Biometrics-2013

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Biometrics & Biostatistics

June 10-12, 2013 Hilton Chicago/Northbrook, USA

Gene-environment interaction studies with measurement error– Application in CODING study

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Abstract

It is now well known that obesity leads to a number of metabolic and chronic diseases that affect a large portion of the population. Obesity is also associated with a higher incidence of psychological problems, decreased productivity, and lower educational and professional attainment. Rates of obesity and overweight are increasing for youth in Newfoundland & Labrador and are, along with adult rates, the highest among the Canadian provinces. Based on a study in 2005 by Statistics Canada, a large proportion of Canadian adults were overweight (35%) or obese (24%). Newfoundland and Labrador had the highest overweight rate (37%) in Canada.

This complex trait is determined by multiple genetic and environmental factors that interact with one another in complicated ways. The existing studies examine such factors under the assumption that they are measured accurately. In reality, both genetics and environmental factors are likely measured with errors. Measurement and/or misclassification (genotyping) error can influence the results of a study. The impact of ignoring these errors varies from bias and large variability in estimators to low power or even false-negative results in detecting genetic associations.

Motivated by the Complex Diseases in the Newfoundland population: Environment and Genetics (CODING) study, we propose a Generalized Quasi-Likelihood estimation method when both environmental and genetic factors are subject to error. Using simulation studies, we investigate the finite sample performances of the estimators and show the impact of measurement error and/or misclassification in the covariates, on the estimation procedure. The method is applied to the CODING data.

Biography

Abarin has completed her Ph.D in Statistics from University of Manitoba and postdoctoral studies from Samuel Lunenfeld Research Institute, at Mount Sinai Hospital, in Toronto. She is currently an assistant professor at the Department of Mathematics and Statistics at the Memorial University in St. John's, Newfoundland. Prior to her study in Canada, for over 9 years, she served as a senior statistician, and a deputy director, at the Statistical Center of Iran. She participated in designing and planning many sampling surveys and three national censuses, developing the national input-output tables, consulting researchers, and training many statisticians and graduate students.