Increase in Mortality of Middle-Aged Males in Japan

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C O N T E N T S

T A B L E S

F I G U R E S

A B S T R A C T ─────────────────────────────

Using the recent experience of Japan, this paper examines the mortality of middle-aged men. Based on vital statistics from the Ministry of Health and Welfare, the discussion focuses both on the transition of mortality for each age group and on the causes of death. Finally, the importance of malnutrition as a cause in the rise of deaths in middle-aged males in Japan is considered.

I. Introduction

This paper examines two hypotheses: that there has been a rise in the death rates of middle-aged Japanese males between 1950 and 1976 and that recent death rates of Japanese middle-aged males have been higher than those of French middle-aged males and U.S.A. Caucasian middle-aged males. Dr. Toshio Kuroda may have been the first that has hinted the possible existence of a definite increase in the death rates of middle-aged Japanese males in the last five years. At his suggestion this study was undertaken.

To test the first hypothesis, we calculate the single-year mortality rates among Japanese between the ages of 35 and 55. The data for males and females are analyzed separately. We chart the transition in death rates for each age group between 35 and 55, analyzing the middle years by year and sex. To test the second hypothesis, we compare the death rates of males in each age group in Japan with those of the same age groups in France and in the U.S.A. (Caucasians only). Finally, we examine the causes of death among Japanese males and females, age 35-55.

The analysis reveals a definite increase in the death rate of middle-aged males in Japan today, as compared with 25 years ago. Death rates among males are much higher than those of females. The charting of the various causes of death indicates that cirrhosis of the liver, diabetes mellitus, and subarachnoid hemorrhage are responsible for the absolute increase in the death rates among this age group of males. Cerebral hemorrhage, ischaemic heart disease (constriction of blood vessels), and stomach ulcers are also responsible for increases, but to a lesser degree.

II. Shifts in Curve of the Number of Deaths for Each Age Group

Figure 1 shows the curves of the number of deaths for each age group. The number of deaths are shown vertically by logarithm, emphasizing the 1930 Cohort and the 1920 Cohort. It is also clear by the number of deaths that the 1930 Cohort forms the peak and the 1920 Cohort the bottom of the middle-aged increase which started to appear in 1970. The peak is noticeable only when curves for individual years are shown simultaneously and can not be noticed from one curve alone.

Figure 1. Changes in Mortality: Absolute Increase in Age-
Specific Number of Deaths, by Sex, for Japan, 1950-1976
(The number of deaths is shown logarithmically. The
basic line of the logarithm diagram for each year is
marked on the left side and the year line is marked
on the right side.)
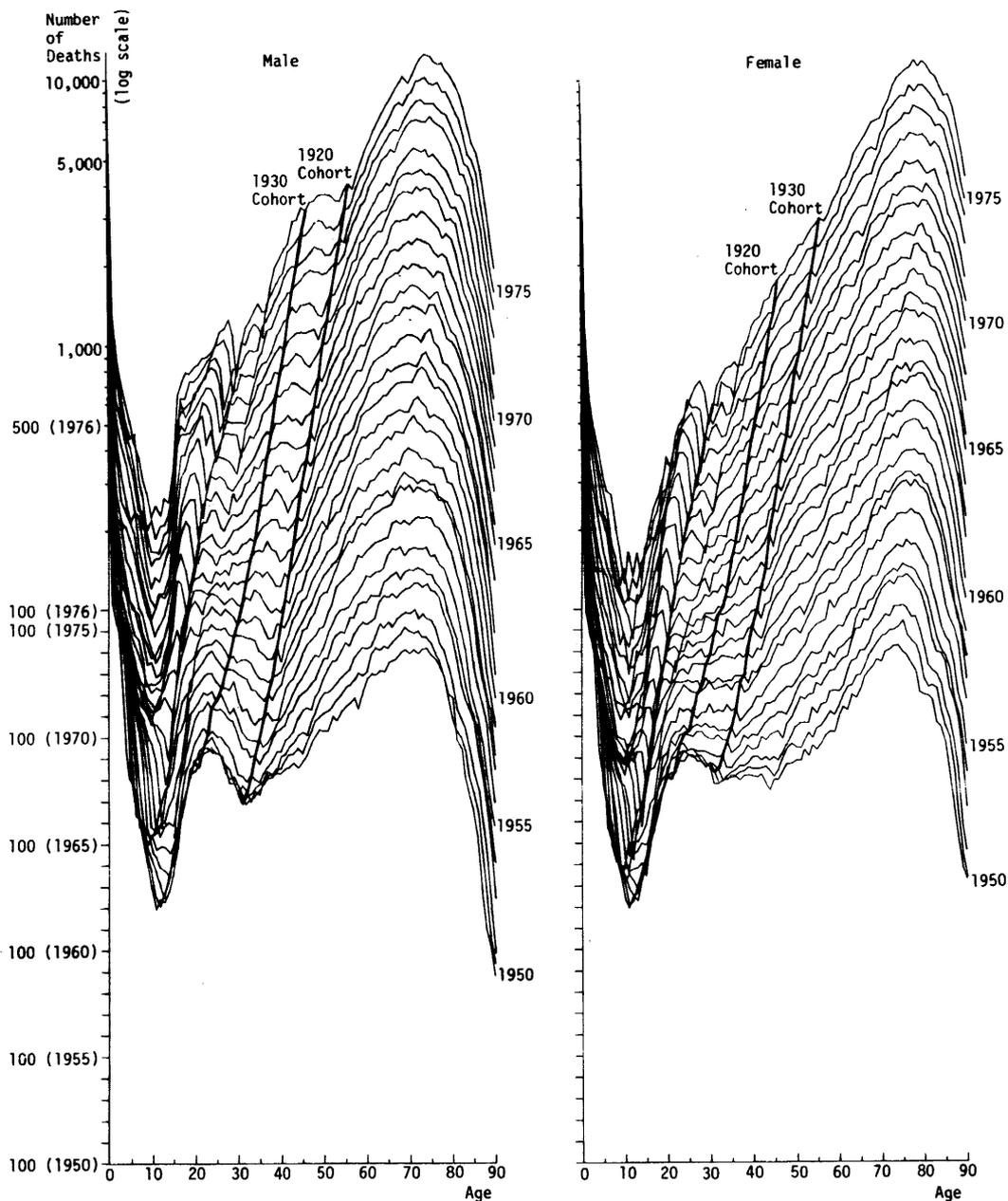
III. Annual Changes in the Number of Deaths for the Middle-Aged

Figure 2 shows the transition of the number of deaths for the middle-age group. The number of deaths is illustrated on the vertical axis per 1000. Comparing the differences between 1970 and 1976, one sees that the number of deaths of those age 40 has an apparent increase, whereas that of those age 35 and those around age 55 has decreased. The number of deaths of the middle-aged show an absolute increase.

Table 1 shows the actual number of deaths in figures. Comparing 1970 and 1976, the number of deaths between ages 35 and 42 shows a decrease, those aged 43 through 52 an increase, and those over age 53 again a decrease. The number of deaths between 1970 and 1976 suggests that among males from ages 45 to 51 there was a large increase. The ratios for females show a decrease in every age group except age 51, which has a small increase. Thus, it is quite possible to agree with Dr. Kuroda's suggestion that middle-aged mortality has rapidly been increasing from the results mentioned above.

According to Figure 3, if you compare the male and female peaks of the middle-aged in the 1950 death rates, they were almost equal but in the 1970 death rates the male peak was definitely higher than that of the females. In the recent years the sex ratio in the middle aged death rate has become higher.

IV. Changes in Age-Specific Death Rates, by Sex, for Japan

Figure 3 presents the changes in the curves of the age-specific death rates by sex for the years between 1950 and 1976. Each curve is shown logarithmically and is shifted on the vertical axis. Just the death rates of the middle-age group are shown in Figure 4.

Originally the death rate curve formed a "V", indicating peaks on both edges, that of infants and the elderly, and a trough at age 10. In between is a small peak at the age of 20. Among males, there have been higher death rates in the middle-age groups since the 1970s than among females, though not as high as youths. Females show a peak at youth but not in the middle-age.

Figure 2. Changes in Mortality for Middle-Age Group: Absolute
Increase in Age-Specific Number of Deaths, by Age, for
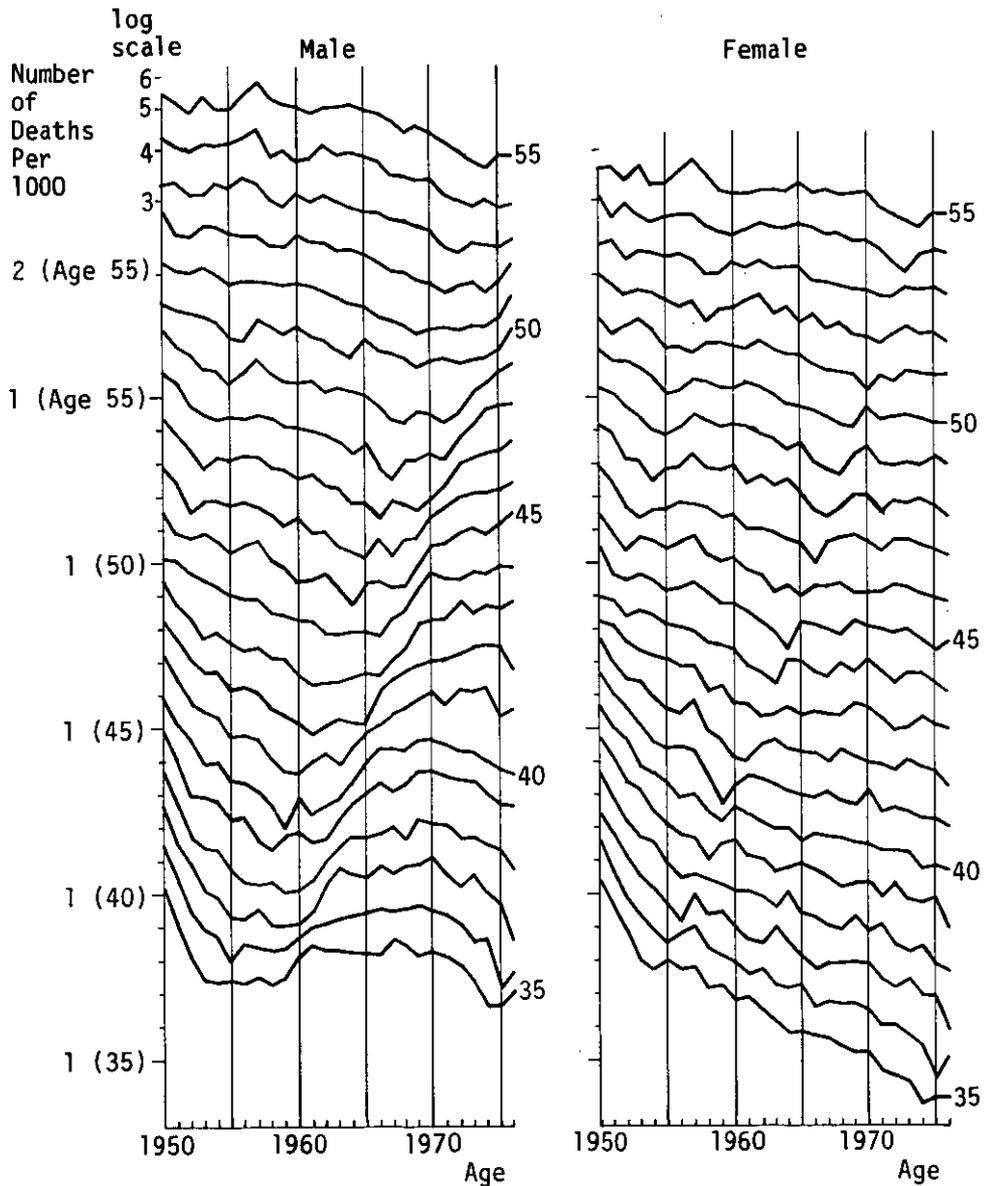Japan, 1950-1976 (Logarithmically Shifted)

Table 1. Number of Deaths by Age and Sex for Middle-Age Group, Japan, 1970-1976

Age	1970	1971	1972	1973	1974	1975	1976	D 1970-1976	$\frac{D}{1970} \times 100$
				Male					
35	1 809	1 777	1 689	1 567	1 361	1 371	1 447	-362	-20.0
36	1 862	1 796	1 793	1 621	1 663	1 259	1 354	-508	-27.0
37	2 144	1 951	1 807	1 947	1 772	1 666	1 341	-803	-37.5
38	2 152	2 141	1 943	1 991	1 909	1 835	1 674	-478	-22.2
39	2 382	2 301	2 234	2 212	2 106	2 006	1 958	-424	-17.8
40	2 334	2 496	2 377	2 445	2 285	2 192	2 180	-154	-6.6
41	2 526	2 387	2 590	2 586	2 615	2 254	2 322	-204	-8.1
42	2 506	2 582	2 624	2 716	2 767	2 744	2 395	-111	-4.4
43	2 656	2 670	2 918	2 734	2 868	2 817	2 920	+264	+9.9
44	2 814	2 773	2 779	2 886	2 840	2 964	2 934	+120	+4.3
45	2 733	2 808	2 961	3 049	2 957	3 170	3 317	+584	+21.4
46	2 681	2 826	3 004	3 067	3 079	3 158	3 226	+545	+20.3
47	2 470	2 696	3 035	3 192	3 296	3 338	3 413	+943	+38.2
48	2 628	2 581	2 901	3 110	3 418	3 468	3 472	+844	+32.1
49	2 749	2 605	2 720	3 093	3 301	3 562	3 621	+872	+31.7
50	3 029	2 889	2 682	3 066	3 284	3 510	3 666	+637	+21.0
51	3 044	3 086	3 030	3 079	3 117	3 373	3 709	+665	+21.8
52	3 259	3 037	3 203	3 285	3 141	3 387	3 699	+440	+13.5
53	3 643	3 348	3 226	3 412	3 397	3 273	3 493	-150	-4.1
54	4 038	3 668	3 594	3 409	3 629	3 448	3 496	-542	-13.4
55	4 388	4 117	3 913	3 714	3 522	3 841	3 819	-569	-13.0
				Female					
35	1 021	947	926	896	783	813	810	-211	-20.6
36	1 104	1 008	1 001	959	897	748	847	-257	-23.3
37	1 184	1 075	1 024	1 072	980	982	808	-376	-31.8
38	1 183	1 218	1 076	1 039	1 085	982	943	-240	-20.3
39	1 280	1 182	1 295	1 139	1 127	1 148	992	-288	-22.5
40	1 316	1 297	1 291	1 278	1 148	1 151	1 141	-175	-13.3
41	1 492	1 303	1 339	1 312	1 285	1 264	1 202	-290	-19.4
42	1 431	1 412	1 378	1 454	1 409	1 370	1 260	-171	-11.9
43	1 617	1 524	1 425	1 456	1 516	1 481	1 436	-181	-11.2
44	1 766	1 664	1 525	1 635	1 630	1 550	1 473	-293	-16.6
45	1 768	1 749	1 704	1 732	1 625	1 552	1 617	-151	-8.5
46	1 759	1 771	1 845	1 820	1 765	1 734	1 701	-58	-3.3
47	1 962	1 836	1 981	1 957	1 904	1 860	1 802	-160	-8.2
48	2 114	1 920	2 032	2 012	2 056	2 007	1 878	-236	-11.2
49	2 284	2 083	2 072	2 096	2 089	2 153	2 082	-202	-8.8
50	2 409	2 239	2 279	2 285	2 234	2 183	2 184	-225	-9.3
51	2 199	2 364	2 282	2 405	2 370	2 333	2 339	+140	+6.4
52	2 425	2 341	2 484	2 560	2 437	2 471	2 344	-81	-3.3
53	2 637	2 539	2 349	2 709	2 612	2 673	2 528	-109	-4.1
54	2 897	2 764	2 568	2 412	2 691	2 707	2 700	-197	-6.8
55	3 106	2 853	2 731	2 694	2 561	2 794	2 793	-313	-10.1

Figure 3. Changes in Relative Increase of Death Rate for Each Age Group, by Year, Japan (Logarithmically Shifted)
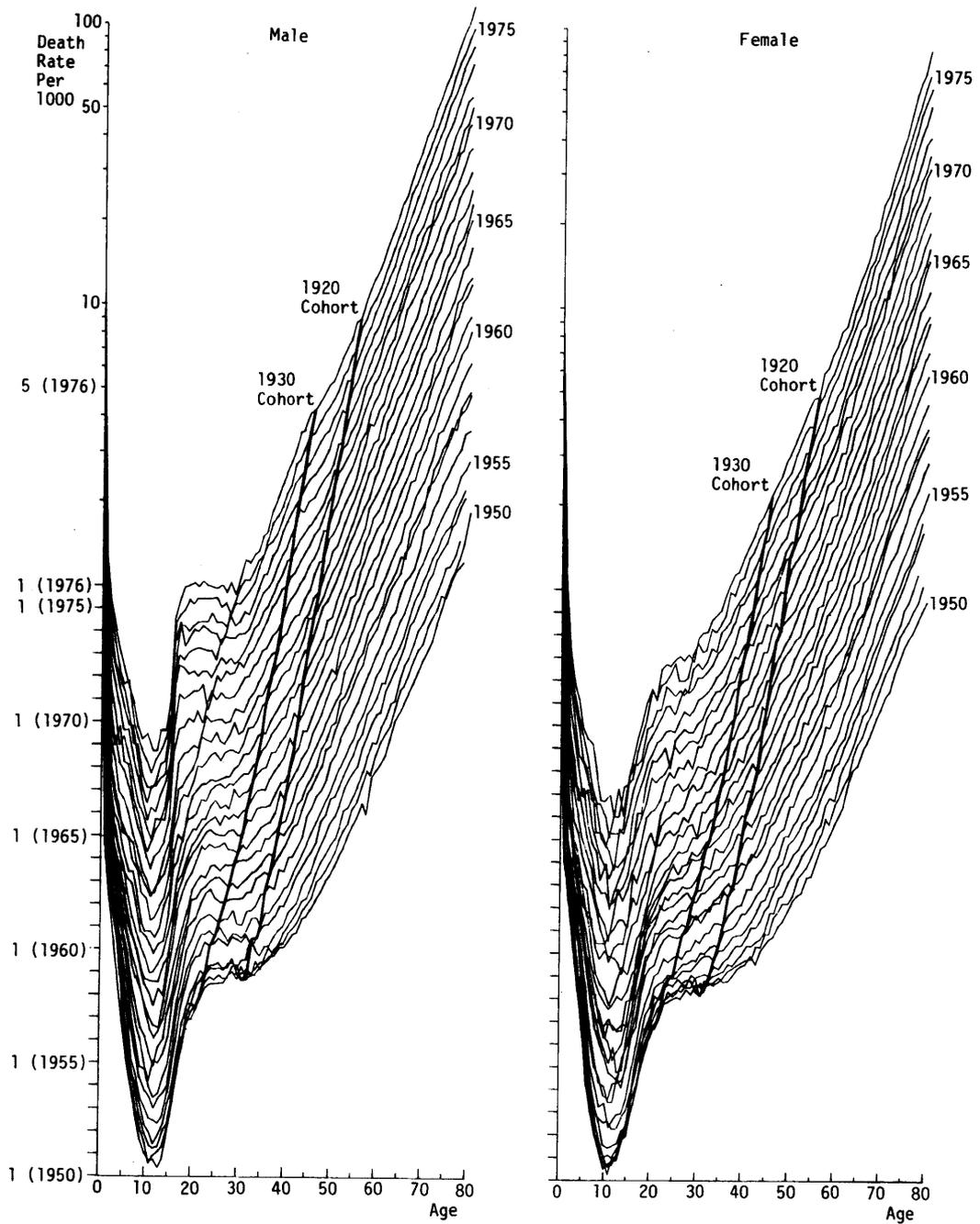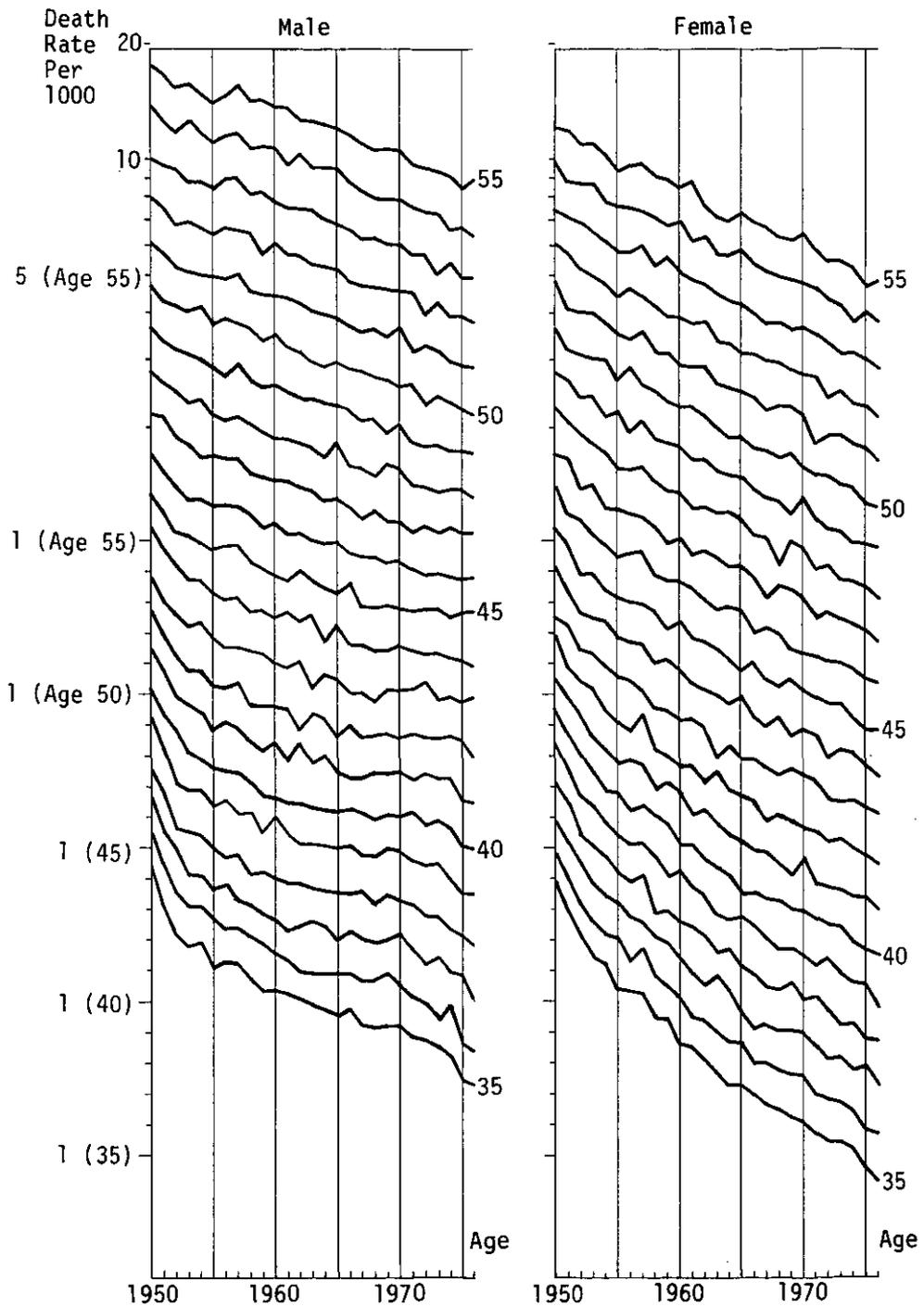
Figure 4. Changes in Relative Increase of Death Rate for Each
Middle-Age Group, by Age, Japan (Logarithmically
Shifted)

V. Annual Change in Age-Specific Death Rate for the Middle-Aged Groups

It is necessary to analyze whether the cause of the apparent increase in middle-aged death rates comes from an absolute increase, which we call Type I, or a relative increase, Type II, which might be caused by the faster decrease of death rates among the other age groups (youths and the elderly). Figure 4 indicates the change of the death rate of each age group between ages 35 and 55 from 1950 to 1976, by sex. The values are expressed logarithmically to accentuate the differences in death rates. One can see from Figure 4 that the change of each male age group's death rate between 1970 and 1976 was unchanged or very little changed for a few years around age 45, whereas that of men and women in their 30s and 50s indicates a great decrease. The "increase" of the recent middle-aged death rate in Figure 3 was thus caused by relative growth (Type II). The death rates of females shows a decrease in each age group.

Table 2 reveals that the male death rate at age 45 in 1970 was 4.20 per 1000; in 1976 it was 4.14. The difference was 0.06. Differences in the death rate were also small at age 43 (0.17), and at age 47 (0.27). These differences are small between ages 42 and 47, while around age 35 the difference in the death rates was 0.6 to 0.8, and at around age 50 was over 1.0. This indicates that the difference in the middle-age male death rate was quite small. This phenomenon is not apparent with females.
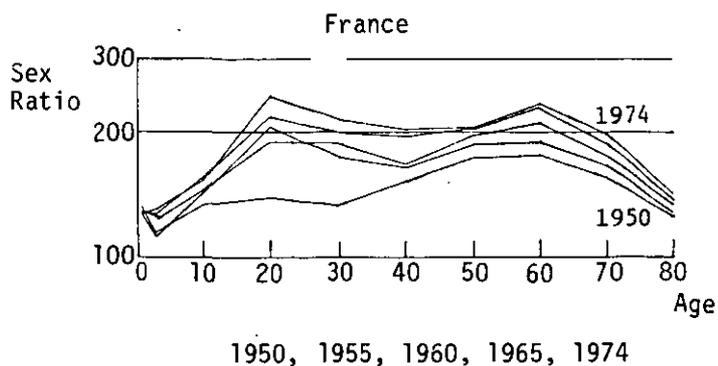
VI. Peak of the Middle-Aged Death Rate and Sex Ratio

Figure 5 shows the sex ratio of the death rate every 5 years from 1950 to 1970 and in 1976; all curves are drawn on one chart. In 1950 the sex ratio of the male death rate (ratio of male death rate to 100 female deaths) compared to the female death rate in youths was 100, that is, it was the same in both sexes. The ratio for those over age 60 rose to 150. The curve for 1950 has only one peak. A new peak appears in 1955 which makes it a two-peak curve. Since 1960, the peak of the sex ratio of youths' death rate has grown higher and moved to between ages 15 and 19, and in 1976 the sex ratio of the death rate at these ages became more than 250, which was the highest. The peak of the elderly was between ages 60 and 64 and counted as

Table 2. Changes in Age-Specific Death Rates (per 1000) of Middle-
Age Groups, by Sex, for Japan, 1970-1976

Age	1970	1971	1972	1973	1974	1975	1976	1970-1976
Male
35	2.16	2.02	1.97	1.90	1.79	1.56	1.51	0.65
36	2.30	2.14	2.05	1.89	2.02	1.64	1.54	0.76
37	2.59	2.36	2.14	2.24	2.07	2.01	1.74	0.85
38	2.62	2.58	2.38	2.36	2.20	2.13	2.02	0.60
39	2.95	2.75	2.69	2.71	2.50	2.29	2.28	0.67
40	3.02	3.09	2.89	2.95	2.81	2.58	2.50	0.52
41	3.32	3.13	3.21	3.15	3.16	2.76	2.73	0.59
42	3.38	3.45	3.39	3.37	3.38	3.30	2.94	0.44
43	3.69	3.71	3.90	3.55	3.58	3.43	3.52	0.17
44	4.03	3.95	3.81	3.87	3.70	3.68	3.58	0.45
45	4.20	4.09	4.18	4.19	3.98	4.11	4.14	0.06
46	4.61	4.40	4.31	4.34	4.25	4.19	4.20	0.41
47	4.81	4.60	4.70	4.60	4.68	4.55	4.54	0.27
48	5.48	5.04	5.01	4.84	4.95	4.90	4.75	0.73
49	6.12	5.46	5.30	5.37	5.16	5.16	5.14	0.98
50	6.30	6.43	5.61	6.01	5.73	5.48	5.34	0.96
51	7.57	6.43	6.73	6.48	6.15	5.94	5.82	1.75
52	7.83	7.69	6.69	7.35	6.65	6.76	6.55	1.28
53	8.63	8.05	8.02	7.18	7.65	7.01	7.01	1.62
54	9.33	8.86	8.72	8.57	7.69	7.82	7.53	1.80
55	10.37	9.51	9.38	9.10	8.92	8.24	8.72	1.65
Female
35	1.22	1.12	1.07	1.07	1.02	0.92	0.85	0.37
36	1.36	1.20	1.15	1.11	1.08	0.97	0.96	0.40
37	1.43	1.31	1.21	1.23	1.14	1.18	1.05	0.38
38	1.46	1.49	1.32	1.23	1.25	1.14	1.13	0.33
39	1.60	1.47	1.56	1.40	1.34	1.32	1.15	0.45
40	1.72	1.63	1.58	1.54	1.41	1.36	1.31	0.41
41	1.97	1.69	1.67	1.61	1.55	1.55	1.42	0.55
42	1.93	1.90	1.79	1.82	1.73	1.66	1.55	0.38
43	2.22	2.13	1.91	1.90	1.90	1.82	1.74	0.48
44	2.45	2.31	2.00	2.19	2.13	1.94	1.82	0.63
45	2.54	2.44	2.37	2.38	2.18	2.02	2.03	0.51
46	2.69	2.62	2.54	2.53	2.43	2.29	2.22	0.47
47	3.08	2.76	2.84	2.71	2.66	2.52	2.38	0.70
48	3.43	3.03	3.10	2.89	2.85	2.78	2.55	0.88
49	3.91	3.41	3.22	3.20	3.02	2.99	2.89	1.02
50	3.93	3.77	3.67	3.56	3.43	3.16	3.05	0.88
51	4.42	3.73	3.86	3.89	3.71	3.61	3.39	1.03
52	4.77	4.68	4.03	4.35	3.96	3.92	3.64	1.13
53	5.18	4.98	4.70	4.42	4.46	4.37	4.02	1.16
54	5.63	5.45	5.06	4.84	4.41	4.63	4.44	1.19
55	6.26	5.64	5.35	5.32	5.16	4.60	4.79	1.47

Figure 5. Changes in Sex Ratio of Death Rate by Age for Japan, U.S.A.
(Caucasian), and France, 1950-1976 (Ratio of Male Death
Rate to Female Death Rate), Logarithmically Expressed

Japan

1950, 1955, 1960, 1965, 1970, 1976

U.S.A. Caucasians

1950, 1955, 1960, 1965, 1973

France

1950, 1955, 1960, 1965, 1974
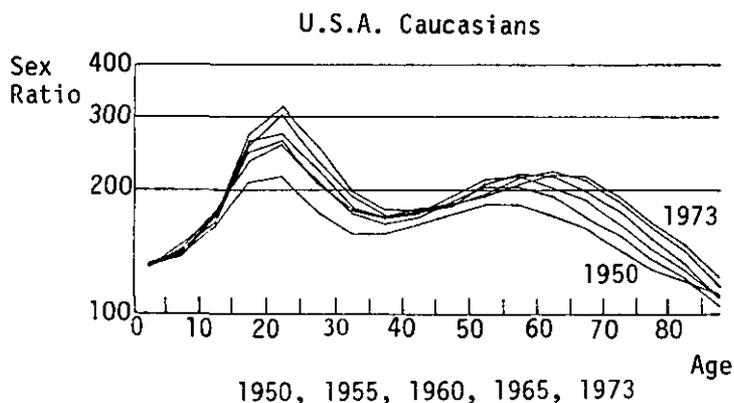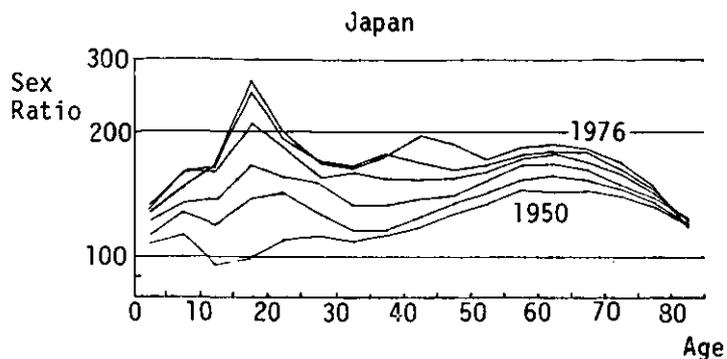
high as 186 in 1976.

Within this time period a small peak in the middle-aged sex ratio of the death rate started to appear, of which the highest point was in the ages between 30 and 34 in 1965, moving to between ages 35 and 39 in 1970, and to between ages 40 and 44 in 1976. The highest point was 195 in 1976, which means it was higher than that of the elderly. The sex ratio of the death rate of each age group showed one peak only in 1950, which changed into three peaks of youths, middle-aged and the elderly in 1976. The peaks of youths and the elderly shifted slightly to the right and that of the middle-aged shifted gradually to the right as the years passed.
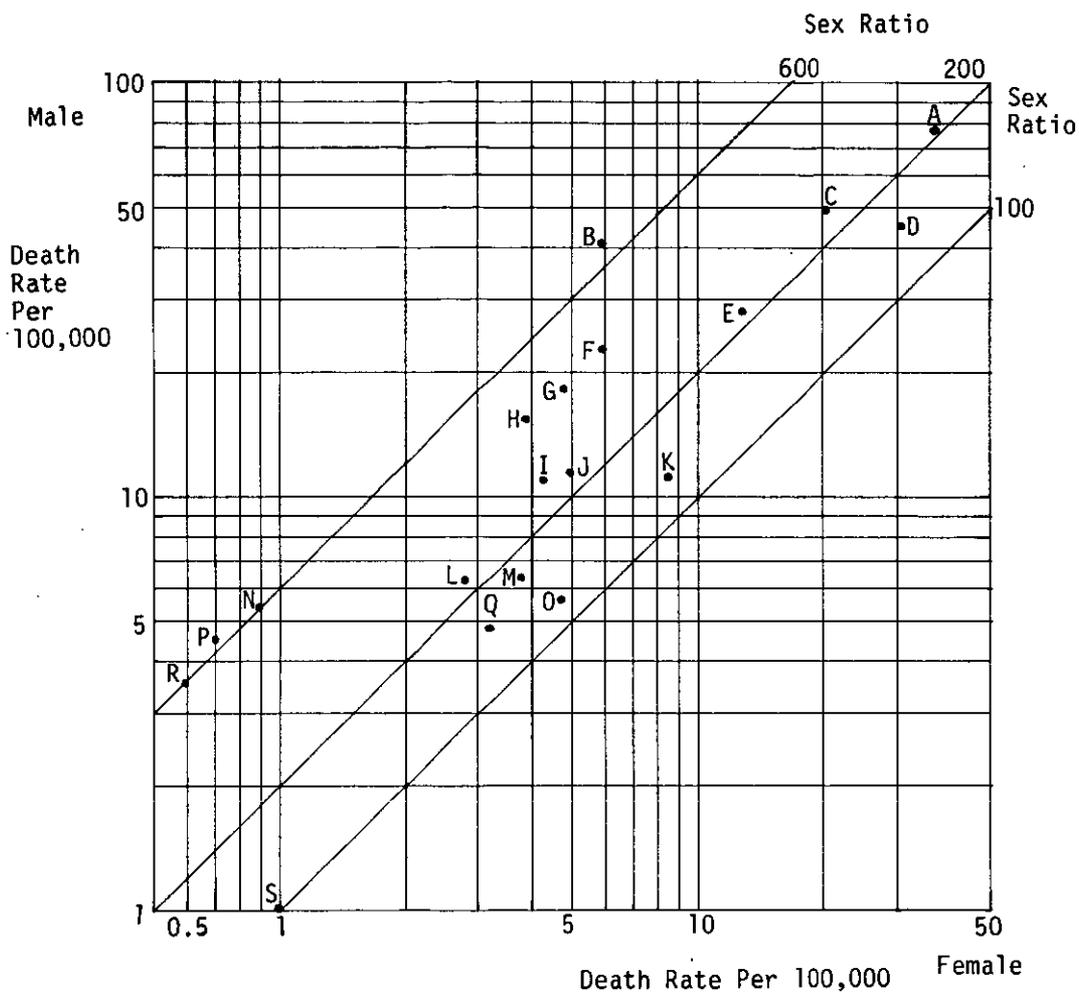
The sex ratio of the death rate of Caucasian males in the U.S.A. and males in France (middle-aged) is shown in Figure 5 with that of Japan to show whether the high middle-aged mortality ratio exists in these countries. In the chart of the U.S.A. Caucasians, as well as in France, there is a high mortality ratio among youths and the elderly. Especially the youths' peak of U.S.A. Caucasians showed more than 300 in the sex ratio, which is extraordinarily high. The peak of the elderly showed in recent years in both cases over 200 which is higher than that of Japan. However, neither France nor U.S.A. Caucasians show any sign of an increase in the sex differential of the death rate of the middle-aged. It is concluded that this death rate sex differential peak exists only in Japan among the three countries compared. The sex ratio of the death rates by age between the years 1950 and 1975 for each country, were drawn on one sheet. Next, let us investigate the causes of the middle-aged deaths in Japan.

VII. Causes of Death and Sex Ratios of the Middle-Aged Death Rate

Figure 6 indicates the sex differential of the death rate by cause of death in 1976, for ages 45 to 49. Causes are categorized according to the B LIST, which comes from the Health Welfare Information Department, Ministry of Health and Welfare, called the International Classification of Diseases, List of Fifty Causes for Tabulation of Mortality.

The relatively high death rate among infants and the elderly (Figure 1), the very low death rate at age 10, and the slight rise at 20 are related to various causes. The small peak at age 20, which

Figure 6. Sex Ratio of Death Rate for Diseases of Those Aged 45-49
in Japan, 1976

$$\left(\text{Average Sex Ratio for 1976} = \frac{456.6 \ (M)}{242.9 \ (F)} \times 100 = 188.0\right)$$

A. Cerebrovascular Disease
B. Cirrhosis of the Liver
C. Cerebral Hemorrhage
D. Stomach Cancer
E. Suicide
F. Ischaemic Heart Disease
G. Car Accidents
H. Liver Cancer
I. Respiratory Tuberculosis
J. Lung Cancer

K. Subarachnoid Hemorrhage
L. Diabetes Mellitus
M. Pneumonia
N. Intestinal Ulcers
O. Nephritis/Nephrosis
P. Cancer of the Esophagus
Q. Leukaemia
R. Stomach Ulcers
S. Infectious Hepatitis

30 years ago was caused by tuberculosis, is today caused by motor vehicle accidents. The peak of youth mortality was quite high when tuberculosis was a common disease, and became lower since the anti-T.B. drive. Recently, however, there is a new peak caused by the increase in car accidents and suicides.

Stomach ulcers (R) and subarachnoid hemorrhage (K) are the greatest causes of the increased numbers of death among the middle-aged Japanese males and females. Figure 6 indicates the female death rate on a horizontal axis and the male death rate on a vertical axis with the corresponding values as points on the logarithmic diagram. The diagonal lines show the constant sex differentials of the death rate which are 600, 200, and 100. Through this method it is possible to show both the causes of the death rate and the sex differential in the death rates on one chart. Among the same sex differentials in the death rate, some are high and some are low. The causes of death which have a higher sex differential in the death rate of the middle-aged are: cirrhosis of the liver (B), intestinal ulcers (N), cancer of the esophagus (P), and stomack ulcers (R) which have a sex ratio of 600 or more for males while cirrhosis of the liver (B) also causes a high death rate in females. The causes of a high death rate of both males and females are: cerebrovascular disease (A), cerebral hemorrhage (C), and stomach cancer (D).

The sex differential of the death rate for these causes: ischaemic heart disease (F), cancer of the liver (H), car accidents (G), respiratory tuberculosis (I), cerebral hemorrhage (C), lung cancer (J), suicide (E), diabetes mellitus (L), and cerebrovascular disease (A) is 200 or over. The sex ratio value of pneumonia (M), stomach cancer (D), leukemia (Q), subarachnoid hemorrhage (K), and nephritis/nephrosis (kidney diseases) (O) is over 100 and under 200. Infectious hepatitis (S) is located on the 100 line.

VIII. The Grouping of Causes Accelerating Middle-Aged Mortality

The causes of death among middle-aged males in Japan are divided into two categories: Group I--those diseases causing an absolute increase in the number of deaths for the middle-aged and their death rates, and Group II--those diseases causing a relative increase in the number of deaths for the middle-aged and their death rates. The

diseases in Group I for the middle-aged and their death rate include: cirrhosis of the liver (B), diabetes mellitus (L), and subarachnoid hemorrhage (K) while those in Group II contain: cerebral hemorrhage (C), ischaemic heart disease (F), and stomach ulcers (R).

Figure 7, which shows the change in the death rate due to cirrhosis of the liver, indicates that since 1970 the incidence of cirrhosis of the liver at age 40 has risen steeply. Such a phenomenon was not noticeable in the 1950s nor the 1960s, nor with females.

Figure 8 shows the annual changes in the age-specific death rates due to cirrhosis of the liver. Since 1965 the deaths of those aged 35 show an extreme growth, the peak of which is around 1970; a decrease starts in 1975. The curve of those aged 45 starts its rise later than that of age 40 and still shows an increase in 1976. This phenomenon is conceived to be continuing now.

Although the chart is not shown here, in the recent past the changes in the curve for the rate of each age's number of deaths among the middle-aged Japanese males indicate a clear rise (particularly among those of age 40). This is not the case with females. These changes in the curve of deaths caused by cirrhosis of the liver show the sharpest increase in middle-aged male mortality. Shifts in the curve of the death rate of each age group with diabetes mellitus belonging to Group I show that the middle-aged male death rate has been higher than that of females in recent years. Changes in the age-specific number of deaths curve due to diabetes millitus also indicate a clear rise in middle-aged males but it is not as significant as with cirrhosis of the liver.

A comparison of male death rates due to diabetes mellitus in 1970 to that of 1976 indicates that among men aged 45 the death rate increased from 4.3 to 6.3 per hundred thousand. For those aged 40, it increased from 2.9 to 3.6, for those aged 35, it remained unchanged at 1.9, and for those aged 50, it decreased from 8.2 to 7.7. The females showed a decrease in death rate except for those aged 40 which showed a small increase. The number of deaths caused by diabetes mellitus among age 45 males during the same period show the largest increase, from 114 to 236.

Annual changes in the curve of the number of deaths for each age group show an increase with ages 40, 45, and 50 but a decrease with age 35. The yearly change in the age-specific death rate shows

Figure 7. Absolute Increase in Age-Specific Death Rates for Cirrhosis
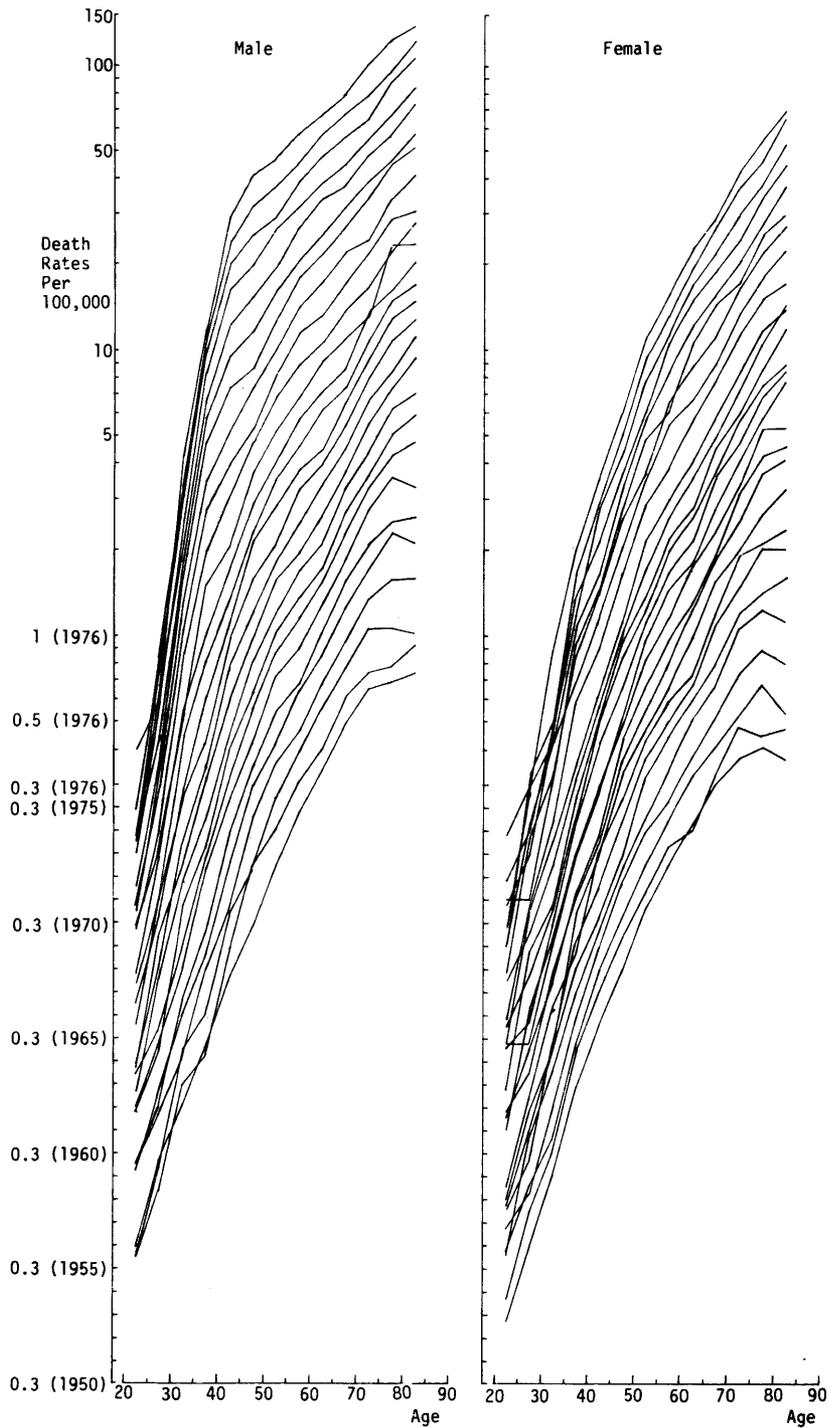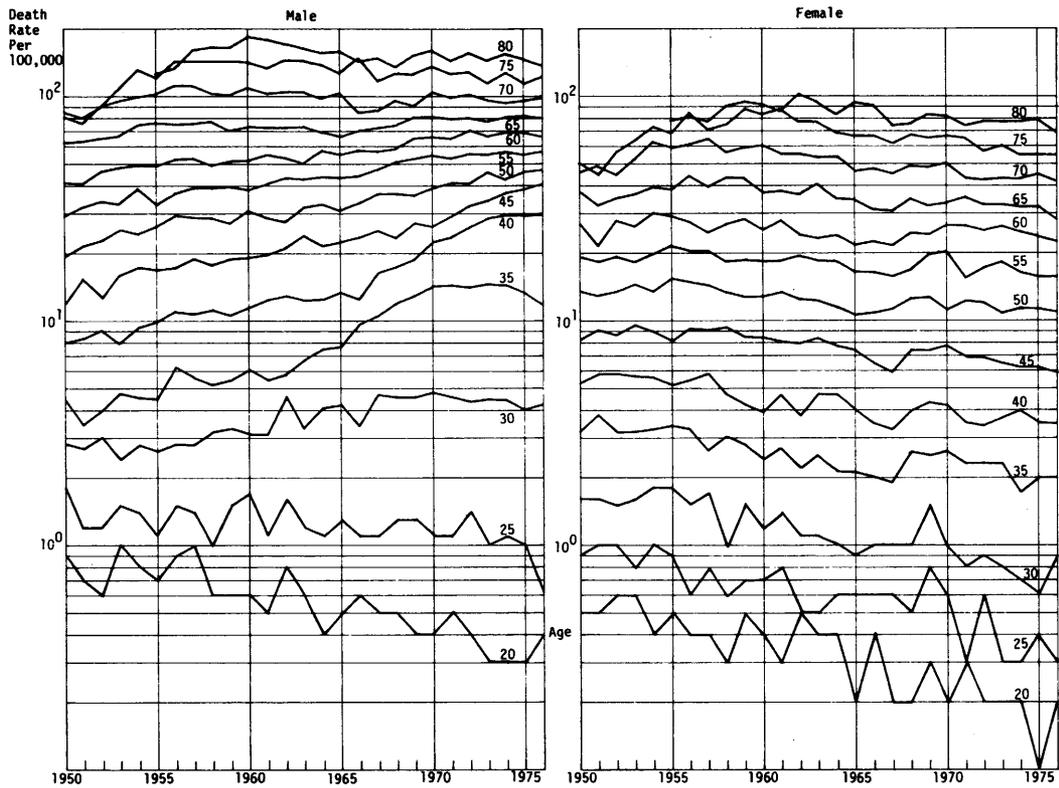of the Liver, by Sex and Year, Japan, 1950-1976

Figure 8. Absolute Increase in Age-Specific Death Rates for Cirrhosis
of the Liver, by Sex and Year, Japan, 1950-1976

an increase in those aged 40, 45 and 50 but a decrease with those aged 35.

Figure 9 is the drawing of changes in the curve for the death rate for cerebral hemorrhage caused deaths of each age group to represent Group II. The middle-aged male death rate forms a small but clear peak while the female death rate shows no such sign.

Annual variations in the curve for the death rate for cerebral hemorrhage caused deaths is shown in Figure 10. The death rates of those males aged 40 and 45 show a small decrease, while those aged 35 and 50 show a greater decrease. Comparing the number of deaths by cerebral hemorrhage in 1970 to 1976, only those aged 45 show an increase in number from 1580 to 1842 deaths, whereas the other ages show a decrease. Changes in the curve of the number of deaths show a clear peak in the middle-aged male.

Variations in the death rate curve of each age group by ischaemic heart disease has a small peak of middle-aged males as well as that of the number of deaths of each age group. The decrease of the death rate of those aged 45 is smaller than that of any other age group, namely, from 24.8 in 1970 to 22.7 in 1976. The curve for the number of deaths by ischaemic heart disease shows a similar pattern as it had an increase in those aged 45 from 657 in 1970 to 848 in 1976 while those aged 35, 40 and 55 all showed a decrease. The middle-aged females showed a decrease in number of deaths in all groups. Variations in the curve for the death rate and number of deaths among the middle-aged males from stomach ulcers indicate only a very small rise. Annual changes in the curve of each age-specific death rate show also a small rise starting from 1963 to 1972 which arrives at the peak with age 40 in mortality, but disappears with age 45.

Other causes of death: the middle-age sex differential in the death rate from cancer of the liver and respiratory tuberculosis is high, but it indicates no noticeable peak. No apparent rise in liver cancer is noticeable either through the shifts in the curve of the death rate or through the number of deaths of each age group. Comparing mortality of 1970 with that of 1976, the age 35 males show a decrease, but ages 40, 45 and 50, an increase. The death rate changes in the curve of each age group of the respiratory tuberculosis caused number of deaths show a rise among youths which is high at first, then dips later and rises again in the middle-aged. This phenomenon

Figure 9. Relative Increase in Age-Specific Death Rates for Cerebral
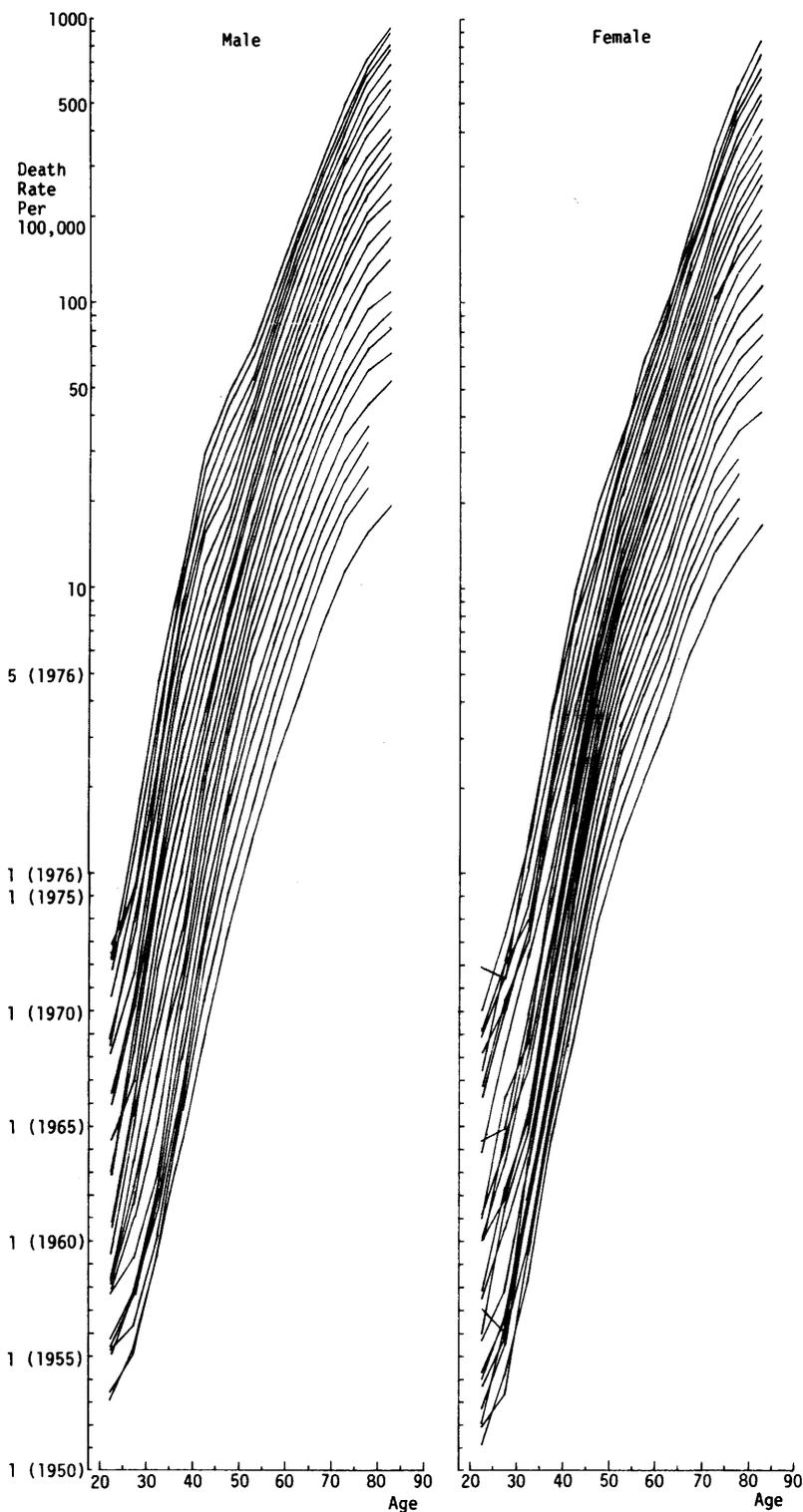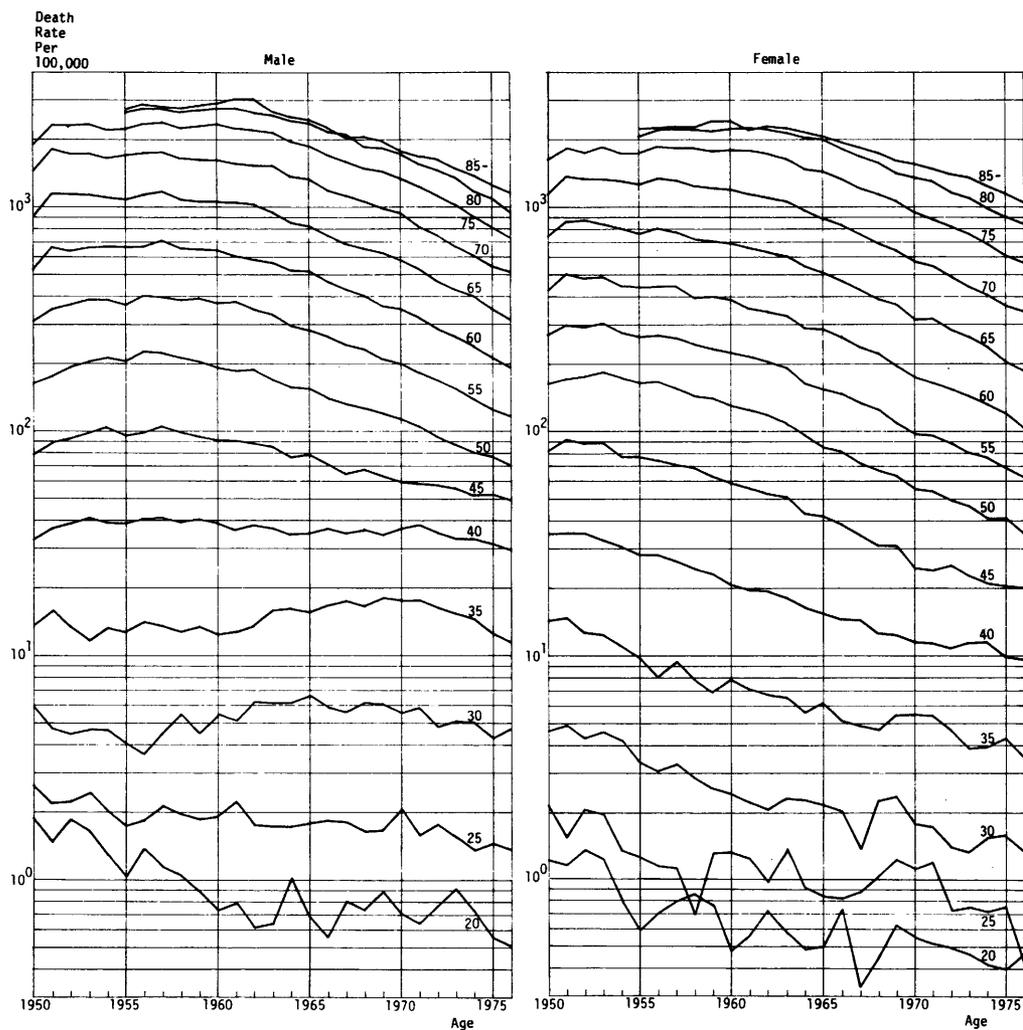Hemorrhage, by Sex and Year, Japan, 1950-1976

Figure 10. Relative Increase in Age-Specific Death Rates for Cerebral Hemorrhage, by Sex and Year, Japan, 1950-1976

is noticeable in both sexes and is of a different character from other diseases showing a peak in the middle-aged male mortality. After the same kinds of investigation it was proved that no such peak in middle-aged male mortality is to be seen with pneumonia, stomach cancer, leukemia, or nephritis/nephrosis.

Now we look into accidents which include car accidents and suicide. The death rate changes in the curve of each age group by car accidents indicate a peak with youths but not with the middle-aged. Originally youths formed a peak with suicide and it remains the same to this day, although since 1962 the peaks have become smaller. A suicide peak of those middle-aged appeared in 1973 which rose to the same level as the youths' peak in 1975. This increase of the middle-aged death rate by suicide is not only with males but also with females, who have a different type of peak from the middle-aged males death rate.

IX. Discussion--Causes of Sudden Increase in Middle-Aged Mortality

The absolute increase of the middle-aged male number of deaths is caused mainly by cirrhosis of the liver (B), diabetes mellitus (L), subarachnoid hemorrhage (K), and the relative increase is caused by cerebral hemorrhage (C), ischaemic heart disease (F), and stomach ulcers (R). Both are hemorrhage types of diseases. Out of these groups of diseases the most extreme increase is noticed with cirrhosis of the liver. It is assumed that recently Japan came to have circumstances which stimulate cirrhosis of the liver as a cause of middle-aged male mortality. These are an increase of alcoholic beverage consumption and infectious hepatitis.

However, in this paper, we only point out that the middle-aged mortality forms an increase in a comparatively small span of ages around 45 caused by all possible diseases. Here those aged 45 in 1975 are traced back to the past with a solid line. Those 45 in 1975 were 20 in 1950, when they were at the peak of the youths' tuberculosis. Below in the chart in 1945 at the end of World War II they were 15 years old and probably experienced the post-war difficulty of obtaining food while they were adolescents when they should have had a rapid spurt in height. Our hypothesis is that the malnutrition of this period led to weaknesses in the blood vessel structures, which

leads to death through hemorrhage when males meet the middle-aged diseases.

X. Summary

Analyzing statistics obtained from the Japanese Ministry of Health and Welfare and drawing a figure for the death rate and the number of deaths for the age-specific groups, by sex, between the time span of 1950 and 1976, a rise in middle-aged Japanese male mortality is noticeable since 1970.

Among the causes of the middle-aged male mortality, cirrhosis of the liver (B), diabetes mellitus (L), and subarachnoid hemorrhage (K) are categorized as the causes of absolute increase in the middle-aged male death rate; and cerebral hemorrhage (C), ischaemic heart disease (F), and stomach ulcers (R) are categorized as causes for the relative increase in their death rates. In both cases, they are a group of diseases which relate to hemorrhaging.

The increase of the middle-aged male Japanese death rate seems to begin around age 45 in 1975. Those aged 45 in 1975 were 15 in 1945. They were in their second growth period during the post-war years when there was a shortage of food in Japan. We assume that the malnutrition of this period led to weaknesses of the blood vessel structures, which in turn leads to an increase in the deaths by hemorrhage when males meet the middle-aged diseases. The increase in the death rate of Japanese middle-aged males is greater than that of the U.S.A. Caucasian middle-aged males or that of French middle-aged males.

XI. Conclusion

This study has found a relationship between a rise in the death rates of middle-aged Japanese males and certain diseases. However, Japanese females were exposed to the same diseases but their death rate did not increase (except for infectious hepatitis). Also, smoking as a factor of an increasing death rate was not considered. Further research is needed taking into account these factors.