ORIGINAL CONTRIBUTION

Validation of Recalled Food Intake in the Past in a Japanese Population

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To evaluate the validity of the recall method in estimating food intake in the distant past, we assessed past and current food intakes by mailed food questionnaires among 80 residents in Gifu, Japan who had answered the same questionnaire 9 years ago. We compared rank correlations and differences between recalled food intake scores and past ones with those between current food intake scores and past ones. We observed higher scores of recalled intake for meat, potatoes and alcohol, and a lower score of recalled intake for cereals than the scores of past intake. We observed increase in food intake scores of soybean products, dairy products and potatoes and decrease in that of cereals intakes from past to current. The rank correlation coefficients between the recalled and past food intake scores (r=0.24-0.89) were greater than those between the current and past ones (r=0.10-0.70) for every food item except for dairy products. After stratification by sex, age and degree of change in body mass index (BMI), the greater correlation between the recalled and past food intake scores remained. These findings suggest that the recall method is more preferable than the current data to estimate food intake in the distant past in Japan. *J Epidemiol*, 1996 ; 6 : 9-13.

food questionnaire, recall method, past food intake, current food intake, validation

In case control studies on diet and chronic diseases, we need to assess retrospectively past food intake several to ten years ago. The recalled food intake method has been frequently used in such studies, because dietary habits may change through a long time and because current food intake could be different from the past food intake. However, the recalled food intake may be influenced by subject's memory and biased. Thus, in some cases, the current food intake was used instead of the recalled food intake. There have been some reports on comparison between the recalled and current food intakes to know which is better predictor of the past food intake in Western countries[1-9]. Most of them have suggested that the recall method has the advantage over the assessment of current food intake to estimate the past food intake. No such studies have been made in a Japanese population. To investigate the usefulness of the recall method for the past food intake in Japan, we compared correlations and differences between recalled food intake and the intake assessed 9 years ago with ones between current intake and the past one using the food intake scores in a local city of central Japan. We also investigated the effects of sex, age, change in BMI on recalled food intake score.

SUBJECTS AND METHODS

From September to November in 1984, 205 persons visited a public health center in Gifu city for a health check up and completed a questionnaire concerning food intake. Nine years after the survey, in the same season of 1993, we sent these subjects the same questionnaires by mail and asked to recall food intake in 1984 and also to answer current one. The subjects were not instructed as to which they should answer first. The response rate was 41% (n=84). After excluding 4 persons who had one or more missing values, we analyzed the data of 16 men (mean age in 1993=62.0 ; SD=12.8) and 64 women (mean age in 1993=60.3 ; SD=11.6).

The questionnaire consisted of questions on frequency and

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serving sizes of intakes of 14 food items. The frequency of milk, milk products and eggs were assessed using a 4-point response, i.e., never, some time per week, once a day and more than once a day. The frequency of rice, bread, noodle, meat, fish, soybean products, green & yellow vegetables, other vegetables, fruits and potatoes were assessed using 8 categories (never to every day) ; their serving sizes were also assessed using 4 response categories (none, a little, ordinary and much). The ordinary serving sizes were indicated by gram of items. For alcoholic beverages, frequency per week and amount of drinks per occasion were asked. Based on the Food Exchange Table for Dietary Cure of Diabetes, 4th edition[10], the amount of these foods which include 80 kcal was counted as one point except for vegetables ; 300 g of vegetables=one point. We calculated food intake score per day from frequency and serving size for each of the 11 food categories : we combined milk and milk products into dairy products, and rice, bread and noodle into cereals. The food intake score is not a popular index of food intake. However, since the figures of the past data in the center were indicated by the food intake score, we use the same score in this study.

Age was classified into 2 categories (those aged <60 years old and those aged ≥ 60 years old). The difference between BMI (body mass index) in 1984 and in 1992 were divided into quartile and categorized to 3 groups : 1) decrease (<25 percentile), 2) no change (25-75 percentile), 3) increase (≥75 percentile).

We calculated median of the past food intake scores for each food category, and assessed the differences between the past and recalled food intake scores and between the past and current ones using Wilcoxon signed rank test. We also calculated Spearman's rank correlation coefficients (RCRs) between the past and recalled food intake scores, between the past and current ones and between the recalled and current ones for each food category. After stratifying the subjects by sex, age or degree of change in BMI, we assessed such differences using Wilcoxon signed rank test and calculated RCRs for each category. These analyses were carried out on a PC with the computer program SAS, Ver. 6.04[11].

RESULTS

The recalled food intake scores of meat, potatoes and alcohol were higher than the past ones (Table 1). The recalled food intake score of cereals was lower than the past one. On the other hand, current food intake scores of soybean products, dairy products and potatoes were greater than the past ones, and the current food intake score of cereals was less than the past one.

RCRs of 0.52 or over were observed between the past and recalled food intake scores of alcohol, potatoes, cereals, fish and meat (Table 2). The RCR between the past and recalled food intake scores of other vegetables was relatively low (r= 0.24). For other vegetables and potatoes, the RCRs between the past and current food intake scores were much lower than those between the past and recalled ones. The RCRs between the past and current food intake scores were similar or slightly lower than those between the past and recalled ones for the other food groups. Each RCR between the recalled and current food intake scores was the greatest except for eggs, potatoes and alcohol.

The RCRs between the past and recalled food intake scores were similar in both sexes except for vegetables and potatoes (Table 3). On the other hand, the RCRs between the past and current food intake scores of males were less than those of females except for dairy products and cereals.

The RCRs between the past and recalled food intake scores were similar in both age groups except for other vegetables (Table 4). The RCRs between the past and current food intake scores of those aged <60 years old were more than those aged

Table 1. Median (and range) of past food intake scores and median differences (and range) between the recalled and past and between the current and past intake scores

	Past intake score		Recall - Past		Current - Past	
Eggs	1.0	(0.0 ; 2.0)	0.0	(-1.0 ; 1.0)	0.0	(-1.0 ; 1.0)
Meat	0.7	(0.0 ; 2.5)	0.2**	(-1.0 ; 3.1)	0.0	(-1.1 ; 4.1)
Fish	0.9	(0.1 ; 3.0)	0.0	(-1.4 ; 2.4)	0.2	(-1.2 ; 1.9)
Soybean products	0.9	(0.0 ; 3.0)	0.1	(-1.5 ; 2.1)	0.2*	(-1.6 ; 3.9)
Dairy products	1.3	(0.0 ; 3.5)	0.0	(-2.6 ; 1.8)	0.3**	(-1.9 ; 3.8)
Green & yellow vegetables	0.2	(0.0 ; 0.5)	0.0	(-0.4 ; 0.3)	1.0	(-0.4 ; 0.4)
Other vegetables	0.4	(0.0 ; 1.0)	0.0	(-0.7 ; 0.6)	0.0	(-0.7 ; 1.2)
Fruits	0.5	(0.0 ; 1.5)	0.0	(-0.9 ; 1.2)	0.0	(-0.9 ; 1.0)
Cereals	10.7	(5.6 ; 23.0)	-1.0**	(-9.8 ; 9.6)	-2.2**	(-12.4 ; 6.4)
Potatoes	0.2	(0.0 ; 1.0)	0.1**	(-0.5 ; 0.5)	0.1**	(-0.4 ; 0.7)
Alcohol	0.0	(0.0 ; 5.8)	0.0*	(-2.9 ; 7.0)	0.0	(-3.5 ; 2.6)

* $p<0.05$, ** $p<0.01$.

Scores of recalled and current food intakes were compared with the past ones by Wilcoxon signed rank test.

Table 2. Rank correlation coefficients of food intake scores between the past (P) and recalled (R), between the past (P) and current (C) and between the recalled (R) and current (C)

	PxR	PxC	RxC
Eggs	0.48**	0.48**	0.46**
Meat	0.52**	0.45**	0.65**
Fish	0.54**	0.36**	0.61**
Soybean products	0.31**	0.27**	0.63**
Dairy products	0.38**	0.40**	0.48**
Green & yellow vegetables	0.35**	0.32**	0.61**
Other vegetables	0.24**	0.10	0.40**
Fruits	0.45**	0.33**	0.51**
Cereals	0.54**	0.50**	0.57**
Potatoes	0.55**	0.23*	0.49**
Alcohol	0.89**	0.70**	0.70**

* $p<0.05$, ** $p<0.01$.

≥60 years old except for eggs, meat, soybean products and fruits.

Subjects categorized into no change of BMI indicated stable RCRs of 0.30 or above between the past and recalled food intake scores and between the past and current ones. On the other hand, subjects who decreased in BMI indicated marginally low RCRs of soybean products, dairy products, fruits and potatoes and inverse RCR of other vegetables between the past and current food intake scores ($P<0.05$). Subjects who increased in BMI indicated marginally low correlation coefficients of meat, soybean products, vegetables between the past and recalled food intake scores.

DISCUSSION

The RCRs between the past and recalled food intake scores were generally greater than those between the past and current ones. Our results are consistent with previous studies conducted in Western countries[1-9]. The recall method may be better indicator to estimate the past food intake than the current data even in Japan. We observed low RCRs between the past and recalled food intake scores of vegetables. Although we conducted this study in the same season when the previous survey had been conducted, it might be difficult to recall the past intake of vegetables because there are many kind of vegetables which are sensitive to the seasonal weather. Greater RCRs between the past and recalled intake scores of alcohol and

Table 3. Rank correlation coefficients of food intake scores between the past (P) and recalled (R), between the past (P) and current (C) and between the recalled (R) and current (C) by sex

	PxR		PxC		RxC	
	Male	Female	Male	Female	Male	Female
Eggs	0.63	0.41	0.44	0.50	0.54	0.45
Meat	0.44	0.54	0.33	0.48	0.87	0.59*
Fish	0.54	0.54	-0.13	0.44*	0.18	0.68*
Soybean products	0.33	0.33	0.14	0.32	0.64	0.63
Dairy products	0.30	0.42	0.49	0.36	0.19	0.55
Green & yellow vegetables	0.18	0.39	-0.02	0.34	0.83	0.55
Other vegetables	0.62	0.17	0.17	0.10	0.55	0.35
Fruits	0.40	0.45	0.16	0.31	0.51	0.48
Cereals	0.50	0.56	0.64**	0.47	0.64	0.57
Potatoes	0.30	0.60	0.06	0.25	0.52	0.44
Alcohol	0.83	0.88	0.58*	0.63	0.44	0.71

Male (N=16), Female (N=64) *$P<0.05$, **$P<0.01$.
The differences between male and female were assessed.

Table 4. Rank correlation coefficients of food intake scores between the past (P) and recalled (R), between the past (P) and current (C) and between recalled (R) and current (C) by age group

	PxR		PxC		RxC	
	<60	≥60	<60	≥60	<60	≥60
Eggs	0.38	0.54	0.44	0.51	0.56	0.38
Meat	0.38	0.48	0.25	0.40	0.64	0.64
Fish	0.51	0.53	0.59	0.16*	0.67	0.59
Soybean products	0.26	0.36	0.22	0.32	0.59	0.64
Dairy products	0.38	0.34	0.45	0.32	0.48	0.44
Green & yellow vegetables	0.33	0.34	0.50	0.17	0.61	0.59
Other vegetables	0.13	0.33	0.14	0.13	0.43	0.22
Fruits	0.49	0.41	0.30	0.33	0.44	0.50
Cereals	0.59	0.47	0.50	0.49	0.65	0.46
Potatoes	0.67	0.51	0.38	0.17	0.44	0.53
Alcohol	0.86	0.91	0.82	0.55*	0.84	0.55*

Numbers by age group : <60 (<60 years old, N=34) and ≥60 (≥60 years old, N=46)
*P<0.05. The differences between <60 and ≥60 were assessed.

cereals are probably attributable to habitual or daily use of these foods[12].

The RCRs between the recalled and current food intake scores were generally greater than those between the recalled and past intake scores. These findings suggest that current food intake may influence the recall of past food intake. The influence of current intake seems to be greater as regards foods showing low correlation between the past and current intake (soybean products and other vegetables). Thus caution is needed in interpreting the recalled past intake of foods whose consumption have changed substantially over the past years.

We observed the underestimation of the past intake of cereals and overestimation of the past intakes of meat, potatoes and alcohol based on the recall method. Declining trend in intake of cereals and increasing trend in intake of potatoes among these subjects may lead to these under-or over-estimation. Underestimation of the past intakes of milk and meat which were found in Western countries[2,3,5,6] may be attributable to recommended low fat and low energy diet for prevention of some chronic diseases.

Our findings also suggest that gender does not influence on their recall ability except for vegetables and potatoes. Also age does not seem to influence much on the recall ability except for other vegetables. Increase in BMI, however, had substantial

Table 5. Rank correlation coefficients of food intake scores between the past (P) and recalled (R), between the past (P) and current (C) and between recalled (R) and current (C) by change in BMI

	PxR			PxC			RxC		
	Decrease	No change	Incerase	Decrease	No change	Incerase	Decrease	No change	Incerase
Eggs	0.48	0.45	0.42	0.57	0.35	0.52	0.54	0.33	0.50
Meat	0.65	0.54	0.10	0.57	0.45	0.21	0.63	0.78	0.23**
Fish	0.75	0.55	0.24	0.40	0.40	0.31	0.59	0.70	0.57
Soybean products	0.34	0.40	-0.00	0.16	0.33	0.23	0.53	0.73	0.43
Dairy products	0.47	0.30	0.49	0.07	0.46	0.51	0.58	0.39	0.44
Green & yellow vegetables	0.56	0.37	0.05	0.32	0.40	0.03	0.59	0.65	0.52
Other vegetables	0.05	0.38	-0.00	-0.37*	0.32	0.07	0.22	0.55	0.16
Fruits	0.41	0.53	0.33	0.10	0.46	0.29	0.28	0.65	0.44
Cereals	0.47	0.56	0.56	0.55	0.44	0.47	0.71	0.42	0.69
Potatoes	0.26	0.68	0.68	0.06	0.49	-0.07*	0.58	0.68	-0.18**
Alcohol	0.80	0.93	0.93	0.71	0.60	0.86*	0.56	0.65	0.91*

Numbers by BMI change : decrease (N=20), no change (N=40) and increase (N=20).
*P<0.05, **P<0.01. The differences were assessed as compared with the group of no change.

influence in recalling past food intakes. Increasing trend in intake of eggs, meat, dairy products and potatoes and declining trend in intake of cereals was noted in those with increase in BMI (data not shown). Krall et. al. (1988) suggested that females and younger adults recall the past intake more accurately than males and older adults[12]. Thompson et. al. (1990) found lower reproducibility of the past intake among women who reported 110% standard weight and intake of special diet, although they did not mention about the direction of bias which is caused by these factors[13].

In retrospective studies, we must consider the differences in the recalled amount of food between cases and controls which can lead odds ratios toward either direction[14,15]. Some nested case control studies suggested no differences of reproducibilities for past food intakes between cases and controls[16-22]. However, we have no such studies in Japan. We did not interview the subjects in this study. The interview method using autobiographical memory is considered to be the best way to estimate the past intake[23]. We need further studies to validate such interview method to predict the past food intake.

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