

Multiple Comparison Procedures

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You are what your mother eats: evidence for maternal preconception diet influencing foetal sex in humans

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Facultative adjustment of sex ratios by mothers occurs in some animals, and has been linked to resource availability. In mammals, the search for consistent patterns is complicated by variations in mating systems, social hierarchies and litter sizes. Humans have low fecundity, high maternal investment and a potentially high differential between the numbers of offspring produced by sons and daughters: these conditions should favour the evolution of facultative sex ratio variation. Yet little is known of natural mechanisms of sex allocation in humans. Here, using data from 740 British women who were unaware of their foetus's gender, we show that foetal sex is associated with maternal diet at conception. Fifty six per cent of women in the highest third of preconceptional energy intake bore boys, compared with 45% in the lowest third. Intakes during pregnancy were not associated with sex, suggesting that the foetus does not manipulate maternal diet. Our results support hypotheses predicting investment in costly male offspring when resources are plentiful. Dietary changes may therefore explain the falling proportion of male births in industrialized countries. The results are relevant to the current debate about the artificial selection of offspring sex in fertility treatment and commercial 'gender clinics'.

More than 200 citations and claim is still cited but...

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Comment

Cereal-induced gender selection? Most likely a multiple testing false positive

The recent paper by Mathews *et al.* (2008) with a provocative title ‘You are what your mother eats’ generated a lot of attention in the press and over 50 000 Google hits putting forth the genetically implausible claim that women who eat breakfast cereal are more likely to have a boy child. Their result is easily explained as chance. We will not go into other methodological issues such as recall bias and measurement errors, difficulty in measuring cumulative exposures in nutritional data, unmeasured confounders, variable categorization, statistical power and study design, as Pocock *et al.* (2004) recently reviewed the sad state of observational studies and Ioannidis (2005) reports that 80 per cent of observational studies fail to replicate or the initial effects are much smaller on retest.

questions at issue.) There was a third time period, but the authors did not present data from this period (table 2). In our first analysis, we computed 264 *t*-tests and plotted the resulting ordered *p*-values versus the integers giving a *p*-value plot, Schweder & Spjøtvoll (1982); figure 1. Some explanation: suppose we statistically test 10 questions where nothing is going on. By chance alone we expect the smallest *p*-value to be rather small. We actually expect the *p*-values to be nicely spread out uniformly over the interval 0–1. Except for sampling variability, we expect that the ordered *p*-values plotted against the integers, 1, 2, ..., 10, to line up along a 45-degree line. With this dataset, we have 264 *p*-values and the plot of the ordered *p*-values against the integers, 1, 2, ..., 264 is essentially linear. This

Motivation (though with only 40 citations since 2008)

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Allgemeine Motivation

Häufig möchte man für einen Datensatz mehrere Fragestellungen gleichzeitig beantworten. Man spricht von sog. statistischen **Mehrentscheidungsverfahren**. Beispiele:

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Typisches Problem dabei: Multiplizität

Inhalte des Seminars

Sie lernen verschiedene Verfahren zum adäquaten Umgang mit derartigen Problemen kennen inklusive der zugrundeliegenden Theorie.

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Sie lernen verschiedene Verfahren zum adäquaten Umgang mit derartigen Problemen kennen inklusive der zugrundeliegenden Theorie. Mögliche Beispiele:

- Klassische simultane Inferenz bei ANOVA-Modellen (Dunnett, Tukey, Scheffé; Union-Intersection-Prinzip)
- Allgemeines Abschlussprinzip
- Bonferroni-Holm
- Allgemeine Step-Up und Step-Down Verfahren
- FDR- und FDP-Verfahren (Benjamini-Hochberg, Benjamini-Yekutieli)
- Semi- und nichtparametrische Verfahren für Kontraste
- ...

Regularien und Voraussetzungen

- **Studiengänge:** B.Sc. Statistik, B.Sc. DS, M.Sc. Statistik, M.Sc. DS
- **Sprache:** Deutsch; man darf aber auch auf Englisch vortragen
- **Voraussetzung:** Wahrscheinlichkeitsrechnung (bestanden) sowie Schätzen und Testen (wenigstens belegt)
- **Durchführung:** Als Blockseminar, voraussichtlich in der letzten August Woche
- **Benotung:** Vortrag und Folien (Notenbonus für gute Diskussionsteilnahme)
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