

## 报告 20

大数据在医疗与健康管理的應用研究

### **Multivariate Longitudinal Hidden Markov Latent Variable Models for the Management of Episodic Process of Cocaine Addiction**

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#### 报告摘要 **Abstract**

Cocaine addiction is chronic and persistent, and has become a major social and health problem in many countries. Existing studies have shown that cocaine addicts often undergo episodic periods of addiction to, moderate dependence on, or swearing off cocaine. Given its reversible feature, cocaine use can be formulated as a stochastic process that transits from one state to another, while the impacts of various factors, such as treatment received and individuals' psychological problems on cocaine use, may vary across states. This article develops a hidden Markov latent variable model to study multivariate longitudinal data concerning cocaine use from a California Civil Addict Program. The proposed model generalizes conventional latent variable models to allow bidirectional transition between cocaine-addiction states and conventional hidden Markov models to allow latent variables and their dynamic interrelationship. We develop a maximum-likelihood approach, along with a Monte Carlo expectation conditional maximization (MCECM) algorithm, to conduct parameter estimation. The asymptotic properties of the parameter estimates and statistics for testing the heterogeneity of model parameters are investigated. The finite sample performance of the proposed methodology is demonstrated by simulation studies. The application to cocaine use study provides insights into the prevention of cocaine use.