Short Communication

No association between fruit or vegetable consumption and the risk of colorectal cancer in Japan

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MATERIALS AND METHODS

The JPHC study has two population-based cohorts, and study designs are described in detail elsewhere (Otani et al., 2003). Briefly, Cohort I started in 1990 and included 40 106 subjects (19 345 men and 20 761 women) who were 40–69 years of age, lived in four Public Health Center districts, responded sufficiently to a self-administered questionnaire, and had no history of cancer (73.7% of the eligible subjects). Cohort II started in 1993 and included 48 552 subjects (23 180 men and 25 372 women) who were 40–69 years of age, lived in five Public Health Center districts, responded sufficiently to a self-administered questionnaire, and had no history of cancer (77.9% of the eligible subjects).

RESULTS

Compared with men in Cohort I in the lowest quartile of total vegetable consumption, men in the highest quartile were more likely to engage in sports and use vitamin supplements, less likely to be current smokers, and consumed higher amount of meats and fish, but lower amount of cereals. The men in the two groups did not differ with respect to age, body mass index, or the prevalence of colorectal cancer increased during 1950–2000, especially in men (73.7% of the eligible subjects). Dietary factors may play a part in this increase, but the role of fruit and vegetables remains unclear. We therefore examined the association between fruit and vegetable consumption and the risk of colorectal cancer in Japan Public Health Center (JPHC) prospective study on cancer and cardiovascular disease.
of regular drinkers. We observed similar tendencies for women in Cohort I, and for men and women in Cohort II.

We found no significant association between fruit or vegetable intakes and the risk of colorectal cancer (Table 1). Multivariate RRs (95% CI) for the highest vs the lowest quartile of intake were 0.92 (0.70–1.19) and 1.00 (0.79–1.27), respectively, based on 705 cases. We observed no association whether or not colon and rectal cancers were separated, or men and women were separated. Exclusion of colorectal cancer cases diagnosed in the first 3 years of follow-up did not change the findings materially. Stratified analyses by covariates included in multivariate models did not reveal remarkable effect modifications. Analyses based on the octiles of total fruit or vegetable consumption did not show significant associations. No individual fruit or vegetables showed significant relations with risk.

DISCUSSION

This is the first prospective cohort study of fruit and vegetable consumption and incident risk of colorectal cancer in Japan. Our results are consistent with the recent prospective studies in Western populations showing no substantial protective associations (Michels et al, 2000; Voorrips et al, 2000).

Our food frequency questionnaires had relatively small number of fruit and vegetable items and limited range of frequency categories. Nevertheless, we had observed in Cohort I an inverse association between fruit and vegetable intakes and the risk of gastric cancer (Kobayashi et al, 2002). It is therefore unlikely that failure to observe protective association was due to the crude designs of our questionnaires.

While mortality from colorectal cancer in Japan increased during 1950–2000, the average consumption of fruit and vegetables also increased during this period (42–117 and 242–311 g day$^{-1}$, respectively) (Kenko Eiyo Joho Kenkyukai, 2002). Our results, along with these time trends, suggest that low consumption of fruit and vegetables is not primarily responsible for the increased rate of colorectal cancer in Japan.

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Table 1  Pooled multivariate RR and 95% CI of colorectal cancer for total fruit and total vegetable consumption

| Quartiles of total fruit consumption | Person-years in Cohort I | Person-years in Cohort II |
|-------------------------------------|--------------------------|----------------------------|
| Lowest                              | 94,449                   | 78,632                     |
| Second                              | 95,035                   | 78,285                     |
| Third                                | 94,925                   | 78,545                     |
| Highest                              | 95,901                   | 78,303                     |

| Trend P | 64/80 | 0.40 |
|---------|-------|------|
|         | 100/85| 91/84|
| RR (%)  | 1.00  | 0.98 |
|         | 0.89  | 0.92 |
|         | 0.88  | 0.92 |
|         | 0.92  | 0.70–1.19 |
|         | 0.92  | 0.66–1.28 |
|         | 0.83  | 0.90 |
|         | 0.83  | 0.89 |
|         | 0.83  | 0.93 |
|         | 0.83  | 0.66–1.28 |
|         | 0.83  | 0.89 |
|         | 0.83  | 0.93 |
|         | 0.83  | 0.66–1.28 |

| Quartiles of total vegetable consumption | Person-years in Cohort I | Person-years in Cohort II |
|-------------------------------------------|--------------------------|----------------------------|
| Lowest                                    | 94,394                   | 78,581                     |
| Second                                    | 94,936                   | 78,766                     |
| Third                                     | 95,360                   | 78,467                     |
| Highest                                   | 95,620                   | 77,950                     |

| Trend P | 64/80 | 0.40 |
|---------|-------|------|
|         | 95/78 | 91/81|
| RR (%)  | 1.00  | 0.98 |
|         | 0.98  | 0.92 |
|         | 0.98  | 0.79–1.27 |
|         | 0.98  | 0.80–1.45 |
|         | 0.98  | 0.80–1.45 |
|         | 0.98  | 0.80–1.45 |
|         | 0.98  | 0.80–1.45 |
|         | 0.98  | 0.80–1.45 |

RR = relative risk; CI = confidence interval. *RRs have been adjusted for sex, age (5-year groups), Public Health Centre area, body mass index in kg m$^{-2}$ (less than 19, 19–22.9, 23–26.9, and 27 or more), frequency of sports (never or 1 day/month or more), smoking (never, past, and current), alcohol consumption (non, occasional, 1–149, 150–299, and 300 g week or more), vitamin supplement use, quartiles of energy, cereals, meats, and fish by each cohort. The lowest quartile serves as reference category. The numbers of colon and rectal cancers are from Cohort I/Cohort II.
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Appendix A

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