Predicting long-term outcomes of Type-2 diabetes and mortality from dietary patterns and metabolite-score

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It has been widely shown that dietary intake has an effect on mortality and incidence of Type II Diabetes (T2D). Furthermore, it is known that both of these outcomes can be predicted from blood biomarkers. Since blood metabolic profile is affected by dietary intake, we aim to investigate whether diet and blood biomarkers describe mutual or distinct variation in the long-term risk of T2D incidence and mortality. This would provide us information whether blood profile is able to already describe the elevated or lowered risk that long-term dietary habits possess on mortality and T2D

For that we divide over 49 000 adults from the population-based Estonian Biobank (EB) cohort into eight mutually exclusive dietary-pattern groups using K-means clustering. These dietary groups are based on 17 items from the Food-Frequency Questionnaire. For the characterization of metabolic profile, we use previously published scores based on blood metabolites measured by Nuclear Magnetic Resonance spectroscopy. After excluding individuals with missing data, we calculated for ca 9000 individuals the T2D score developed by Ahola-Olli et al. (2019) and the mortality score developed by Deelen et al. (2019). Both scores predict well the associated outcome (either mortality or T2D), proving that these scores function for the EB cohort. We characterize the risks of dietary habits and metabolite-scores on T2D and mortality by hazard ratios from the Cox regression models. We show that the score for T2D does not attenuate the hazard ratios of dietary patterns, whereas the score for mortality dilutes the risk estimates of some dietary groups. This indicates that the metabolic score and dietary patterns describe distinct variation in long-term T2D incidence, whereas in case of mortality these two have a shared component in the variation they explain.

References:

Ahola-Olli, A.V., Mustelin, L., Kalimeri, M., Kettunen, J., Jokelainen, J., Auvinen, J., Puukka, K., Havulinna, A.S., Lehtimäki, T., Kähönen, M. and Juonala, M., 2019. Circulating metabolites and the risk of type 2 diabetes: a prospective study of 11,896 young adults from four Finnish cohorts. Diabetologia, 62(12), pp.2298-2309.

Deelen, J., Kettunen, J., Fischer, K., van der Spek, A., Trompet, S., Kastenmüller, G., Boyd, A., Zierer, J., van den Akker, E.B., Ala-Korpela, M. and Amin, N., 2019. A metabolic profile of all-cause mortality risk identified in an observational study of 44,168 individuals. Nature communications, 10(1), pp.1-8.