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Nutrient intakes of middle-aged men and women in China, Japan, United Kingdom, and United States in the late 1990s: The INTERMAP Study

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Abstract

The purpose of the study was to compare nutrient intakes among Chinese, Japanese, UK, and US INTERMAP samples, and assess possible relationships of dietary patterns to differential patterns of cardiovascular diseases between East Asian and Western countries. Based on a common *Protocol* and *Manuals* of *Operations*, high-quality dietary data were collected by four standardized 24-h dietary recalls and two 24-h urine collections from 17 population samples in China (three samples), Japan (four samples), UK (two samples), and USA (eight samples). There were about 260 men and women aged 40–59 years per sample—total *N*=4680. Quality of dietary interview and data entry were monitored and enhanced by extensive systematic ongoing quality control procedures at local, country, and international level. Four databases on nutrient composition of foods from the four countries were updated and enhanced (76 nutrients for all four countries) by the Nutrition Coordinating Center, University of Minnesota, in cooperation with Country Nutritionists. The mean body mass index was much higher for Western than East Asian samples. Macronutrient intakes differed markedly across these samples, with Western diet higher in total fat, saturated and *trans* fatty acids, and Keys dietary lipid score, lower in total carbohydrate and starch, higher in sugars. Based on extensive published data, it is a reasonable inference that this pattern relates to higher average levels of serum total cholesterol and higher mortality from coronary heart disease in Western than East Asian populations. The rural Chinese diet was lower in protein, especially animal protein, in calcium, phosphorus, selenium, and vitamin A. Dietary sodium was higher, potassium lower, hence Na/K ratio was higher in the Asian diet, especially for

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Chinese samples. This pattern is known to relate to risks of adverse blood pressure level and stroke. At the end of the 20th century, East Asian and Western diets remain significantly different in macro-and micronutrient composition. Both dietary patterns have aspects that can be regarded, respectively, as adverse and protective in relation to the major adult cardiovascular diseases. In both Asian and Western countries, public efforts should be targeted at overcoming adverse aspects and maintaining protective patterns for prevention and control of cardiovascular diseases.

Keywords

dietary patterns; macronutrients; micronutrients; international population study

Introduction

INTERMAP is a basic epidemiological investigation aiming to clarify unanswered questions on the role of dietary factors in the aetiology of unfavourable blood pressure patterns. Its general aim is—by means of an international cooperative multisample cross-sectional population study of men and women aged 40–59 years in four countries (China, Japan, UK, US)—to advance knowledge on influence of dietary factors on BP of individuals. For this purpose, 4680 participants were recruited in 1997–1999 from 17 population samples diverse in ethnic and sociodemographic background in the four countries (three Chinese, four Japanese, two UK, and eight US samples). Four 24-h dietary recalls and two timed 24-h urine specimens were collected for each participant with extensive standardized quality control.[1,2]

This report compares average nutrient intakes among Chinese, Japanese, UK, and US men and women at the country level, with a focus on possible relationships of contrasting dietary patterns to differential patterns of cardiovascular diseases between East Asian and Western countries.

Methods

Study samples and participants

At each local centre in the four countries, a population-based sample of approximately 260 persons was randomly selected from the target population (eg, community, village, city block, workplace); about 65 persons were randomly selected from each of four age–gender subgroups—men and women, aged 40–49 and 50–59 years. Extensive efforts were made to recruit a high proportion of those invited to participate. Only one person was allowed from each family to avoid the effect of similar dietary patterns among persons within one family. Substitute participants were similarly selected to replace persons who did not satisfactorily complete full data collection.

Dietary recall methods and quality control

Four standardized 24-h dietary recalls were collected for each participant on two pairs of successive days about 3–6 weeks apart. One of the dietary recalls was for a day just after a weekend of no work or a day off, to include effect of possible variation in diet during days off. At each recall, done by trained and certified interviewers, data were obtained on use of nutritional supplements. Two of the dietary recalls included collection of data on daily alcohol intake during the preceding 7 days.

Standardization and quality control of dietary interviews involved the following procedures:[2]

1. Central training and certification for all dietary interviewers.
2. 'Dry run' before start of field work, with surveillance by international and country nutritionists.
3. Use of standard food models, calibrated utensils, scales, pictures, etc. to help quantify amounts of foods consumed; collection of information from cooks in family or restaurant when participant did not cook the meal.
4. Monitoring of interviewers during field work and—for China, Japan, UK, where hard copy of the recall was made and then coded—daily local recoding of 10% of recalls; also, tape recording of all interviews and review of randomly selected tapes by Site Nutritionists according to a standard protocol, feedback to the interviewer, and timely correction of any problems found.
5. Recoding of 10% of randomly selected dietary records by the Country Nutritionist, timely feedback to the local centres, and correction of problems.

Coded dietary data were entered twice into the computer by two separate trained staff members, checked for comparability, discrepancies adjudicated, and final corrections made. Nutrient intakes of participants were calculated based on the special food table for each country. Each food table was compiled on the basis of a national food table for each country and was made comparable—based on standards for quality control of international databases—by the Nutrition Coordinating Center, Minneapolis, Minnesota.[3] The automated Nutrition Data System (NDS) from the Nutrition Coordinating Center was used for dietary interviews at US centres; reported foods and beverages consumed were entered in detail directly into a computer.

Results

Complete data sets were collected for 4680 people aged 40–59 years, 2359 men and 2321 women from 17 samples (four samples from Japan, three from China, two from UK, and eight from US) (Table 1). Mean ages of men and women were in the range48.1–49.6 and 48.6–49.2 years with small differences across countries. Average years of education were markedly lower for participants from the three rural Chinese samples, only 6.5 years for men and 4.3 years for women. US samples had the highest average years of education, 15.4 for men and 14.5 for women. For both men and women, mean body mass index (BMI) levels of Asian samples were much lower than those of Western samples, for example,22.4 and 23.7 kg/m^2 for men from China and Japan, respectively, and 27.7 and 29.1 kg/m^2 for men from UK and US, respectively.

Intake of energy, macronutrients, cholesterol, fibre

US men and women reported the highest average total energy intake; Asian samples, lower than Western samples (Table 2). There were marked differences in macronutrient composition between Asian and Western samples, reflecting differences in overall dietary pattern. Total fat provided 23.7 and 20.5% of total calories for Japanese and Chinese men; 26.1 and 19.5% for women. For UK and US samples, per cent of calories from total fat ranged between 32.5 and 33.3%. Energy provided by saturated fatty acids for Asian men and women ranged from 4.8 to 7.1%, but for Western samples from 10.6 to 12.2%. Per cent polyunsaturated fatty acids was similar across the four countries, in the range 5.9–7.0%, with omega-3 polyunsaturated fatty acid (PFA) higher for Japanese (1.3–1.4%) than others (0.5–0.8%). Owing to lower SFA for Asian samples, PFA/SFA ratio for Asian samples was higher than for Western samples (1.1–1.4 compared to 0.6–0.8). Dietary cholesterol intake was highest for Japanese and lowest for Chinese samples. Keys dietary lipid score was lowest for the Chinese, and lower for Japanese than Western samples, despite higher Japanese cholesterol intake.

Per cent energy from carbohydrate of Asian samples was higher than for Western samples (Table 2). Chinese samples had highest intake of total carbohydrate (62–68%), starch (54–59%), fiber, and lowest intake of sugars (7–9%), in contrast to 24–26% for US participants.

Intake of total protein was lowest for Chinese samples (12–13%, compared to about 16% for other samples) (Table 2). This reflected low Chinese animal protein intake (2–3%, compared to 9–10% for other samples).

Alcohol intake, uniformly higher on average for men than women, was highest for Japanese men(8.2%), in contrast to 2.7% for US men (Table 2).

Intake of minerals

Mean daily intake of sodium—as measured by timed 24-h urine collections—was higher in Asian than Western samples, highest for Chinese samples (Table 3). The opposite was true for potassium intake. Hence the Na/K ratio was higher for Japanese and Chinese than Western samples, highest for the Chinese (6.0 and 6.8, compared to 2.2–3.1 for Western samples).

Calcium intake was lower in Asian than Western samples, especially low for Chinese (only 356 and 256 mg/day for men and women) (Table 3). Magnesium and iron intake were lower for Japanese samples. Phosphorus intake was lower for Chinese samples. Chinese samples also had the lowest intake of selenium, only 28–40 mg/day, compared to 77–191 for other samples.

Intake of vitamins

Concordant with low animal protein intake, retinol intake of Chinese samples was especially low, 125 and 71 μg/day for men and women, compared to 427–555 for men and 319–425 for women from other samples (Table 4). Correspondingly, intake of total vitamin A was lowest for Chinese samples. β-Carotene intake was higher for US than other samples. Vitamin C intake was lower for Chinese and UK than other samples.

Discussion

The main findings across countries and regions from these INTERMAP in-depth dietary surveys of middle-aged nutrient intake patterns in China, Japan, UK, and USA at the end of the 20th century were: (1) much higher mean BMI, and higher energy intake, for Western than East Asian samples; (2) higher average intake of total fat, saturated fat, Keys dietary lipid score in Western than East Asian samples; (3) higher intake of sodium and lower intake of potassium in East Asian than Western samples, hence higher dietary Na/K intake by East Asians, especially Chinese. Also, calcium and phosphorus intakes were lower for East Asians than Westerners, with Chinese intakes of calcium—also selenium and vitamin A—conspicuously lower. Three other findings, on the Japanese samples—one favourable ('protective'), the other two unfavourable—were higher intake of omega-3 PFA, almost certainly reflecting greater fish intake; higher intake of cholesterol, due probably to greater egg consumption; and for Japanese men greater average intake of alcohol.

The three Chinese samples were all rural farmers, hence some of the nutrient intakes may have been lower than for populations from more developed areas of the country and from urban areas. However, they were from widely dispersed areas north to south in China, and reflected traditional dietary patterns known to be typical for the Chinese population. Similarly, the four Japanese samples, two UK samples, and eight US samples were not randomly selected from their national populations. Again, the dietary findings for them are concordant with those from recent national surveys and from FAO food balance sheet analyses for each of these three countries,[4] hence it is reasonable to infer that cross-country comparisons here of the high-quality INTERMAP nutrient data are generally valid for the countries and regions.

The differential findings in nutrient intake patterns of middle-aged East Asian and Western men and women reported here are consistent with those from many other studies in recent decades.[4–17] Thus, while multiple phenomena—for example, economic development, globalization (including of the food supply), national and international public health recommendations for CHD-CVD prevention and control—have influenced dietary trends in recent decades, and produced rapid transitions in China (and other countries),[18–20] important differences remain (albeit blunted) across East Asian and Western populations.

The foregoing summary statements are applicable also to differences across these populations in incidence of the major cardiovascular diseases. Particularly thought-provoking have been the much higher mortality rates for coronary heart disease (CHD) in Western (eg, UK, USA) than East Asian (eg, Japan) countries, and—in contrast—the much higher mortality rates for stroke in East Asian than Western countries. Table 5 gives typical data on these findings, as of the year 1970.[21] Note that CHD rates were severalfold higher for UK and US than for Japan, whereas stroke rates were about two to three times higher for Japan than for UK and USA. From 1970 to the late 1990s, these death rates—for both CHD and stroke—decreased substantially for all three countries.[21] The CHD declines were 39 and 57% for Japanese men and women, 46 and 42% for UK men and women, 64 and 62% for US men and women. The stroke declines were an extraordinary 80 and 82% for Japan, 58 and 62% for UK, 65 and 63% for USA. By the late 1990s, Japanese mortality rates from stroke were no longer grossly different from those for Western countries (Table 6).[21,22] However, newly available data for China show inordinately high stroke death rates for both men and women from both rural and urban populations, not grossly dissimilar to those for Japan in earlier decades, and three to six times higher than for UK and USA in the late 1990s. For both China and Japan, in contrast, CHD death rates were still considerably lower than for UK and USA, despite marked decline in their CHD rates during the latter decades of the 20th century. This persistence in the East Asian-Western differential in CHD has been verified by data on large population samples from the World Health Organization MONICA Study. In the late 1980s and early 1990s, incidence rates of nonfatal myocardial infarction plus CHD death were 86 per 100 000 per year for Chinese (Beijing) men aged 35–64 years, in contrast to 593 and 744 for two UK samples (Belfast, Glasgow, UK), and 349 for the US sample (Stanford); corresponding rates for women aged 35–64 years were 33, 174 and 269, 116.[22]

As is well known, the underlying pathology producing most clinical CHD is severe coronary atherosclerosis, usually of multiple arteries, and its complications, particularly thrombosis. The aetiology of the modern epidemic of severe atherosclerotic disease is adverse lifestyles, especially adverse eating patterns—populationwide diets high in total fat, saturated fat, trans fat, cholesterol, calories (for level of energy expenditure), salt, and often inadequate in protective micronutrients and fibre, and excessive in alcohol. Particularly in this dietary context, cigarette smoking and sedentary habit all too frequently add insult to injury. Excess dietary lipid is of pivotal importance, primarily because it produces rise in population average serum cholesterol and its atherogenic fractions from youth through middle age, with resultant population high average levels and high rates of dyslipidaemia. These fundamental generalizations have been over the last decades derived from a vast array of concordant evidence from research with every investigative methodology (clinical, pathologic, animal-experimental, epidemiologic, anthropologic, etc).

On the basis of this knowledge, it is a reasonable inference that the key factor accounting for persistent low CHD rates for China and Japan is the low average serum cholesterol that has prevailed throughout adulthood for both men and women.[4,7,8,23,24] Thus, in the MONICA Study in the early 1990s, mean serum total cholesterol level was 174 for both men and women in the Beijing sample, in contrast to the higher values for UK and US samples (Table 7).[21] Serial data from the PRC-USA collaborative study indicate that average serum cholesterol levels of middle-aged Chinese rose during the 1990s, as diets became 'richer' and BMI increased. Similarly, data from the Japanese–Hawaii INTERLIPID Study, ancillary to INTERMAP, published in this special number of the *Journal of Human Hypertension*, indicate that the decades-long favourable serum lipid levels of Japanese middle-aged populations—for example as reported earlier by the Seven Countries and the Ni-Hon-San Studies—may be on the way out.[17,25] Especially given the extraordinarily high smoking rates for Chinese (Table 7) and Japanese men,[17,23–26] the high average blood pressures, and the high rates of high BP, the East Asian serum lipid trend is to be regarded as a warning signal.

In terms of underlying pathology, the situation in regard to stroke is—compared to CHD—variegated and complex. Thus, only a small percentage of strokes, different from population to population, is due to atherothrombotic disease of large arteries (extracerebral and cerebral) supplying the brain. Stroke also results from haemorrhage at the base of the brain (ruptured arterial aneurysm) and deep within the brain (ruptured microaneurysm); from cerebral ischaemia due to the poorly understood 'degenerative' lesion in smaller arteries within the substance of the brain (lacunar stroke), and from embolism to brain (eg, from the heart, especially with auricular fibrillation, due to rheumatic or atherosclerotic disease; also embolism from atherothrombotic plaques of arteries supplying brain). For all the several types of stroke, high blood pressure is a prime risk factor, and cigarette smoking also enhances risk markedly.[27,28] On the other hand, serum cholesterol—not unexpectedly—relates to risk only of atherothrombotic stroke, based on data available to date (evidence is sparse on its role in lacunar and embolic stroke).

In this context, the greater East Asian intake of salt and higher dietary Na/K, especially for China, loom large as probable contributors to upward slope of BP during adulthood resulting in high average SBP/ DBP for the population from middle age on and high prevalence rates of adverse SBP/DBP levels, despite low average BMI.[9–11,16,17,29–35] For China, comparatively low intake of total protein, especially animal protein, and of calcium may also be factors playing a role in development of adverse SBP/DBP levels and high risk of strokes. In this regard, it is a reasonable inference that decades-long successful public health efforts in Japan to reduce salt intake and improve protein nutrition and dietary levels of 'protective' micronutrients probably contributed importantly to the dramatic sustained decline in stroke mortality rates of both men and women—along with efforts to detect, treat, and control prevalent high BP. It is ironic that increasing egg intake has been a key approach to improvement in protein nutrition in Japan (along with fish–shellfish intake), with resultant high cholesterol ingestion and its adverse effects on atherogenic serum lipid fractions and on CHD risk.

Conclusion

At the end of the 20th century, East Asian and Western diets remain significantly different in composition of macro-and micronutrients. Both Asian and Western dietary patterns have aspects, respectively, adverse and protective in relation to the major cardiovascular diseases. Higher saturated fat, cholesterol, and Keys score of traditional Western diets have adverse effects on serum lipids and are associated with higher mortality from CHD. Higher sodium chloride, lower potassium, higher Na/K ratio, and lower calcium of Asian diets have adverse effects on blood pressure, and apparently relate to higher mortality from stroke, especially haemorrhagic stroke. In both Asian and Western countries, public efforts must be targeted at overcoming adverse effects and maintaining protective effects of dietary patterns for West and East, for prevention and control of the cardiovascular diseases.

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Table 1

Number of participants, average age, years of education, and BMI, by country and gender

Variable	Japan		PR China		UK		US	
Men								
Number of participants	574		416		266		1103	
Age (years)	49.5[a]	(5.3)[b]	48.1	(6.0)	49.6	(5.6)	49.0	(5.4)
Education (years)	12.4	(2.1)	6.5	(2.4)	13.1	(3.2)	15.4	(3.1)
BMI (kg/m^2)	23.7	(2.7)	22.4	(2.7)	27.7	(3.9)	29.1	(5.1)
Women								
Number of participants	571		423		235		1092	
Age (years)	49.2	(5.3)	48.9	(5.6)	48.6	(5.6)	49.2	(5.4)
Education (years)	11.6	(2.0)	4.3	(2.9)	12.2	(2.9)	14.5	(2.9)
BMI (kg/m^2)	23.2	(3.1)	23.9	(3.7)	27.2	(5.3)	28.7	(6.6)

[a]Average.

[b]Standard deviation.

Table 2

Intake of energy, macronutrients, cholesterol, fibre, alcohol

Variable	Japan		PR China		UK		US	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Men								
Energy (kcal/day)	2278	428	2347	532	2470	635	2609	694
Total protein (%kcal)	15.8	2.3	12.6	2.0	15.6	3.2	15.5	3.2
Animal protein (%kcal)	8.9	2.5	2.8	2.6	9.5	3.4	10.2	3.3
Vegetable protein (%kcal)	6.9	1.1	9.8	1.4	6.1	1.4	5.0	1.5
Total fat (%kcal)	23.7	4.8	20.5	6.2	33.0	6.5	33.3	6.7
SFA (%kcal)	6.1	1.6	5.2	2.0	12.0	3.4	10.8	2.8
MFA (%kcal)	8.6	2.1	8.3	2.8	11.2	2.5	12.4	2.8
PFA (%kcal)	6.2	1.5	5.9	2.2	6.4	1.9	7.0	2.2
Omega-3 PFA (%kcal)	1.3	0.4	0.6	0.4	0.7	0.3	0.7	0.3
Omega-6 PFA (%kcal)	4.8	1.3	5.4	2.2	5.6	1.8	6.3	2.1
Trans FA (%kcal)	0.3	0.2	0.2	0.4	1.6	4.1	2.0	0.8
Cholesterol (mg/day)	446	175	218	201	299	145	348	176
Cholesterol (mg/1000kcal)	195	67	94	86	120	48	133	59
Keys dietary lipid score[a]	28.7	5.9	18.8	10.2	39.9	11.3	36.6	9.7
PFA/SFA	1.1	0.3	1.3	0.6	0.6	0.3	0.7	0.3
Total available carb. (%kcal)	52.3	*7.7*	61.8	11.5	46.6	7.2	48.4	8.1
Starch (%kcal)	35.5	8.0	54.3	11.5	25.8	5.3	22.5	5.7
Total fibre (g/day)	15.5	4.8	30.5	9.9	29.1	9.8	21.5	8.5
Estimated total sugars (%kcal)	15.8	3.9	7.1	4.6	17.9	5.2	24.3	8.0
Alcohol (%kcal)	8.2	7.2	5.1	8.0	4.7	6.1	2.7	4.8
Women								
Energy (kcal/day)	1798	325	1733	443	1827	419	1876	474
Total protein (%kcal)	16.1	2.3	12.2	1.8	16.1	3.1	15.6	3.2
Animal protein (%kcal)	8.8	2.4	2.2	2.1	10.1	3.1	10.1	3.2
Vegetable protein (%kcal)	7.3	1.1	10.1	1.2	6.1	1.4	5.3	1.6
Total fat (%kcal)	26.1	4.9	19.5	6.0	32.5	6.5	32.6	7.1

Variable	Japan		PR China		UK		US	
	Mean	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**
SFA (%kcal)	7.1	1.8	4.8	2.1	12.2	3.3	10.6	2.9
MFA (%kcal)	9.4	2.2	7.8	2.8	10.8	2.4	12.0	3.0
PFA (%kcal)	6.6	1.4	5.7	2.2	6.1	1.8	6.9	2.2
Omega-3 PFA (%kcal)	1.4	0.4	0.5	0.4	0.7	0.2	0.8	0.3
Omega-6 PFA (%kcal)	5.2	1.3	5.2	2.1	5.4	1.7	6.3	2.0
trans FA (%kcal)	0.5	0.3	0.2	0.3	1.3	0.6	1.9	0.8
Cholesterol (mg/day)	359	139	146	152	220	105	244	121
Cholesterol (mg/1000kcal)	199	67	84	85	121	49	130	58
Keys dietary lipid score[a]	31.1	6.5	17.2	10.6	40.8	10.6	35.9	9.8
PFA/SFA	1.0	0.3	1.4	0.6	0.6	0.2	0.8	0.3
Total available carb. (%kcal)	56.2	6.4	68.1	6.8	48.3	6.8	50.5	8.0
Starch (%kcal)	35.6	6.5	58.6	8.4	25.1	4.9	23.0	5.6
Total fibre (g/day)	15.8	4.8	26.1	8.5	21.4	6.4	16.7	6.4
Estimated total sugars (%kcal)	19.3	4.2	8.9	5.0	20.2	5.8	25.7	7.3
Alcohol (%kcal)	1.5	3.2	0.2	0.9	3.0	4.8	1.3	3.4

SFA, saturated fatty acids; MFA, monounsaturated fatty acids; PFA, polyunsaturated fatty acids; FA, fatty acids.

[a] 1.35 (2 SFA PFA)+1.5 $CHOL^{1/2}$, where CHOL is dietary cholesterol in mg/1000 kcal.

Table 3

Intake of minerals

Mineral	Japan		PR China		UK		US	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Men								
Urinary Na (mg/day)	4843	1302	5633	2454	3702	1180	4202	1436
Urinary Na (mmol/day)	211	57	245	107	161	51	183	62
Urinary K (mg/day)	1920	519	1506	506	2912	852	2512	839
Urinary K (mmol/day)	49.2	13.3	38.6	13.0	74.7	21.9	64.4	21.5
Urinary Na/K (mmol/mmol)	4.5	1.3	6.8	3.0	2.3	0.9	3.1	1.2
Dietary Ca (mg/day)	605	224	356	150	1013	354	882	402
Dietary Mg (mg/day)	288	68	348	117	360	97	364	115
Dietary Fe (mg/day)	11.4	3.0	18.4	5.9	14.8	4.4	19.4	7.8
Dietary Se (meg/day)	191	79	40	14	110	41	153	78
Dietary P (mg/day)	1232	285	1000	306	1556	439	1488	454
Women								
Urinary Na (mg/day)	4278	1221	4839	2084	2929	913	3272	1110
Urinary Na (mmol/day)	186	53	210	91	127	40	142	48
Urinary K (mg/day)	1891	541	1475	488	2378	582	1982	697
Urinary K (mmol/day)	48.5	13.9	37.9	12.5	61.0	14.9	50.8	17.9
Urinary Na/K (mmol/mmol)	4.1	1.2	6.0	2.7	2.2	0.8	3.1	1.3
Dietary Ca (mg/day)	607	219	256	115	843	246	699	313
Dietary Mg (mg/day)	250	58	271	100	276	67	273	87
Dietary Fe (mg/day)	9.9	2.5	13.5	4.4	11.1	3.0	14.4	5.1
Dietary Se (μg/day)	151	63	28	10	77	25	109	37
Dietary P (mg/day)	1037	243	762	258	1209	279	1100	329

Table 4

Intake of vitamins

Vitamin	Japan		PR China		UK		US	
	Mean	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Mean**	**s.d.**
Men								
β-Carotene (μg/day)	2859	1918	2667	2229	2375	1899	4025	3754
Retinol (μg/day)	427	899	125	215	553	542	510	581
Vitamin A (IU/day)	6187	4284	4865	3796	5801	3654	8420	6641
Vitamin C (mg/day)	126	81	80	41	87	56	121	85
Vitamin E[a] (mg/day)	10.4	3.0	12.4	5.0	11.2	5.1	11.4	5.4
Women								
β-Carotene (μg/day)	3100	2106	2210	1868	2018	1451	3858	3785
Retinol (μg/day)	319	428	71	109	374	294	425	464
Vitamin A (IU/day)	6229	3720	3921	3157	4611	2566	7860	6618
Vitamin C (mg/day)	132	71	75	40	85	53	100	65
Vitamin E[a] (mg/day)	9.6	3.4	9.3	3.8	8.0	3.4	8.6	4.2

[a] α-Tocopherol equivalents (ATE).

Table 5

CHD and stroke mortality rate age-standardized, 1970, men and women aged 35–74 years by country

Cause of death	Japan	PR China	UK		US
Men					
Coronary heart disease	94[a]	Not available for entire PRC population	509[b]	634[c]	652
Stroke	385		141	180	120
Women					
Coronary heart disease	47	Not available for entire PRC population	164	240	252
Stroke	225		113	158	90

[a] Age-standardized rate per 100 000 population.

[b] England and Wales.

[c] Scotland.

Table 6

CHD and stroke mortality rate age-standardized, 1994–1998, men and women aged 35–74 years by country

Cause of death	Japan 1997	PR China 1994		UK 1997		US 1998
Men						
Coronary heart disease	57	54[a]	100[b]	267[c]	349[d]	202
Stroke	79	230	251	57	80	42
Women						
Coronary heart disease	20	36	69	96	139	84
Stroke	41	151	170	44	59	33

[a]Rural.

[b]Urban.

[c]England and Wales.

[d]Scotland.

Table 7

CHD–CVD risk factor level early 1990s, men and women aged 35–64 years by country, MONICA study samples

Risk factor	Japan	PR China Beijing	UK Belfast, Glasgow		US Stanford
Men					
Serum cholesterol (mg/dl)	Not available—no MONICA sample	174	228	236	209
Systolic BP (mmHg)		131	135	133	129
Smoking (%)		64	29	41	23
BMI[a] (kg/m^2)		24.1	26.3	26.8	26.9
Women					
Serum cholesterol (mg/dl)	Not available—no MONICA sample	174	228	236	205
Systolic BP (mmHg)		130	129	126	119
Smoking (%)		9	25	41	19
BMI[a] (kg/m^2)		24.5	25.6	26.9	26.6

[a]BMI, body mass index.