A System-level Multi-center Quantitative Approach to Optimize Healthcare Providers' Screening Behavior for Improved Quality of Care

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Abstract

Domestic violence is a significant public health issue. Routine health screening is a cost-effective strategy to reduce the harmful physical and mental consequences after the violence occurs. However, existing research finds consistently low rates of violence screening offered by healthcare providers, e.g., nurses, nurse practitioners, physicians. There is a critical need for research that helps understand how providers' screening behavior is impacted by their intentions of screening, demographics, workload, and practice environment of the health center which they work in. However, much of the existing research in this field is empirical and qualitative. Two recent studies, Health Care Providers (HCP) study and American Association of Nurse Practitioners (AANP), involved quantitative data collected to measure providers' screening behavior and intention, and multi-level impacting factors including providers' demographics and work experience at individual level and characteristics of practice environment at organizational level. The data have many challenging properties such as multi-level and multi-source, which make existing statistical machine learning and data analytics models inadequate. The proposed research develops a novel system-level multi-center structural equation model (SEM) to fuse AANP and HCP data and integrated both datasets to examine how providers' behavior are related to their intentions, demographics, workload, and practice environment. The innovative multi-center SEM enables joint estimation across multiple datasets and leverage information collected from multi-sources, which greatly improves power in statistical analysis. The knowledge and insights generated from our study could facilitate the design and optimization of health professional training, workload assignment, and practice environment, which leads to improved providers' performance and quality of care in healthcare systems.

Keywords

Healthcare performance improvement, quality of care, structural equation modeling, multi-center data analytics

Biography / Biographies

Lan Jiang is a second year Ph.D. student in Systems Science and Industrial Engineering at State University of New York at Binghamton. She earned B.S. in Management from Shanghai Finance University in China and Master of Business Administration in both Supply Chain Management and Business Analytics from School of Management at State University of New York at Binghamton. Lan's research focuses on developing advanced data analytics methods, optimization algorithms and machine learning approaches for quality and performance improvement of complex engineering and healthcare systems.

Melissa Sutherland is a family nurse practitioner and has trained as a sexual assault nurse examiner (SANE) with expertise in interpersonal violence and quantitative research methods (specifically survey methodology). Her interpersonal violence work has evolved to include individual, dyad- and macro-level factors that influence interpersonal violence and violence screening. She has been the PI for three extramurally funded and other funded projects in the U.S. and Chile.

Bing Si is an Assistant Professor in Systems Science and Industrial Engineering at State University of New York at Binghamton. She received her B.S. in Mathematics from University of Science and Technology of China and an M.S. and a Ph.D. in Industrial Engineering from Arizona State University in 2014 and 2018, respectively. Bing's research focuses on developing data analytics and statistical learning methodologies to support health care decisions in diagnosis, prognosis, treatment, and care delivery. Her research has been applied to a number of disease domains including Alzheimer's disease, migraine, and traumatic brain injury. She has experience collaborating with medical professionals in Mayo Clinic, ASU School of Nursing and Health Innovation, and the medical school at Technical University of Munich, Germany. She is a member of IISE, INFORMS, and IEEE.