

Pizza made healthy – an epidemiological cookbook

Ingredients (Introduction): Large surveys, multi-cohort studies and sophisticated statistical methods lay the ground for ever-increasing quality in epidemiological research. Still, there is a concern that the quality is deteriorating – rightfully so. A common quality deteriorating practice in epidemiological studies is failure to correct for multiple testing.

Palette (Aims): There are multiple methods to correct for multiple testing, but it seems like the most common approach is to not correct at all. With the no-correction approach, the chances of drawing the wrong conclusion increase for every test you do.

Utensils (Method): Does pizza protect against cancer? is an Ig Nobel award winning paper by Gallus et al. (Intern J of Cancer, 2003) and serves as example. The pizza-cancer association was investigated for 5 cancer sites, and the results for several hypothesis tests are presented. Gallus' own conclusion is

“The ORs for all the cancers considered, and the corresponding trends, were significant, with the exclusion of those for larynx and rectum. The favourable influence of pizza on the risk of several digestive tract neoplasms [...]” Mediterranean diet and cancer risk, Eur J of Cancer Prevention, 2004, Gallus et al.

The significance Gallus' is referring to in the quote has not been subject to correction for multiple testing, but it will now.

Buon Appetito! (Results): The p-value is not a tool for disregarding interesting findings: The pizza-cancer association is present for 8314 people in this study. The question is whether the association would be present if the study were repeated with 8314 different hospitalised Italians. Regardless of the actual existence of a pizza-cancer association, we can expect to find at least one association following the statistical analysis scheme of Gallus', which makes an eventual finding uninteresting.

By applying a simple Bonferroni-correction, the new conclusion would be:

“None of the ORs were significant, but the corresponding trends for oesophagus and colon were significant.”

Nutrition value (Conclusions): The favourable influence of any food item on cancer risk will be found eventually if the statistical analyses are not conducted correctly. With proper use, statistical analysis points research in the right direction.

Preference: Oral