Nutritional Intake and Longevity

-International Comparative Study-

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We tried to make the relation between the state of nutritional intake
and the life span of human beings clear by comparing them internationally.

1. Observing the correlation of nutrition and life span of both advanced
and the other nations, the tendency is almost the same with that of the
middle and low developed nations. It can be concluded that in any case
the more the nutritional intake is, the more favorable influence is given
upon the life span. Examining only about the advanced nations, however,
it resulted that the correlations of the both are either very low or opposite
to each other. It can be said that the people taking so much nutrition are
having a bad influence upon the life span and death. It is especially true
with the animal origin calorie and fats and oils.

2. Generally speaking, the influence of nutritional intakes upon the
life span seems to change from the better or the worse at the following
points. As for the total calorie it changes somewhere around 3000 kcal per
capita a day, 35-40 % for the ratio of animal origin calorie, around 90g for
protein, 50-60g for fats and oils.

3. Observing the relation between the two in the yearly transition of
7 nations, the intakes of total calorie, the ratio of animal origin calorie,
protein, fats and oils, meat and eggs pararelled well especially with arteri-
osclerotic and degenerative heart diseases both in ranking by each nation
and in yearly transition. Especially with intake of meat, it traces the
most alike excess of ranking.

INTRODUCTION

It seems likely that nutritional intakes especially the quantity and
quality of calorie and protein intakes are closely related to the life span
of living things. Including McCay's characteristic studies[1][2] on the
relation between the nutritional intake and the life span of living
things, many other studies[3]-[9] such as to observe the relation of the

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two through the biological tests have been published.   As for the study of the relation between the human life span and the nutritional intakes, however, only a few studies are known.   WEISS[10] in a foreign country and KONDO[11] in Japan are known by their suggestive laborious work.   Besides the two, only SEGI[12] and KAMIYAMA[13] are known that they have made the further study of the relation by looking it internationally.

It is very difficult to observe the relation of nutrition and life span of human beings.   For, not only nutrition but many other important elements are also concerned the human life span, and they are entwined each other complicatedly.   The relation of the two observed is the result of the complicated action of those important elements extending over a long period of time, and therefore, it seems rather impossible to make an effective experiment analyzing an influence upon the work. As the general idea and expression that prescribe and compose the word "life span" involves many difficult problems, through investigations are needed for them.   As for these problems, WATANABE[14][15] tried to systematyze them in connection with public health, and succeeded in giving many suggestions to the prescribing of the general idea and thesis of measurement.

From this point of view, it is quite natural that there are only a few methods to study the relation between nutritional intakes and human life span.   One of them is KONDO's so as to watch retrospectively the correlation of the state of nutritional intake and the rates of the long-lived and short-lived persons to the population about each group of the persons regarding the other primary factors as almost fixed.   As for international study it is natural that SEGI should employ epidemiological indirect methodology to study the correlation of the amounts of expenditure of nutrition and food and various indexes related to longevity.

In order to examine the relation of the two internationally in like manner, it seems better to observe them traversely and vertically as well.

In traverse way, the life span of human beings should be observed in consideration with the number of livings and deaths and also the construction of them by age groups, the construction of causes of death and it's transition.   Nutrition should be observed from the amount of expenditure of food and nutrition per capita a day or a year.   The traverse correlation existing between the two should be observed within the limit of the various statistical data published in rather many nations in reality.

From the vertical viewpoint, some of the yearly transition by nations of the two should be observed even though it is rather short-period to analyse according to the law of cause and effect.

We will examine the following results on condition that only the correlative results are available and it is rather difficult to reason by the law of cause and effect.

METHODS AND RESULTS

I   The Correlation of Nutrition and Life Span in Each Country

A Nations

As for the subjects, we picked and chose the nations with enough research materials to use, mainly from each Demographic Year Book,[16] World Statistical Year Book,[17] some data from the United Nations[18] and also from 'the age-adjusted death rates according to death causes in 30 nations' ckecked up by SEGI and others.[19]   Then we divided the whole 30 nations into three groups such as advanced, middle developed and under developed (less advanced).   As Table 1, there are 15 advanced nations, 6 middle developed and 9 low developed nations.

Table 1.
Countries (Whole 30 nations)

1	Australia	16	France
2	Austria	17	Israel
3	Belgium	18	Italy
4	Canada	19	Japan
5	Denmark	20	Portugal
6	Finland	21	Yugoslavia
7	W. Germany	22	Ceylon
8	Ireland	23	Chile
9	Netherland	24	China (Taiwan)
10	New Zealand	25	Greece
11	Norway	26	Mexico
12	Sweden	27	Philippines
13	Switzerland	28	U. Arab Rep.
14	England & Wales	29	Argentina
15	U.S.A. (White)	3C	India

o 15 Advanced nations   1—15

o 21 Advanced & Middle-ad. nations   1—21

o 15 Middle & Low developed nations   16—30

o 28 nations   1—28

As for the age-adjusted death rates according to death causes, only 28 nations are chosen because Argentina and India belonging to the group of low developed nations do not have this data.

B Items

We chose the items shown in table 2, and the figures of the table except a few are comparatively accurate. They are of the latest in each country mainly of 1963—4.

Longevity rate and population index of old person are taken from the figures resulted by Abe and others.[20]-[23] Longevity rate is closely related with the aging tendency of the population construction, and it doesn't show the direct tendency to longevity. Longevity rate seems to produce an interesting result among the nations of almost the same level.

As for the death rate according to each different death cause except the infant death rate, we used SEGI's standard population age-adjusted and figured out the rate of correction of the ones which were out of SEGI's by the same formula.

Table 2. Items

A. Nutrition

Calories (Total Intake)	per capita a day	Cal
Calories (Animal Origin)	//	%
Protein	//	g
Fats & Oils	//	g

B. Life

Average span of human life	Male & Female	yrs
Life expectancy at 50 yrs	//	//
Death rate of the fifties	//	Rates per 1,000 population
Infant death rate	//	Rates per 1,000 births
Longevity rate of over 70yrs to the total population	Male & Female	%
Population index of old person (Rate of over 75yrs to over 70yrs population)	//	%
Death rate	Male & Female	Rates per 100,000 population
All Causes Tuberculosis	//	//
Vascular Lesions Affecting Central	//	//
// Nervous System		
Heart Diseases	//	//
Arteriosclerolic and Degenerative Heart	//	//
Diseaee		

Remarks: Every death rate is age-adjusted by standard populationof Segi [19]

C   Method

We divided the values of the items of nutrition and life span (death) of each nation into such groups as the whole, advanced, advanced and middle, and middle and low developed. Then we calculated and examined the average means and standard deviations of every item by nations group showed as table 3 and 4, and the correlation coefficient between the two item groups of nutrition and life span, the straight regression of life span (death) toward nutritional intake and its satistical significance as table 5 to 12.

D   Correlation with Whole Calorie Intake (Table 5, 6)

1) In the whole 30 (28) nations, calorie intake shows the plus correlation with the average span of human life (both sexes), life expectancy at 50 yrs (female), longevity rate (male, female), death rate caused by heart diseases and arteriosclerotic and degenerative heart diseases (male, female).

It shows the minus correlation with death rate of the fifties (female), infant death rate, age adjusted death rate (female), and death rate of all causes tuberculosis.

2) In 21 advanced and middle developed nations, the tendency is almost the same with that of the whole 30 nations in every item, however, the correlation gets smaller generally. This fact is the same with the following items.

3) In 15 (13) middle and low developed nations, the correlation is

Table 3. Means and Standard Deviations of Various Figures Used

Items.	30 Whole nations		21 Advanced & Middle-ad. nations		15 Advanced nations		15 Low developed nations	
	$\bar{X}$	σ	$\bar{X}$	σ	$\bar{X}$	σ	$\bar{X}$	σ
Calories Total	2854	416	3041	270	3144	187	2564	394
Animal Origin	28.2	13.7	33.9	11.4	40.1	4.9	16.3	8.7
Protein	82.7	15.4	89.2	8.4	90.4	7.5	74.9	18.1
Fats & Oils	16.8	7.5	20.2	5.6	22.5	4.2	11.1	5.8
Life exp. m	64.1	7.0	67.7	2.8	68.4	2.0	59.8	7.9
f	68.6	7.9	72.8	2.7	73.7	1.2	63.5	8.8
Life expectancy at 50yrs m	23.3	2.0	23.7	1.4	23.8	1.5	22.9	2.3
f	26.4	2.2	27.1	1.1	27.2	1.2	25.6	2.7
Death rate of the fifties m	9.94	2.39	9.29	1.78	9.42	0.71	10.50	2.76
f	5.96	1.60	5.29	0.69	5.23	0.78	6.70	1.94
Infant death rate	40.1	32.7	26.0	15.0	20.4	4.4	51.4	49.3
Rate of over 70yrs to population m	4.25	1.81	5.13	1.25	5.56	1.05	2.94	1.53
f	5.76	2.61	7.07	1.82	7.53	1.32	3.99	2.48
Rate of over 75yrs to over 70yrs m	52.5	4.5	53.7	2.6	54.4	2.1	50.5	5.5
f	55.2	3.5	56.2	2.1	56.5	1.6	53.9	4.4

Remarks: Fat & Oils-kilogramme per year, Units in figures as Table 2.

Table 4.
Nutritional Intake and Age-Adjusted Death Rates for Causes

Items	28 Whole nations		15 Advanced nations		13 Middle & Low developed nations	
	$\bar{X}$	σ	$\bar{X}$	σ	$\bar{X}$	σ
Calories Total	2894	392	3144	187	2605	382
Animal Origin	28.7	13.7	40.1	4.9	15.5	6.8
Protein	84.0	14.9	90.4	7.5	76.7	18.0
Fats & Oils	17.3	7.5	22.5	4.2	11.2	5.8
Age-Adjusted Death Rates m	998.5	287.7	880.7	111.6	1,134.4	366.6
f	752.5	308.9	604.3	59.6	923.5	389.0
All Causes Tuberculosis (B_1, B_2) m	29.58	32.09	12.17	9.61	49.67	37.33
f	16.24	26.27	4.64	3.26	29.62	34.33
Vascular Lesions Affecting Central Nervous System (B22) m	85.28	42.75	87.07	18.54	83.20	60.85
f	77.50	32.55	84.24	17.57	69.73	43.61
Heart Diseases (B25—B28) m	208.6	87.53	269.0	63.51	138.8	52.02
f	139.7	45.60	165.8	32.99	109.6	39.75
Arteriosclerotic and Degenerative Heart Disease (B26) m	161.4	91.20	225.4	61.71	87.6	57.07
f	95.1	46.96	123.8	23.90	61.9	41.98

Table 5.   Correlation Coefficient Table of Calories (Total Intake)
(1)   per capita a day

Items		30 Whole nations	21 Advanced& Midde-ad. nations	15 Advanced nations	15 Middle & Low-dev. nations
Average span of	m	.69	.20	.00	.50
human life	f	.72	.18	.17	.53
Life expectancy	m	.30	−.01	−.86	.27
at 50yrs	f	.50	.11	−.28	.47
Death rate of	m	−.18	.01	.05	−.05
the fifties	f	−.50	.18	.42	−.40
Infant death rate		−.56	−.17	.02	.08
Longevity rate	m	.75	.38	−.03	.63
	f	.73	.31	−.09	.58
Population index	m	.06	**.57**	.20	.47
of old person	f	.05	.29	.41	.35

Remarks: Gothic letters Significant at 5% level, the same correspondingly

Table 6.   Correlation Coefficient Table of Calories (Total Intake)
(2)   per capita a day

Items		28 Whole nations	15 Advanced nations	13 Middle & Low-dev. nations
Death rate	m	−.29	.01	.02
	f	−.36	.21	−.03
All Causes	m	−.67	−.21	−.49
Tuberculosis	f	−.63	.06	−.52
Vascular Lesions Affecting Central Nervous System	m	−.02	−.22	−.05
	f	.18	.01	.05
Heart Diseases	m	.73	.34	.61
	f	.75	.42	.64
Arteriosclerotic and Degenerative Heart Disease	m	.71	.28	.51
	f	.72	.35	.54

almost the same with that of the whole 30 (28) nations.

4)   As compared with above, in 15 advanced, calorie intake shows the minus correlation with life expectancy at 50 yrs (male), showed as figure 1 but the other items show no significance.   It tends to show some opposite results to the middle and low developed nations, and the correlation is sometimes very low.
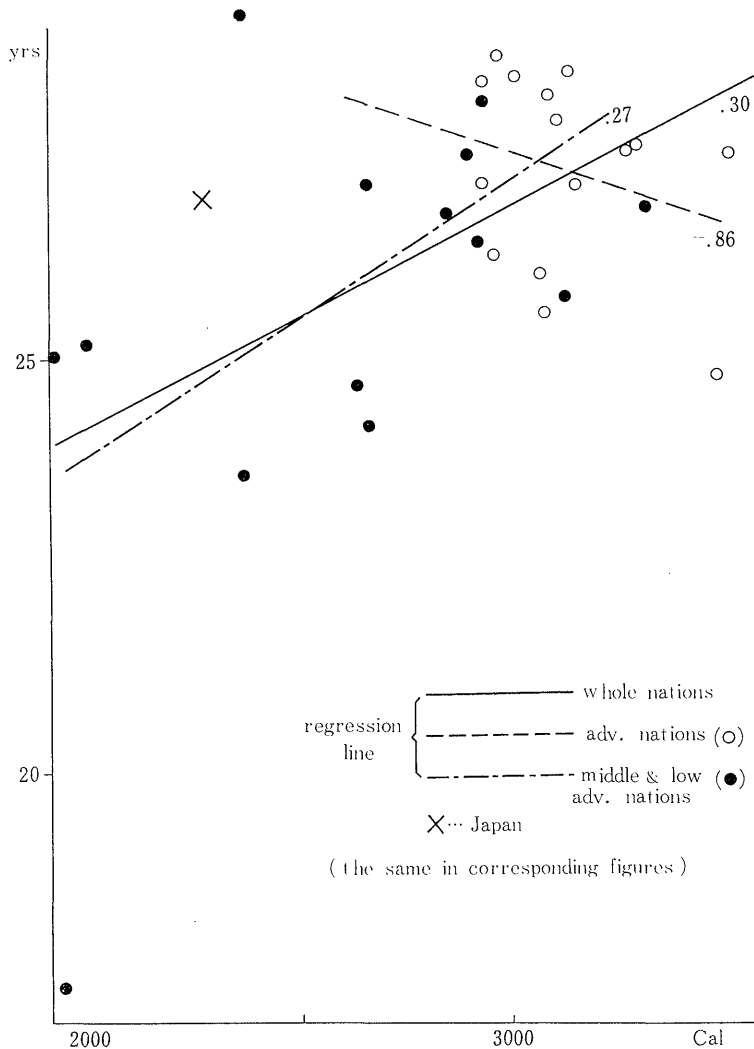

Fig. 1.   Calories (Total Intake):Life Expectancy at 50 yrs (m)

5)   The others do not show any significant correlation at 5% level

E   Correlation with the Ratio of the Animal Origin Calorie Intake to Total Calories. (Table 7, 8)

1)   In the whole 30 (28) nations, it shows the plus correlation with average span of human life (male, female), life expectancy at 50 yrs

Table 7.   Correlation Coefficient Table of Calories (Animal Origin) (1)   per capita a day

Items		30 Whole nations	21 Advanced & Middle-ad. nations	15 Advanced nations	15 Middle & Low-dev. nations
Average span of human life	m	.57	.03	−.10	.12
	f	.64	.13	−.03	.22
Life expectancy at 50yrs	m	−.10	−.28	−.09	−.76
	f	.27	−.24	−.01	−.15
Death rate of the fifties	m	−.18	.08	.40	−.04
	f	−.49	−.19	.23	−.30
Infant death rate		−.65	.03	−.15	−.05
Longevity rate	m	.74	.51	−.20	.52
	f	.72	.46	−.16	.48
Population index of old person	m	.54	.57	.17	.38
	f	.58	.46	.43	.55

Table 8.   Correlation Coefficient Table of Calories (Animal Origin) (2)   per capita a day

Items		28 Whole nations	15 Advanced nations	13 Middle & Low-dev. nations
Death rate	m	−.48	.09	−.31
	f	−.58	.08	−.44
All Causes Tuberculosis	m	−.56	−.14	−.11
	f	−.47	−.08	−.16
Vascular Lesions Affecting Central Nervous System	m	.03	−.41	.07
	f	.27	.18	.17
Heart Diseases	m	.79	.51	.39
	f	.67	.42	.33
Arteriosclerotic and Degenerative Heart Disease	m	.77	.50	.26
	f	.67	.39	.20
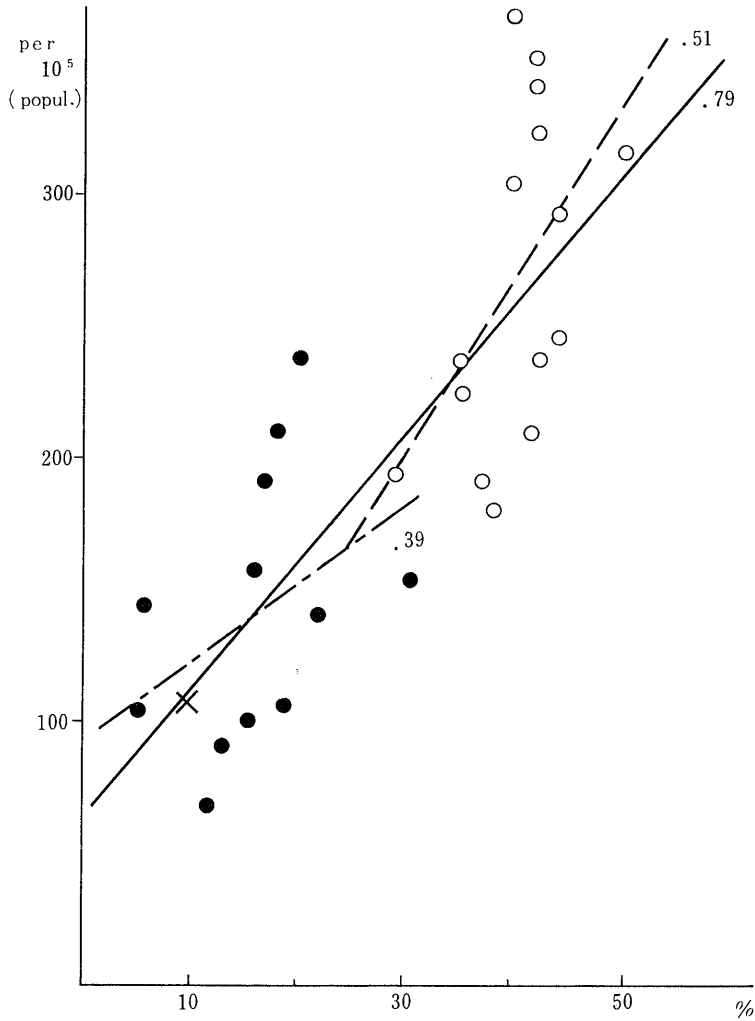
Fig. 2.   Calories (Animal Origin): Death Rates of Heart Diseases (m)

(female), longevity rate (male, female), population index of old person (male, female), death rate caused by total heart diseases showed as Fig. 2, and arteriosclerotic and degenerative heart diseases (male, female).   The minus correlation is with death rate of the fifties (male), infant death rate and with all causes tuberculosis (male, female).

2) In the middle and low developed nations, it shows the plus correlation with longevity rate (male, female), population index of old person (female), and the minus correlation with life expectancy at 50 yrs (male).   The tendency is about the same with the whole 30 nations though it is not so distinct as in the total calorie.

3) In the advanced nations, it shows the plus correlation with death

Table 9.   Correlation Coefficient Table of Protein (1)

per capita a day

Items		30 Whole nations	21 Advanced & Middle-ad. nations	15 Advanced nations	15 Middle & Low-dev. nations
Average span	m	.63	.01	−.25	.27
of human life	f	.68	.06	−.25	.56
Life expectancy	m	.18	−.17	−.24	.16
at 50yrs	f	.45	−.12	−.19	.40
Death rate of	m	−.06	.26	.92	−.00
the fifties	f	−.45	.30	.41	−.39
Infant death rate		−.46	.04	.08	.06
Longevity rate	m	.65	−.03	−.42	.71
	f	.66	.06	−.37	.66
Population index	m	.61	.44	.15	.05
of old person	f	.57	.37	.44	.05

Table 10.   Correlation Coefficient Table of Protein (2)

per capita a day

Items		28 Whole nations	15 Advanced nations	13 Middle & Low-dev. nations
Death rate	m	−.22	.23	−.06
	f	−.33	.20	−.15
All Causes	m	−.58	−.49	−.54
Tuberculosis	f	−.61	.05	.10
Vascular Lesions Affecting Central Nervous System	m	.07	−.20	.20
	f	.26	.00	.59
Heart Diseases	m	.64	.53	.58
	f	.66	.48	.53
Arteriosclerotic and Degenerative Heart Disease	m	.61	.46	.53
	f	.63	.36	.54

rate caused by heart diseases, arteriosclerotic and degenerative heart diseases (male), however, it partially shows the opposite tendency to that of the middle and low developed nations.

F Correlation with Protein (Table 9, 10)

1) In the whole 30 (28) nations, it shows the plus correlation with average span of human life (male, female), life expectancy at the fifties (male, female showed as Fig. 3), longevity rate (male, female), population index of old person (male, female), death rate caused by heart diseases showed as Fig. 4, and arteriosclerotic and degenerative
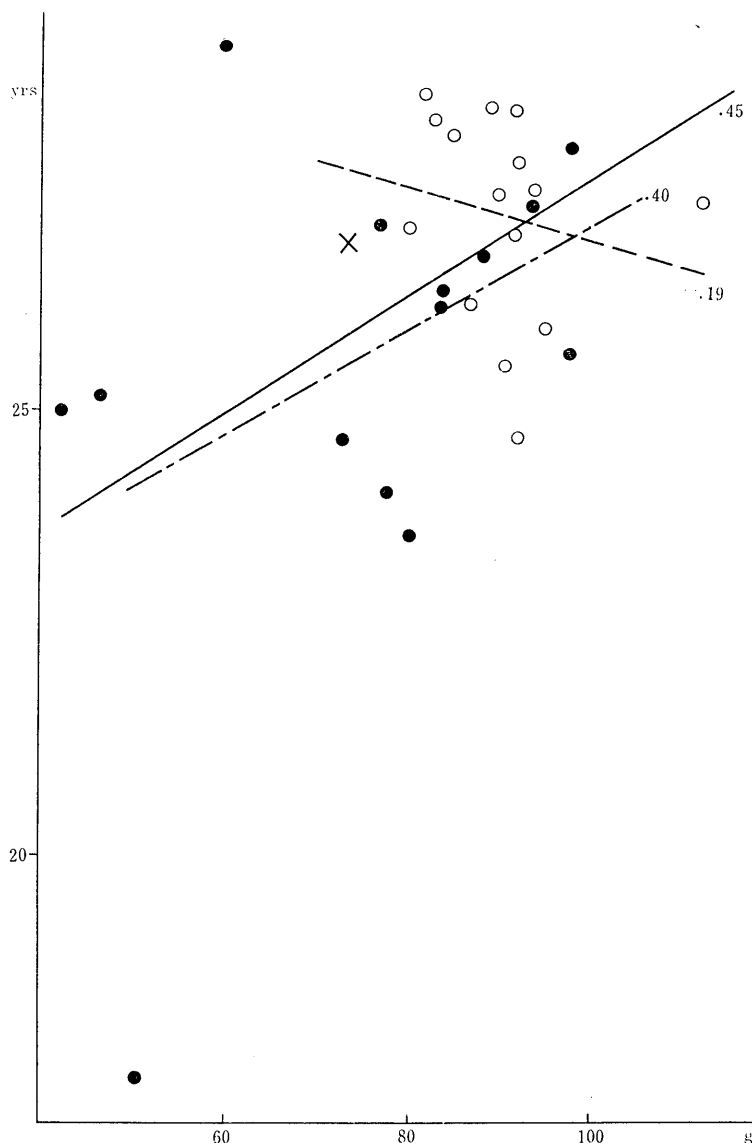
Fig. 3.   Protein:Life Expectancy at 50 yrs (f)
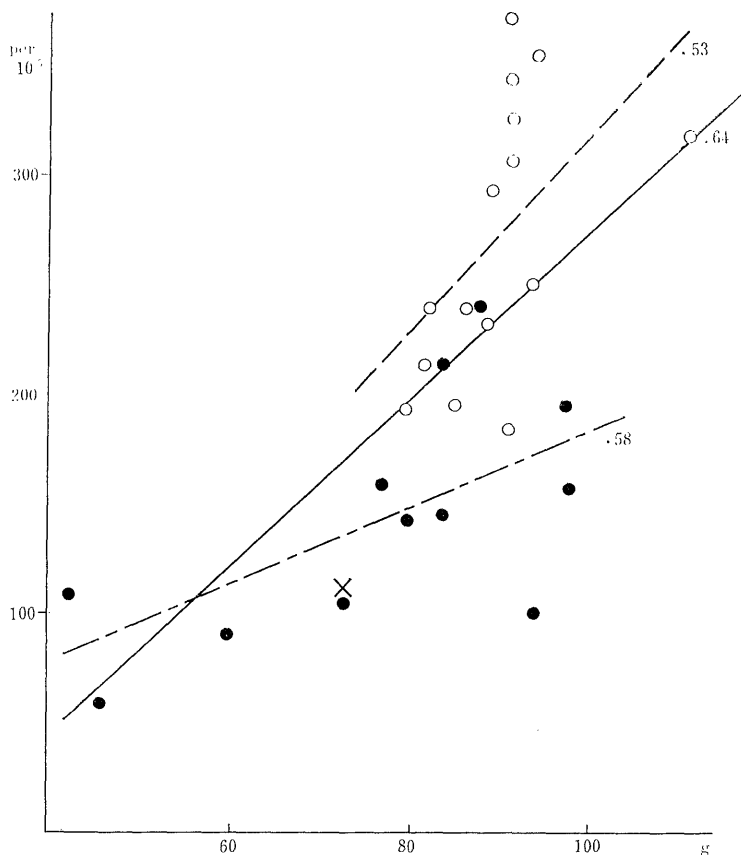
Fig. 4.   Protein: Death Rates of Heart Diseases (m)

heart diseases (male, female). The minus correlation is with death rate of the fifties (female), infant death rate, age-adjusted death rate (male, female), and of all causes tuberculosis.

2) In the middle and low developed nations, it shows the plus correlation with average span of human life (female), longevity rate (male, female), death rates caused by vascular lesions affecting central nervous system (female), heart diseases, and arteriosclerotic and degenerative heart diseases (male, female), and the minus correlation with death rate of all causes tuberculosis (male).

The tendency is about the same with the whole 30 nations except the case of population index of old person.

3) In the advanced nations, it shows the plus correlation with death rate of the fifties (male), and heart diseases (male, female), and the minus correlation with death rate of all causes tuberculosis (male). It shows the opposite tendency to the middle and low developed nations, though it shows no significance in some items.

G   Correlation with Oils and Fats Expenditure. (Table 11, 12)

Table 11.   Correlation Coefficient Table of Fats & Oils (1)

per capita a day

Items		30 Whole nations	21 Advanced & Middle-ad. nations	15 Advanced nations	15 Middle & Low-dev. nations
Average span	m	.78	.44	.46	.64
of human life	f	.80	.46	.45	.67
Life expectancy	m	.37	.30	.37	.26
at 50yrs	f	.49	.24	.15	.39
Death rate of	m	−.37	.11	−.90	−.30
the fifties	f	−.67	.41	−.44	−.56
Infant death rate		−.66	−.20	−.19	−.12
Longevity rate	m	.87	.63	−.36	.80
	f	.81	.48	.23	.71
Population index	m	.58	.55	.26	.46
of old person	f	.51	.20	−.05	.48

Table 12.   Correlation Coefficient Table of Fats & Oils (2)

per capita a day

Items		28 Whole nations	15 Advanced nations	13 Middle & Low-dev. nations
Death rate	m	−.56	−.39	−.81
	f	−.61	.30	−.45
All causes Tuberculosis	m	−.66	−.18	−.51
	f	−.61	−.30	−.54
Vascular Lesions Affecting Central Nervous System	m	.04	−.40	.11
	f	.20	−.48	.24
Heart Diseases	m	.54	−.63	.58
	f	.49	−.65	.56
Arteriosclerotic and Degenerative Heart Disease	m	.55	−.62	.50
	f	.52	−.66	.47

1) In the whole 30 (28) nations it shows the plus correlation with average span of human life (male, female), life expectancy at fifty years of age (male, female), longevity rate (male showed as Fig. 5, female), population index of old person (male, female), death rate caused by heart diseases showed as Fig.6 and arteriosclerotic and degenerati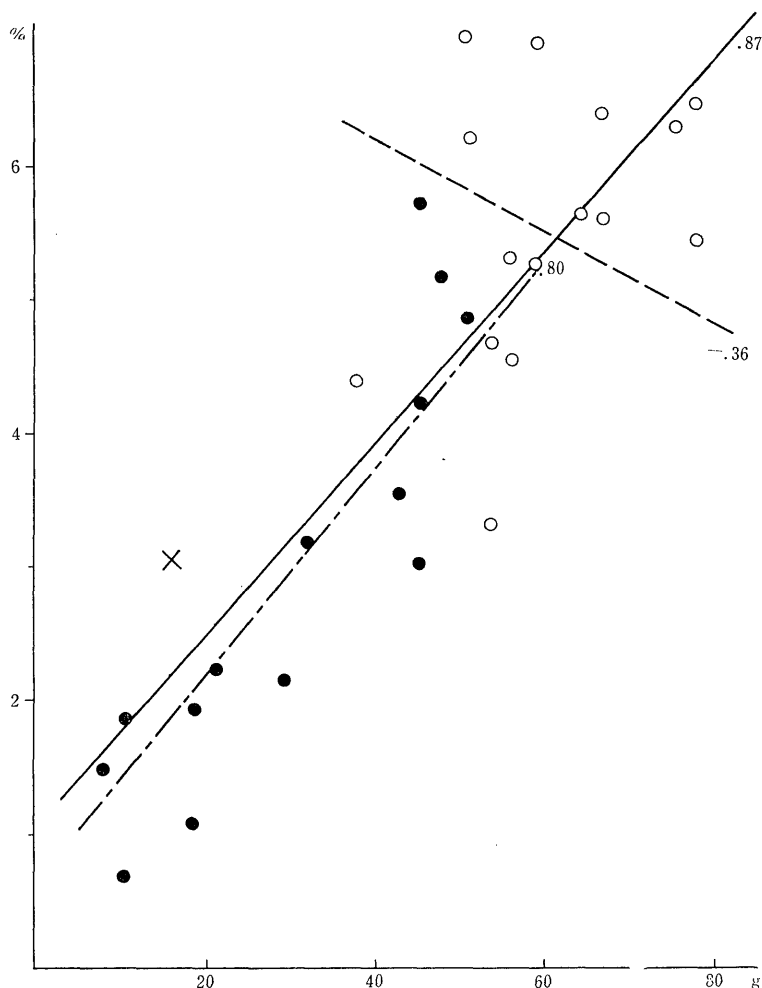ve heart diseases (male, female).   The minus correlations are with death rate of the fifties (male, female), infant death rate, age-adjusted death rate (male, female), and of all causes tuberculosis (male, female)

2) In the middle and low developed nations, it shows the plus correlation with average span of human life (male, female), longevity rate (male, female), population index of old person (female), death rate caused by heart diseases (male, female), and arteriosclerotic and degenerative heart diseases (male), and the minus correlation with death

Fig. 5.   Fats & Oils:Longevity Rate (m)
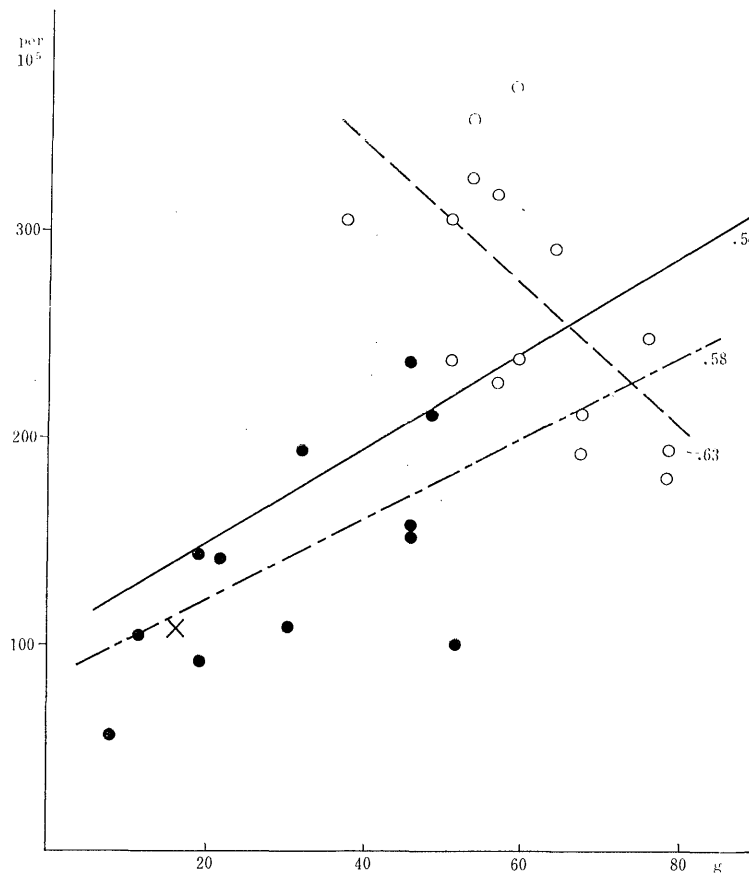
Fig. 6.   Fats & Oils : Death Rates of Heart Diseases (m)

rate of the fifties (female), age-adjusted death rate (male) and of all causes tuberoulosis (male, female).

3) In the advanced nations, it shows the minus correlation with death rate of the fifties (male, female), death rate caused by vascular lesions affecting central nervous system (female), heart diseases, and arteriosclerotic and degenerative heart diseases (male, female).

    As for heart diseases and arteriosclerotic and degenerative heart diseases, the tendency in the advanced nations is apparently opposite to that in the middle and low developed nations.

H Fats and Oils :   Expenditure and Longevity Rates and Population Index of Old Person of Each Sex.

    There is a relatively clear tendency between these items as mentioned above.   Observing the relation of them, it results that longevity rate tends to become lower whenever the intake of the fats and oils increases, and the difference by sex of this ratio (female's is higher) becomes larger according to the rise of the longevity rate
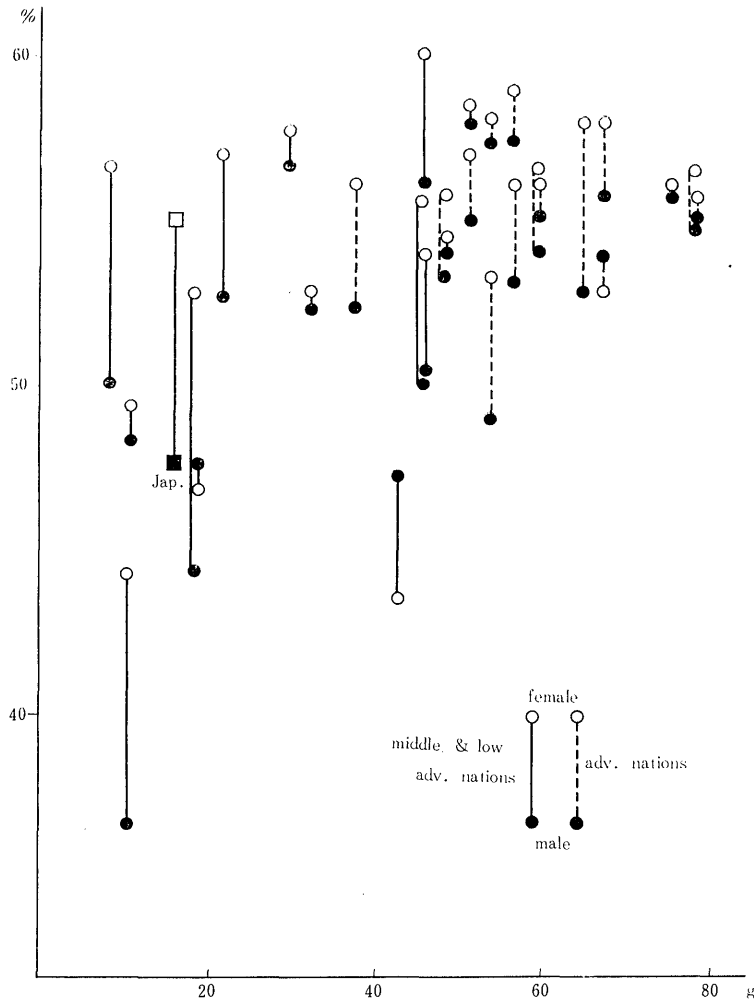
Fig. 7.   Fats & Oils : Longevity Rate (m.f)

showed as Fig. 7.   This tendency of the advanced nations is opposite
to the middle and low developed.

Concerning population index of old persen, it shows the plus
correlation in the advanced nations as well as in the other groups of
the nations.   There is a tendency that the large sex difference (female'
s is higher) becomes smaller in the nations with high percentage of
population index of old person.   That is opposite to the longevity rate
showed as Fig. 8.

Further examination is needed concerning the reasons of this
tendency.
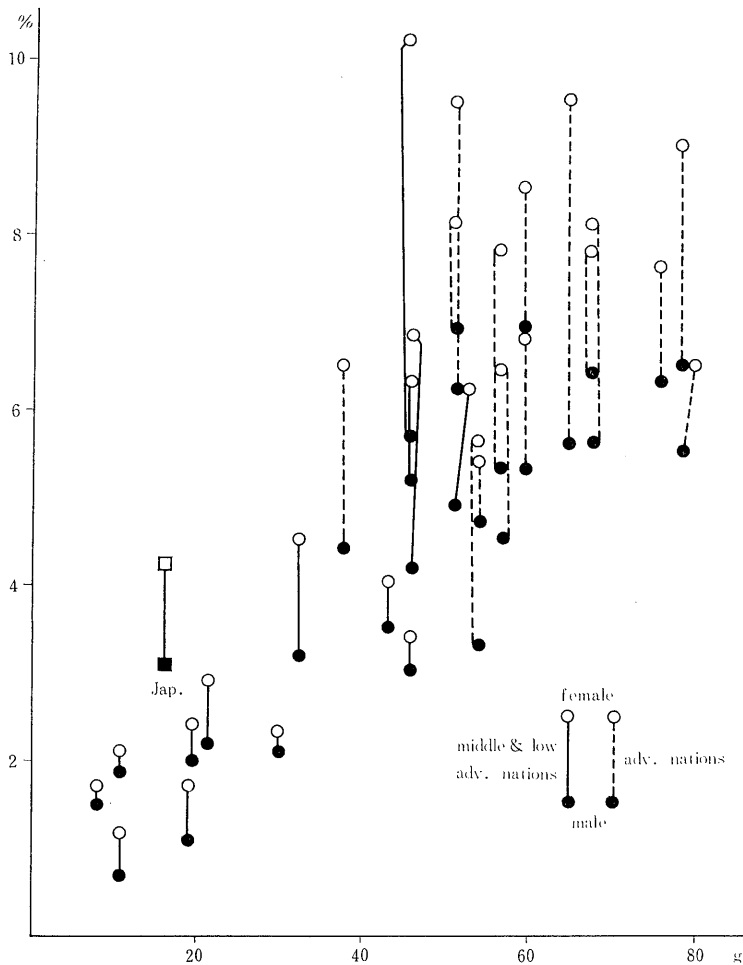
Fig. 8.   Fats & Oils: Population Index of Old Person (m.f)

I DISCUSSION

It can be summarized that the correlation of the whole nations is almost the same with that of middle and low developed.   It resulted that the nation taking much nutrition had a favorable influence upon the extension of the life span.

According to the quite reliable data of 21 advanced and middle developed nations, however, those correlations become smaller irrespective of plus and minus.   In case of dividing 30 nations into 2 groups of 15 advancad and 15 (13) middle and low developed nations, the tendency of the middle and low developed nations accords with that of the whole nations as mentioned above.   But, the tendency of the advanced nations is just opposite to it.   It means that there is a tendency of exercising a bad influence upon the extension of the life span

when the calorie intake increases.   On the other hand even when the advanced nations show the same tendency with the middle and low developed nations, the tendency of the advanced nations becomes stronger sometimes.

The point of changing or fixing the boundaries of the two, the opposite and strengthening tendency is just as shown in Figures ; around 3000 Cal. for the total calorie intake, 35-40 % for the ratio of the animal origin calorie, around 90g for protein, 50-60g for fats and oils.   The occurrence of such a converting point on the quantity of various nutritional intakes seems to suggest that not only the quantity but also the quality of the various nutritional intakes converts.   It is difficult to have a clear conclusion only with the above data. The further examination is required as to the ones which differ in sex.   Besides, as the figures used are the mean values, many sided attention are needed in order to employ this data for the nutritional education.

II   Yearly transition of Nutrition and Heart Diseases
     Death Rates in Several Nations.
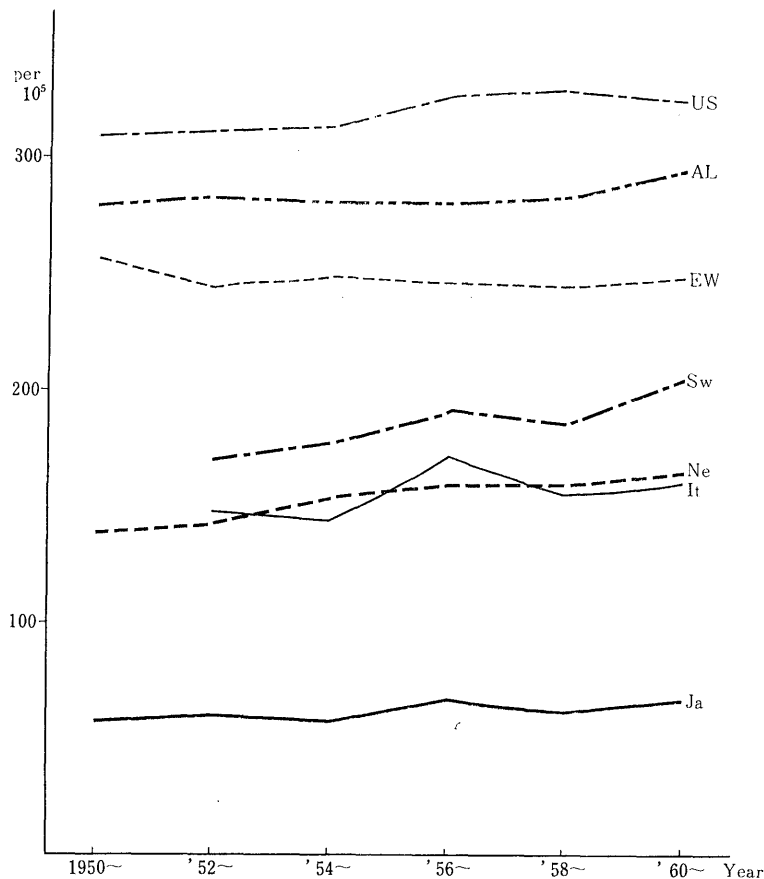

Fig. 9.   Death rates of Arteriosclerotic and Degenerative Heart Disease (m)
Remarks : US - U.S.A, AL Australia, Ew-England & Wales, Sw-Sweden,
              Ne-Netherland, It-Italy, Ja-Japan

A Subjects

Japan, U. S. A., Australia, England & Wales, Netherland, Italy

B Items

a) Nutrition

The figures show the intake of the following elements per capita a day or a year calculated during 1936,7-1963,4 : the total calorie, the ratio of the animal origin calorie, protein, fats and oils, meat, eggs.

b) Death

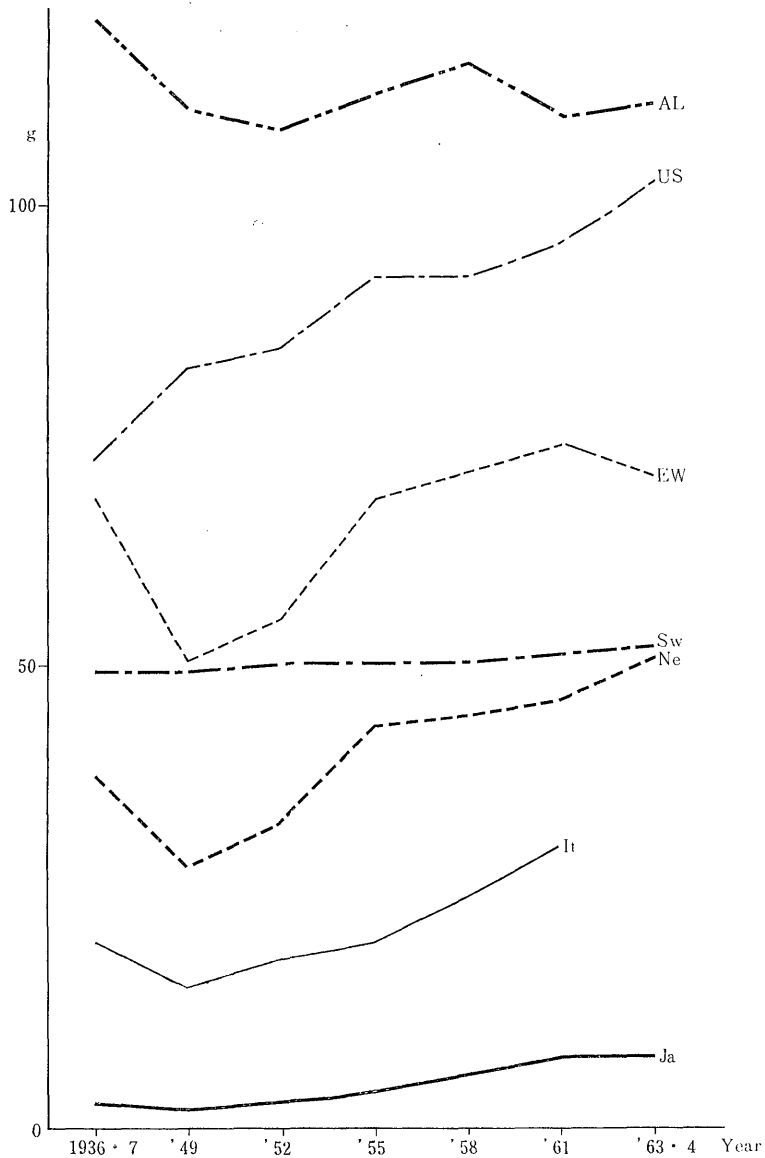Each age-adjusted death rate of heart diseases, arteriosclerotic

Fig. 10. Expenditure of Meat -per capita a day-

and degenerative heart diseases and vascular lesions affecting central nervous system, from 1950 to 1960.

C Summary of the Results

Though the death rate of vascular lesions affecting central nervous system shows apparently the opposite ranking and the yearly transition of each different country to the other various intakes, in reality there is little difference among the nations except Japan showing the high rate.   Therefore the relation between the death rate and the intakes of various nutritive elements is rather complicated to be explained.

On the other hand, the death rates of heart diseases and of arteri-osclerotic and degenerative heart diseases, a kind of heart diseases, show quite the same ranking among the nations and yearly transition showed as Fig.9.   On examining the latter, the ranking in each nation is almost the same with the order of intakes of various elements, and is especially alike to the intake of meat showed as Fig. 10.   The transition also shows very similar tendency extending over from ten
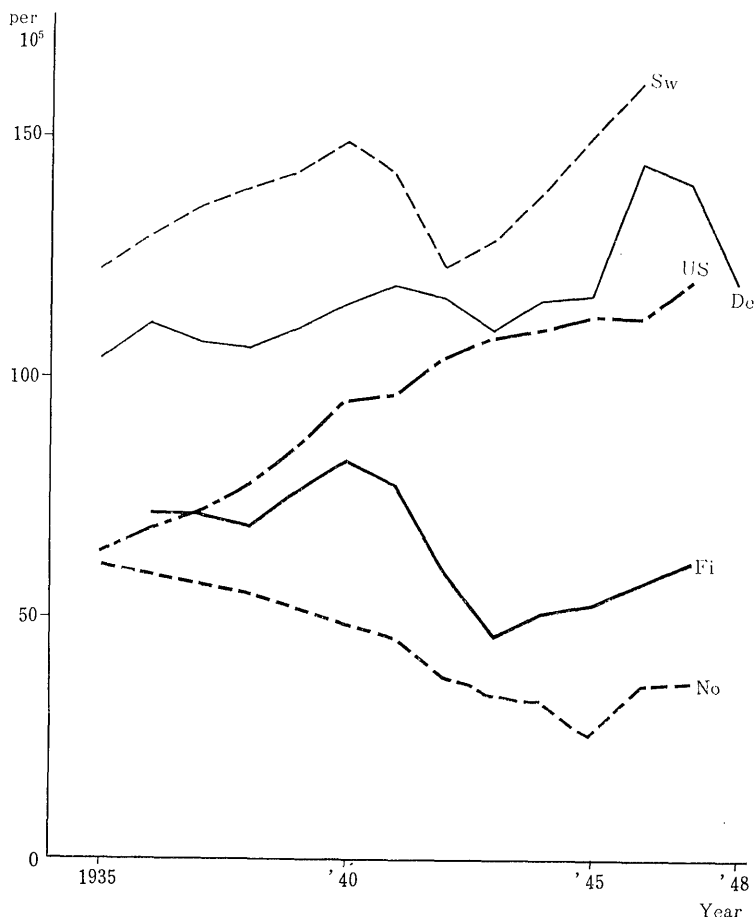

Fig. 11.   Death rates of Arteriosclerosis
Remarks : Sw-Sweden, De-Denmark, US-U.S.A., Fi-Finland, No-Norwsy

more than 20 years long.

Then we refer to MALMROS studies examining the distortion of nutritional intake after the World War II : Concerning Sweden, Denmark, Finland, Norway and U.S.A., we examined the intake amount per capita a day of the whole fat, butter, milk and eggs and the transition of death rate of arteriosclerosis including coronary heart diseases from 1935 to 1948. In such countries as U.S.A. and Denmark taking enough milk and eggs even in the War time, the death caused by arteriosclerosis increases in steady.   On the other hand, in Norway and Finland taking rather less amount of milk, eggs and butter and whose transition showing the downward curve, the death rate of arteriosclerosis went downward.   The relation mentioned above can be observed in the matter of egg typically showed as Fig. 11 and 12.   That is, the intake of eggs and the death rate of arteriosclerosis show the plus correlation among these nations within the term.

Observing the subsequent transition, it looks to trace the rising curve in accordance with the increasing of the intake after the war in
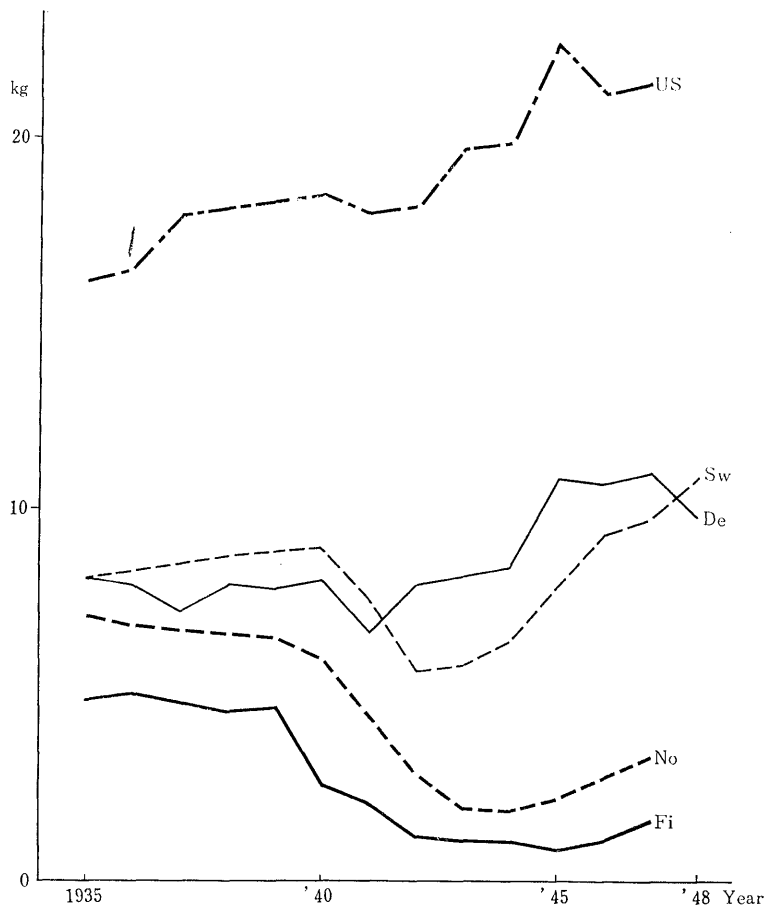
Fig. 12.   Expenditure of Eggs -per capita a year-

every country.

CONCLUSION

We tried to make the relation between the state of nutritional intake and the life span of human beings was made clear by comparing them internationally. Though the method is indirect and all-inclusive, if we observe in what way either shortage or excess of certain nutritional intake affects on the life span and the death causes, we may have a suggestion concerning the future counterplan of nutrition and foods.

The statistical data we employed here are taken from the newest leading material of life span and death, and of the expenditure per capita a day of nutrition and food in the whole 30 nations of 15 advanced, 6 middle developed and 9 low developed. And we also used the correlation among them. In the other seven nations, we compared and examined the transition of some characteristics of the two relating with the above mentioned during the period from 1936 to 1964.

On Concluding the above results :

1) Observing the correlation of nutrition and life span of both advanced and the other all nations, the tendency is almost the same with that of the middle and low developed nations. It can be concluded that in any case the more the nutritional intake is, the more favorable influence is given upon the life span.

Examining only about the advanced nations, however, it resulted that the correlations of the both were either very low or opposite to each other. It can be said that the people taking so much nutrition are having a bad influence upon the life span and death. It is especially true with the animal origin calorie and fats and oils.

Looking from this view point, it seems to suggest that there is great danger we apt to get into in case of examination, and that we should be very attentive to the situation of each different nation.

2) Generally speaking the influence of nutritional intakes upon the life span seems to change from the better or the worse at the following points.

As for the total calorie it changes somewhere around 3000 kcal per capita a day, 35-40% for the ratio of animal origin calorie, around 90g for protein, 50-60g for fats & oils. The above values, however, should not be definite. It is rather difficult to define only by the above values. The occurrence of such a converting point on the quantity of various nutritional intakes seems to suggest that not only the quantity but also the quality of the various nutritional intakes converts.

3) Observing the relation between the two in the yearly transition of 7 nations, the intakes of total calorie, the ratio of animal origin calorie, protein, fats and oils, meat and eggs pararelled well especially with

arteriosclerotic and degenerative heart diseases both in ranking by each nation and in yearly transition. Especially with intake of meat, it traces the most alike excess of ranking. This reminds us of the relation between eggs and arteriosclerotic and degenerative heart diseases which Malmros observed in the similar comparison in several nations before and after World War II.

ACKNOWLEDGEMENT

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