

Issues with Interpretations of the Statistical Results of *The China Study*

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The grandiose study conducted by Cornell and Oxford healthcare departments with the support of the government of the People's Republic of China in the late 1970s and 1980s became one of the most successful projects in epidemiology and a great treasure for public health care. Yet, despite all of the merits of the study, the content of the book written by one of its leading figures T. Colin Campbell titled *The China Study* became both the most sensational and informed bestseller of dietary literature and one of the most controversial volumes in the field. Such a state of affairs resulted from the fact that, while 'the China Study' itself is as perfect as it could get within the field of dietary theory in terms of sampling, methodological purity, and statistical analysis, the interpretation provided in *The China Study* book appears to be far beyond the established scientific discoveries and thus oversells the reliability of statistical correlation as an indicator for causal relations.

The Cornell-Oxford-PRC study was intended to be a methodological 'Grand Prix' of nutrition-caused heart diseases. The only study in epidemiology that was comparable to it in terms of statistical ingenuity, scale, and presumed importance was the 'British Doctors' Study' that was launched in the 1950s. During that study, Richard Doll and Austin Bradford Hill discovered an indisputable correlation between smoking and lung cancer—a revelation that later was supported by physiological modeling of cancerogenesis as triggered by nicotine (Mukherjee, 2011). The Cornell-Oxford-PRC study strove for even greater methodological purity and thus was organized as a longitudinal study that included 65 samples, each including 100 people from 65 Chinese rural counties with a total number of 6500 participants. The rationale behind this

choice was that the given counties were internally homogeneous in terms of population diversity, and the rate of migration between them was low while dietary preferences significantly differed. This made rural China a perfect object for an epidemiological study in nutrition, as it could possibly match the boundaries of research ethics.

While the investigation itself was a success in terms of conduction and it arrived with important discoveries on relations between food consumption and the risk of diabetes, the resulting statistic correlation was nowhere near as strong as in British Doctors' Study, and many parallels that were found there are supported by physiological models. Despite this, one of the chief engineers of the study, T. Colin Campbell, presented many questionable correlations in a rather confident manner within his bestselling book *The China Study* (2006). The book is most famous for its leading claim on a strategy of minimizing the risks of diabetes, heart diseases, as well as cataracts, Alzheimer's, cognitive dysfunction, osteoporosis, and many others, that is presented as a conclusion derived from multiple-variable modeling on the entire sample:

“All of these diseases, and others, spring forth from the same influence: an unhealthy, largely toxic diet and lifestyle that has an excess of sickness-promoting factors and a deficiency of health-promoting factors. In other words, the Western diet. Conversely, there is one diet to counteract all of these diseases: a whole foods, plant-based diet.” (Campbell, Campbell, 2016, p. 110).

It is this conclusion that spawned the initial praise for *The China Study* in mass media, yet ultimately led to the biggest controversy in the 21st century academic nutrition studies.

The claim produced by Campbell is rather complex and is predicated on the inference that ‘Western diseases’ can be predicted as a function of the ‘Western diet’. Campbell defines a set of Western diseases that includes coronary heart diseases, leukemia, colon cancer, as well as breast, lung, stomach, liver, and lung cancer (pp. 228-229). As for the set of the Western diet, it includes refined foods, added salt, and added fats (p. 242). An obvious methodological issue with a claim of such grandiose scale is that it cannot be inferred from statistical analysis alone. The principles of scientific discovery currently accepted by the scientific community—ones that include statistical framework as a research tool for epidemiological purposes—are hesitant when making universal claims from studies that are not corroborated by evidence from studies on alternative samples or studies performed via methods of different disciplines (Popper, 2005, pp. 264-267). This notion is especially relevant for descriptive studies that are performed in an uncontrolled environment, and the Cornell-Oxford-PRC study precisely fits in this category.

However, issues of *The China Study* are not limited to its main claim being unjustifiably oversold. Some partial claims that are included in the main claim appear to be disputable at best. Arnold (2011) provides a positive assessment of each and every interpretation of the statistical inference provided in *The China Study*. In opposition to it, Cordain (2008) launched a prolonged debate with Campbell & Campbell, arguing that their interpretation of the data contradicts basic insights from the field of the evolutionary theory of nutrition. According to Cordain (2008), “Animal protein, when added to diets already containing 10% protein, has the potential to promote the development of a wide variety of serious and oftentimes fatal diseases. ... It just so happens that 10% dietary protein is the same level that is typically found in a diet of varied

whole plant-based foods” (p. 25). This insight not only contradicts the dietary advice proposed in *The China Study*, but also ultimately makes all the inferences regarding plant-based diet potentially fallacious. T. Colin Campbell answered to the criticism by launching a debate on the spread of dietary protein in plant-based food, and until today this discussion remains one of the leading academic debates on the correctness of *The China Study*.

To conclude, *The China Study* is based on the solid data and a deep understanding of the statistical method, yet it failed to be properly discussed and corroborated in a scientific debate before its publishing. Despite the claims of the published book being too bold, T. Colin Campbell remains a glorified scholar for his participation in the original study, and his credentials as a scientific conductor and an expert in the epidemiological exploration of protein and a statistician. However, in the case when the bold conclusions proposed by Campbell and Campbell turn out to be fallacious, the immense popularity of the book will ultimately lead to misinformation being spread across a wide audience. As a result, *The China Study* still has a chance to be a correct and useful interpretation of the Cornell-Oxford-PRC study. Yet, for now, it seems more like a case of overselling the reliability of statistical correlations.

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