

A robust test for X-chromosome genetic association accounting for X-chromosome inactivation and imprinting

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Abstract

The X chromosome is understood to play a crucial role in many sex-specific diseases. However, only a couple of single-nucleotide polymorphisms on the X chromosome are found to be related to diseases. Compared to the autosomes, conducting association tests on the X chromosome is more intractable thanks to the difference within the number of X chromosomes between females and males. On the opposite hand, X-chromosome inactivation takes place in female mammals, which may be a phenomenon during which the expression of 1 copy of two X chromosomes in females is silenced so as to realize an equivalent organic phenomenon level as that in males. additionally, imprinting effects could also be associated with certain diseases. Currently, there are some existing approaches taking X-chromosome inactivation under consideration when testing for associations on the X chromosome. However, none of them allows for imprinting effects. Therefore, during this paper, we propose a strong test, ZXCII, which accounts for both X-chromosome inactivation and imprinting effects without requiring specifying the genetic models beforehand. Simulation studies are conducted so as to research the validity and performance of ZXCII under various scenarios of various parameter values. The simulation results show that ZXCII controls the sort I error rate well when there's no association. Furthermore, with regards to power, ZXCII is strong altogether of the situations considered and usually outperforms most of the prevailing methods within the presence of imprinting effects, especially under complete imprinting effects.

Biography

Dr. Ji-Yuan Zhou is the Professor of Biostatistics and Associate Director in the Department of Biostatistics, School of Public Health and Tropical Medicine, Southern Medical University, Guangzhou, China. After earning his Ph.D. in statistics from the University of Hong Kong in 2009, Dr. Zhou joined the faculty in the Department of Biostatistics at Southern Medical University in 2010, and was promoted to Professor with Tenure in 2014. From September 2008 to January 2009, he visited the Ohio State University, as a visiting scholar. Dr. Zhou's research interests are in statistical genetics, genetic epidemiology, and health statistics. He has authored/co-authored over 20 journal articles and co-edited a book. He is the Co-Associate Editor of Global Journal of Epidemiology and Public Health, the Editorial Board member of International Journal of Statistics in Medical Research and serves as Reviewer for American Journal of Epidemiology and Journal of Genetics currently. He is also the principal investigator of two National Natural Science Foundations of China. E-mail address: zhoujiyuan5460@hotmail.com