 AND OVER IN 1959 U.S.S.R. CENSUS AS
COMPARED WITH LIFE TABLE DISTRIBUTIONS BY AGE

AGE	POPULATION AS REPORTED IN CENSUS (1)	ADJUSTED LIFE TABLE POPULATION*		COL. (1) AS PERCENTAGE OF	
		U.S.S.R. Life Table, 1958-59 (2)	U.S. Life Table, 1949-51 (3)	Col. (2) (4)	Col. (3) (5)
Males					
60-69.....	4,098,922	3,413,014	3,638,866	120%	113%
70-79.....	2,020,519	2,190,815	2,180,230	92	93
80-89.....	464,794	875,653	738,219	53	63
90-99.....	49,940	151,813	80,913	33	62
100 and over.....	5,432	8,312	1,379	65	394
60 and over..	6,639,607	6,639,607	6,639,607	100%	100%
Females					
60-69.....	7,637,323	5,914,103	6,436,119	129%	119%
70-79.....	4,147,503	4,449,661	4,506,925	93	92
80-89.....	1,113,679	2,147,590	1,860,660	52	60
90-99.....	153,146	503,965	259,211	30	59
100 and over.....	16,276	52,608	5,012	31	325
60 and over..	13,067,927	13,067,927	13,067,927	100%	100%

* Life table population at ages 60 and adjusted to total the same number as in the census at ages 60 and over.

course, since the life table is constructed with the age data reported for the actual population being used as a basis, its functions are accordingly affected by distortions in the underlying data. As a result, some of the differences being investigated will be masked. When the actual Soviet population, according to the census, is compared with the adjusted life table population based on the Soviet life tables, the ratio decreases as anticipated except that for those aged 100 and over, the ratio turns up, which is clear indication of overrepresentation of centenarians. When the comparison is made with a life table based on another population—and the use of the life table of some country other than the United States would not make any significant difference—the picture is changed; there is definite indication of overrepresentation, not only for centenarians (and extremely so for this category), but also for those aged 90–99.

In summary, then, this method of considering population data for the oldest ages for the Soviet Union has given further indication that many persons have apparently overstated their ages—and thus mortality rates at these ages are likely to be understated. The proof, however, is not completely conclusive but rather indicative on the basis of the limited data available. Understatement of mortality rates at the older ages has a significant effect on the reported expectations of life, both at the oldest ages and also, to a lesser extent, at the younger ages.

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