Sirs—A possible protective effect of coffee consumption on the risk of developing type 2 diabetes was suggested recently in a study by van Dam and Feskens. This finding is supported by a Japanese study, whereas no protective effect of coffee was reported in a recent Finnish study and in Pima Indians. This issue is important to study further, especially in view of the prevalent use of coffee. The aim of this study was to explore the association between coffee consumption and type 2 diabetes in a large cohort of Finnish twins, thereby taking hereditary and early childhood factors into account.

The Finnish Twin Cohort was compiled in 1975 and includes all same-sex twins born in Finland before 1958. We restricted the study population to subjects 30–60 years old at baseline as in the Dutch study (n = 10,652). Information on coffee consumption and other lifestyle factors was collected by questionnaires in 1975 and 1981. By record linkage to national registers in Finland of hospital discharges and prescribed medication, 408 incident cases of type 2 diabetes were identified during 20 years of follow-up (1976–1995) using the procedures described by Kaprio et al. To analyse the association between coffee consumption and type 2 diabetes we calculated relative risks using Cox proportional hazards. Time-dependent analyses were performed using baseline information on coffee and other lifestyle factors together with information from the 1981 follow-up questionnaire. To take the intra-pair correlation into account we included gamma frailty components analysed by S-plus. In addition, we calculated odds ratios (OR) of type 2 diabetes in coffee discordant twin pairs using conditional logistic regression analyses (SAS PHREG).

The results were compatible with a reduced incidence of type 2 diabetes in subjects consuming ≥7 cups of coffee per day, compared with subjects consuming ≤2 cups per day (Table 1). Exclusion of abstainers from the reference category resulted in a relative risk of 0.70 (95% CI: 0.49, 0.99) in subjects consuming ≥7 cups of coffee per day. When coffee consumption was analysed as a continuous variable, the relative risk was 0.89 (95% CI: 0.73, 1.08) per 5 cups of coffee per day. Analyses of coffee discordant twin pairs suggested a reduced risk of type 2 diabetes in twins with moderate or high coffee intake compared with their low-consuming siblings.

This study support findings by van Dam and Feskens of a reduced risk of type 2 diabetes in moderate and high consumers of coffee. Importantly, analyses of coffee discordant twin pairs, though based on small numbers, also supported an inverse association between coffee consumption and type 2 diabetes. These analyses have the advantage of taking into account genetic and early childhood factors that could potentially influence this association.

Overall the association between coffee and diabetes was weaker than in the Dutch study and there was no indication of a dose–response pattern. It has been suggested that the type of coffee, e.g. boiled versus filter coffee, may have bearing on possible health effects. However, in Finland as in the Netherlands, filter coffee is the predominant type. There are also other possible explanations for the somewhat weaker results of the present study. The long follow-up period: 20 years instead of 10 years as in the Dutch study, may have induced misclassification of coffee consumption. Such misclassification would tend to dilute the association between coffee consumption and type 2 diabetes and also distort a possible dose–response relationship. We tried to minimize this problem by updating exposure information during follow-up. It should also be noted that analyses based only on the first 10 years of follow-up did not change our results. Adjustment for lifestyle factors such as smoking and body mass index strengthened the association between coffee intake and type 2 diabetes. A limitation was that we were not able to take into account whether milk, cream, and/or sugar was added to the coffee. Also, diet could be related to coffee consumption as well as the risk of type 2 diabetes but unfortunately this information was not available. It is possible that more complete adjustment for lifestyle factors would have strengthened the association between coffee consumption and type 2 diabetes. Finally, our cases were identified by record linkage. This method has been shown to detect 80% of known diabetes cases but will miss cases treated by diet alone. These cases would have been included in the Dutch study as they investigated self-reported diabetes. Still, van Dam and Feskens did perform separate analyses in medication-treated cases and reported similar results as for the whole cohort.

In conclusion, our results are compatible with a protective effect of coffee consumption on the risk of type 2 diabetes. Future studies are, however, needed to further explore this issue, addressing what the possible underlying mechanisms may be.

Acknowledgements
The Finnish Twin Cohort data collection was partially supported by grants from the Academy of Finland (#51266) and the Sigrid
Table 1  Relative risk of type 2 diabetes associated with coffee consumption

<table>
<thead>
<tr>
<th>Daily coffee consumption</th>
<th>≤2 cups</th>
<th>3–4 cups</th>
<th>5–6 cups</th>
<th>≥7 cups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases per 100 000 person yearsa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative riskb</td>
<td>1.0</td>
<td>0.78 (0.55,1.11)</td>
<td>0.80 (0.57,1.12)</td>
<td>0.79 (0.55,1.11)</td>
</tr>
<tr>
<td>Relative risk adjusted for lifestylec</td>
<td>1.0</td>
<td>0.70 (0.48,1.01)</td>
<td>0.71 (0.50,1.01)</td>
<td>0.65 (0.44,0.96)</td>
</tr>
</tbody>
</table>

Coffee consumption discordant twin pairs

| Number of pairs | 22 | 6 |
| Odds ratio | 0.48 (0.18,1.19) | 0.82 (0.11,6.15) |

Questionnaire information on coffee and lifestyle factors from baseline 1975 updated in 1981.

a Number of cases by coffee consumption 1975.
b Adjusted for age and sex.
c Adjusted for age, sex, body mass index (kg/m²), education (eight categories), leisure time physical activity (MET scores), alcohol consumption (g/day) smoking (never, former, occasional, current).

References


DOI: 10.1093/ije/dyh185