區位推論的統計模型：
發展、比較與評估*

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　　所謂「區位推論」，為當研究者可得資料為集體層次，而研究旨趣與目的是個體層次關聯性，因而產生研究目的與資料分析單位層次不相符之情形。如何運用適當的統計方法與程序，從已知的總體集合資訊推估未知個體層次關聯性，即是區位推論首要關注的問題。

　　本文的主要目的，在於回顧區位推論模型的發展歷程，同時比較幾個主要區位推論模型在估計上的表現。筆者首先回顧了區位推論模型的發展，以 Goodman 迴歸、King EI 模型以及階層模型為例，說明這三種主要的區位推論模型於統計元素上的特點。接著，運用模擬實驗的研究設計，筆者嘗試評估三者模型在「不偏性」與「有效性」統計性質的表現。在比較不同已知資訊分佈型態後，本文的模擬實驗結果顯示，在放寬估計係數的機率分配假定、置入較精確的函數形式以及更為彈性的階層結構後，Wakefield 的階層模型具有較佳的估計性質，同時也能有效的矯正極端值的估計。

關鍵字：計量方法、區位推論、貝式統計

The Statistical Approaches of Ecological Inference: A Brief Review, Comparison and Evaluation of Three Main Models

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ABSTRACT

The ecological inference problem arises when people make inferences about individual behavior from aggregate data. While this approach proves useful when individual information is inadequate, scholars should make inferences for unknown individual associations based upon observable aggregate information. Therefore, how to generate unknown individual associations accurately is what methodologists need to focus on making ecological inference.

To address the concerns addressed above, this paper intends to evaluate the major models used for ecological inference, by constructing a series of simulation experiments based on a real case and testing the model performances upon there. Firstly, the author briefly reviews the development of statistical approaches for making ecological inference, and discusses the statistical properties of three main models (Goodman's regression, King's EI model and Wakefield's hierarchical model). Secondly, the author tests the performance of different models through simulations, and compares the model estimations with the true value generated from plenty of survey data. Finally, the author concludes that the hierarchical model performs best in predicting quantities of interest about different individual associations, by relaxing the distributional assumption, and imposing a more exact functional form as well as a more flexible hierarchical structure.

Key Words: quantitative method, ecological inference, bayesian
statistics