

National Science Foundation Faculty Early Career Development (CAREER) Program
Michael P. Johnson
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“CAREER: Public-Sector Decision Modeling for Facility Location and Service Delivery”

Project Summary
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This proposal to the CAREER program is intended to enable research and teaching that will make fundamental contributions to the theory and practice of public sector operations research. This plan addresses design, implementation and evaluation of models for public-sector facility location and service delivery. Through development of novel benefit and cost measures, planning models that are realistic yet tractable, efficient solution algorithms, output visualization techniques and economic incentives to stakeholders, the proposed plan will advance fundamental understanding in public-sector operations research. In addition, collaborations with client-serving agencies will yield datasets to enable model validation and sensitivity analysis and understanding of policy implementation to form the basis for practitioner decision support.

The proposed research and teaching in public-sector facility location will focus on location of subsidized housing in metropolitan areas and allocating community services to the elderly and homebound. These projects share a number of characteristics. First, the operations research/management science literature regarding model development, implementation and evaluation in these areas is relatively underdeveloped. Second, generation of specific policy strategies requires multi-objective math optimization in combination with multi-criteria decision theory. Third, new research is required in the area of outcomes measurements, in particular benefit-cost analysis and equity impact assessments, such as effects on criminal offending of location of subsidized housing, and economic incentives to stakeholders who may be reluctant to act in ways that optimize social welfare. Fourth, math optimization models that have been proposed for these combinatorial optimization problems do not yet have efficient solution algorithms, and decision-theoretic models must be identified that balance theoretical rigor and ease of use by untrained individuals. Fifth, both problems require innovative visualization techniques to enable decisionmakers to better understand the problem context and choose between alternative solutions. Last, both projects motivate the development multiple-stakeholder spatial decision support systems.

The research and teaching proposed in this document share common motivations. Most really interesting public-sector problems are multi-disciplinary. I expect that my research and teaching will: emphasize the role of social science in justifying modeling assumptions, demonstrate the importance of qualitative and quantitative data from actual client-serving organizations for model creation, validation and sensitivity analysis, incorporate the values of multiple, competing stakeholders, and leverage information technology so that less-technical end-users may use these models directly. Also, the policy problems I intend to address disproportionately affect minority and low-income communities, yet the views of these communities are insufficiently reflected in the policies intended to solve these problems. In particular, I hope that my teaching and research will enable under-represented minorities to be increasingly represented as stakeholders, analysts and decisionmakers. In addition, I hope that my work can assist academic researchers in working with non-experts to address many difficult issues through discussions about values, analysis to identify decision alternatives and their benefits and costs, explicit considerations of tradeoffs between alternatives, and incentives to implement a chosen alternative.

Quantitative planning for provision of subsidized housing has been the primary focus of my academic research to date and it likely to remain so. This work has, however, motivated a broader interest in public-sector service provision. It has also reinforced a desire to perform academic research that is relevant to decisionmakers, and to design academic courses that provide the broadest possible exposure to prescriptive quantitative public policy techniques. My primary goal as a CAREER fellow will be to acquire, and teach others how to acquire, domain knowledge—primarily social science-based knowledge of effective policy interventions—and to use this domain knowledge to design theoretically sound, multi-disciplinary decision support methodologies that make the link between “what works” and “how to get it done.”