

11-24-2010

# Decision Models for Foreclosed Housing Acquisition and Redevelopment: A University of Massachusetts Multi-Campus Collaborative Project - Processes and Findings to Date

Michael P. Johnson Jr.

*University of Massachusetts Boston, michael.johnson@umb.edu*

Jeffrey Keisler

*University of Massachusetts Boston, jeff.keisler@umb.edu*

Senay Solak

*University of Massachusetts - Amherst, solak@som.umass.edu*

David Turcotte

*University of Massachusetts - Lowell, david\_turcotte@uml.edu*

Rachel B. Drew

*University of Massachusetts Boston, Rachel.Drew001@umb.edu*

Follow up for additional works at: [http://scholarworks.umb.edu/pppa\\_faculty\\_pubs](http://scholarworks.umb.edu/pppa_faculty_pubs)



Part of the [Policy Design, Analysis, and Evaluation Commons](#), [Public Policy Commons](#), and the [Urban Studies Commons](#)

---

## Recommended Citation

Johnson, Michael P. Jr.; Keisler, Jeffrey; Solak, Senay; Turcotte, David; Drew, Rachel B.; Bayram, Armagan; and Vidrine, Emily, "Decision Models for Foreclosed Housing Acquisition and Redevelopment: A University of Massachusetts Multi-Campus Collaborative Project - Processes and Findings to Date" (2010). *Public Policy and Public Affairs Faculty Publication Series*. Paper 1. [http://scholarworks.umb.edu/pppa\\_faculty\\_pubs/1](http://scholarworks.umb.edu/pppa_faculty_pubs/1)

This Research Report is brought to you for free and open access by the Public Policy and Public Affairs at ScholarWorks at UMass Boston. It has been accepted for inclusion in Public Policy and Public Affairs Faculty Publication Series by an authorized administrator of ScholarWorks at UMass Boston. For more information, please contact [library.uasc@umb.edu](mailto:library.uasc@umb.edu).

---

**Authors**

Michael P. Johnson Jr., Jeffrey Keisler, Senay Solak, David Turcotte, Rachel B. Drew, Armagan Bayram, and Emily Vidrine

***Decision Models for Foreclosed Housing Acquisition and Redevelopment:  
A University of Massachusetts Multi-Campus Collaborative Project***

**Processes and Findings to Date**

November 24, 2010

**Abstract:** The recent housing foreclosure crisis has had devastating impacts on individuals, communities, organizations and government. In response, several community development corporations (CDCs) have sought new ways to assist neighborhoods suffering from the myriad effects of high foreclosures, including neighborhood instability, increased vandalism and crime, lower property values, and economic disinvestment. This research project focuses on activities of community-based organizations that acquire and redevelop foreclosed properties to support neighborhood stabilization and revitalization<sup>1</sup>. However, the costs of pursuing this strategy far exceed the resources available to typical CDCs. Thus, this project seeks to solve the following decision problem: What subset of a large number of available foreclosed properties should be acquired for neighborhood stabilization and revitalization? What activities should be pursued with which properties, when should they be pursued, and to what degree? The decision models we intend to develop will yield acquisition policies that are more efficient, effective, and equitable for CDCs and their community residents. Our goal is to develop theory, models and methods that benefit from the knowledge of practitioners while providing practitioners with novel tools and perspectives that enable them to better achieve their organizations' missions. This document lays out our knowledge to date on the scope and magnitude of the foreclosure crisis, the policy responses and actions by local CDCs to mitigate the effects of foreclosures, and the next steps in our research project, which include applying our expertise to the experiences of community partner organizations to develop models and inform theory and practice as described above.

**Magnitude, Impact, and Responses to the Foreclosure Crisis:** After experiencing the longest sustained boom on record, the U.S. housing market finally peaked in 2006. The fall in house prices that followed the boom was both a consequence of and a catalyst to rising defaults on residential mortgages. The initial rash of foreclosures, concentrated among subprime and exotic mortgage products, created a vicious cycle of abandoned properties lowering the values of nearby homes, putting additional borrowers underwater on their mortgages. These spillover effects were further exacerbated by the broader economic recession and rising unemployment, leading borrowers with prime and low-risk mortgages to also fall into default and eventually foreclosure. Indeed, the share of all loans in foreclosure nationally rose from under 1 percent in mid-2006 to 4.6 percent at the start of 2010.

Foreclosure rates in Massachusetts have similarly spiked in recent years, though the Commonwealth currently ranks near the middle of all states on the share of loans in foreclosure. As of the second quarter of 2010, however, Massachusetts was 11th in the share of loans at least 90 days delinquent, suggesting the Commonwealth could be in a position to see its foreclosure

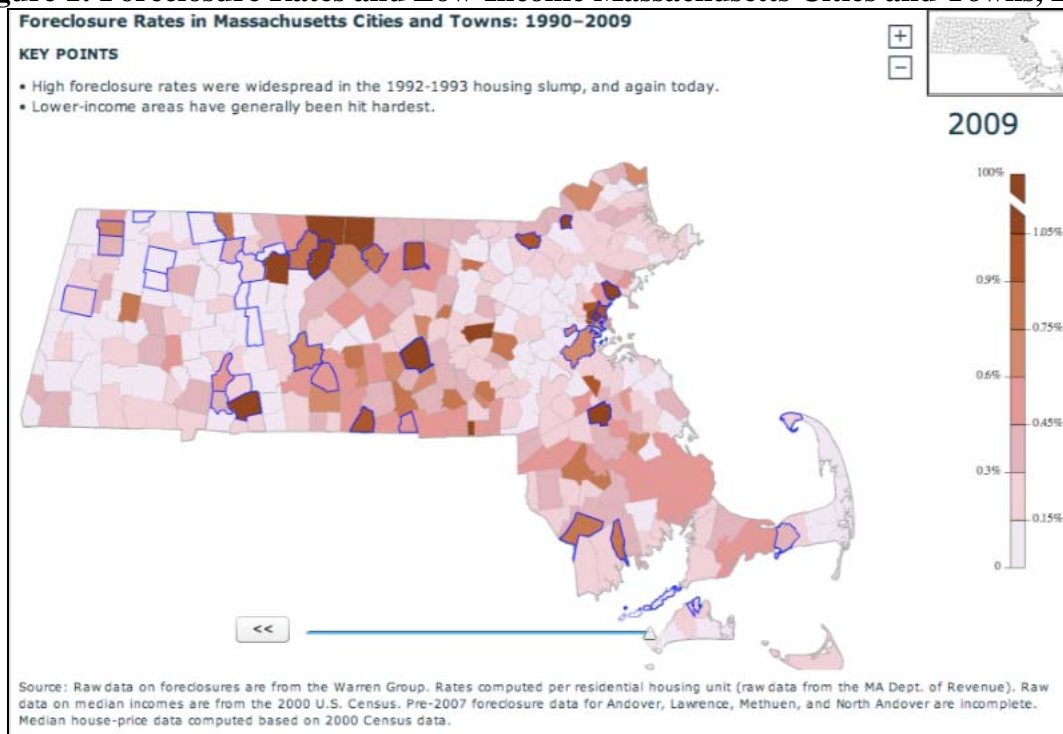
---

<sup>1</sup> Research team: Michael P. Johnson, PhD, Jeff Keisler, PhD and Rachel Drew (University of Massachusetts Boston), David Turcotte, PhD and Emily Vidrine (University of Massachusetts Lowell), and Senay Solak, PhD and Armagan Bayram (University of Massachusetts Amherst).

rate rise relative to other states in the next several months, as many of these delinquent loans enter the foreclosure process.

In Massachusetts, the foreclosure problem has hit low-income urban communities especially hard. Data from the Federal Reserve Bank of Boston report 2009 foreclosure rates by city and town, with the lowest income places (those with median incomes below 80% of the statewide median income in 2000) outlined in blue. As Figure 1 below demonstrates, while rural low-income areas in the western part of the state do not appear to have high foreclosure rates relative to other areas, select cities and towns closer to Boston – including Lowell, Lawrence, Brockton, Springfield, Worcester, Lynn, and Boston itself – are clearly shaded darker, indicating higher foreclosure rates.

**Figure 1: Foreclosure Rates and Low-Income Massachusetts Cities and Towns, 2009**



Available online at <http://www.bos.frb.org/economic/dynamicdata/module1/bmap.html#>

The reaction of policymakers to the rapid rise in foreclosures over the last 3 years has been slow and limited. At the federal level, initial efforts to reduce or delay foreclosures through loan modifications have assisted a small fraction of the intended number of delinquent homeowners, with as many as 40 percent falling into foreclosure even after such actions. Subsequent policy actions designed to help states and municipalities deal with the oversupply of already foreclosed properties, such as the Neighborhood Stabilization Program (NSP), have been somewhat more successful, but included bureaucratic restrictions and delays in implementation that hampered early efforts by CDCs to access and use this resource. Recent amendments to NSP have loosened

some of those restrictions and expanded the pool of properties eligible for acquisition under the program<sup>2</sup>, though it is too soon to assess the long-term impacts of these actions.

At the state level, Massachusetts has been among the more aggressive states to pursue foreclosure prevention and remediation strategies. Through the Department of Housing and Community Development (DHCD), over \$43 million in NSP funds have been allocated to local governments and non-profit organizations to assist with foreclosure acquisition and redevelopment. DHCD also helped fund efforts by the Citizens Housing and Planning Association (CHAPA) to develop an online database of foreclosed properties in Massachusetts and offer a First Look program to provide non-profits with advanced notice of and access to foreclosed properties for potential acquisition.

Responses to the foreclosure crisis – whether by policymakers, CDCs, or partnerships between them – are vitally important, given the detrimental effects that concentrated foreclosures can have on their communities. In addition to the considerable negative impact of foreclosure on evicted owners and tenants (see Kingsley et al., 2009), foreclosed and vacant properties often suffer from under-maintenance and disrepair, inviting increased criminal activity and social disorder, and decreased neighborhood stability. Indeed, by some estimates, a percentage-point increase in neighborhood foreclosure rates increase the incidence of violent crimes by 2.3 percent and of burglaries by 10 percent (Immergluk & Smith, 2006; Goodstein & Lee, 2010). When many foreclosures are concentrated in one neighborhood, the magnitude of such impacts can be startling. Furthermore, foreclosed properties reduce the value of nearby homes, either by distorting recent sales price figures or through their external effects on the neighborhood. Several studies have quantified the lost value associated with foreclosures, generally finding that each foreclosed unit within 1,000 feet of a non-distressed unit reduced the price of that unit by 1-2 percent (Harding et al., 2009; Leonard & Murdoch, 2009; Campbell et al., 2010). When aggregated over all housing units in a dense urban neighborhood that fall into such a range, the total lost value costs up to \$400,000 for each foreclosed property (Campbell et al., 2010). Additional impacts to municipalities include lost tax revenues on abandoned properties, increased demand for police and fire services in areas with concentrated foreclosures, and costs of demolition, if necessary (Apgar & Duda, 2004).

**Scope and Objectives of the Current Project:** Given the speed, magnitude, and expected duration of the recent foreclosure crisis in Massachusetts, its likely detrimental impacts on low-income urban communities, and the policy responses to date, CDCs serving areas with high foreclosure rates face some daunting challenges. Chief among these is how they develop a strategy to acquire and redevelop foreclosed properties for the purpose of neighborhood stabilization. With a large number of foreclosed units in their neighborhoods (though not necessarily available for purchase at a given moment), different and sometimes competing social and organizational objectives, and limited financial and technical resources, CDCs must make strategic decisions to maximize their impact on communities (Mallach, 2008).

Management science/operations research can be used to analyze decision processes made under uncertainty, such as those currently facing CDCs seeking to acquire foreclosed properties

---

<sup>2</sup> These include granting funds directly to non-profits under NSP2, and changing the definitions of ‘foreclosed’ and ‘abandoned’ properties eligible for acquisition.

(Johnson et al, 2010). Such CDCs may not have the tools and skills to most efficiently and effectively identify the wide range of decision alternatives available to them, quantify the impacts of those alternatives, choose the preferred option according to consistent methods, and assess the impact of their decision on changes in community and market conditions. Decision models, developed by researchers in collaboration with partner organizations, can help CDCs leverage their own knowledge and experience to design short-term and long-term responses to the foreclosure crisis that take advantage of know-how and perspectives that are not always available to community practitioners<sup>3</sup>.

This project seeks to partner with local CDCs to jointly specify the decision processes to be modeled, study the existing methods and measures used by CDCs to assess foreclosed housing options, and develop tools and perspective that enable them to better achieve their organizations' missions. The project will adhere to the principles of community-based operations research, including using quantitative and qualitative methods crossing multiple academic disciplines, based on the latest research, accounting for local conditions and resources of partner organizations, and collaboratively developing prescriptive and prospective models that are appropriate to the needs and capabilities of partners<sup>4</sup>. To achieve this goal, we will:

- Use interactive, participatory methods to build new theory about the process, decisions and impacts of foreclosed housing acquisition and redevelopment;
- Adapt and extend current research to estimate measure of the attributes of the decision problem that are important to practitioners;
- Develop innovative decision models that address the tactical question of the choice of specific foreclosed units to acquire and redevelop, and the strategic question of development of portfolios of foreclosed housing acquisition opportunities as a basis for longer-term planning, and
- Adapt methods from multiple analytic disciplines to assess the impact of the use of these decision models on practices of community-based organizations, as well as the communities they serve.

Our work will enable practitioners to explicitly identify and quantify decision problems and solve these problems to generate evidence-based recommendations for provision of key services. Additionally, policy-makers and funders will have increased resources to modify strategies, priorities and funding criteria based on the effectiveness of decision models for community-based service provision.

**Work Completed and Lessons Learned To-Date:** Prior to the current project, members of the research team have engaged in other studies on the role and decision processes of CDCs acquiring foreclosed housing for redevelopment and neighborhood stabilization. Antecedent projects include: 1) the development of a tactical single-period, multi-objective integer model of the hypothetical decision processes and outcomes for a CDC acquiring foreclosed housing units (Johnson et al., 2010), 2) exploratory research funded through a seed grant at the University of

---

<sup>3</sup> There is a substantial academic literature on public-service operations research. Key references include Pollack et al (1994), Larson and Odoni (2007), and Midgley and Ochoa-Arias (2004).

<sup>4</sup> For more on empirical study using community-based operations research, see Johnson & Smilowitz, 2007.

Massachusetts Boston to apply the tactical model to the acquisition decisions of a local CDC, to assess whether and how decision models can inform CDC practice<sup>5</sup>, and 3) a multi-site case study of the CDCs analyzed in the first two projects, to chronicle their current decision making processes and the many limitations and challenges they face in acquiring foreclosed units (Johnson et al., 2010). Through these efforts, we have gained a deep understanding of the data, organizational resources, market conditions, and administrative barriers to CDC interventions in the foreclosure crisis. Key findings include:

- Validation of our assumption that many CDCs are staffed by experienced practitioners skilled at identifying strategic acquisition opportunities and working within resource constraints and the uncertainties of the property condition, availability and likelihood for project success.
- Recognition that opportunities for CDCs to acquire and successfully redevelop foreclosed properties are hampered by many factors, such as policy requirements, limited resources, organizational capability, data availability/collection, competition from private developers.
- Development of schematics and templates to make concrete the factors that matter most to CDCs in the decision to acquire foreclosed housing (see Figure 2).
- Realization that our initial single-period models under certainty for short term decision processes are useful for conceptual representation of the CDC acquisition problem, and as a way to audit or evaluate previous decisions, but less useful to support real-time decisions in practice; decision models that incorporate uncertainty and reflect the long term, multi-period decisions made by housing development professionals are more appropriate.
- The type of model most appropriate to foreclosure acquisition decisions may vary with the organizational characteristics and capacity of CDC partner organizations, the demographics and level of housing market distress in the CDC service area, and the financial and policy conditions applicable to partners' acquisition strategies.
- Proxies for the costs and benefits of foreclosure acquisitions by CDCs can be collected and calculated though such measures are imprecise and best used to rank acquisition options relatively, but not absolutely. Examples of such proxies include measures of social value from acquisitions approximated by the foregone property value impacts, measures of strategic value approximated by proximity of acquisition targets to neighborhood amenities, and measures of social cost approximated by the value of subsidies associated with specific acquisitions.
- The types of acquisition and redevelopment strategies employed by CDCs vary greatly by organization, though administrative barriers represent a significant hurdle to successful acquisition actions for many CDCs.
- Real-time decision support via appropriate information technology based applications with customized user interfaces can offer real value to practitioners (see Figure 3).

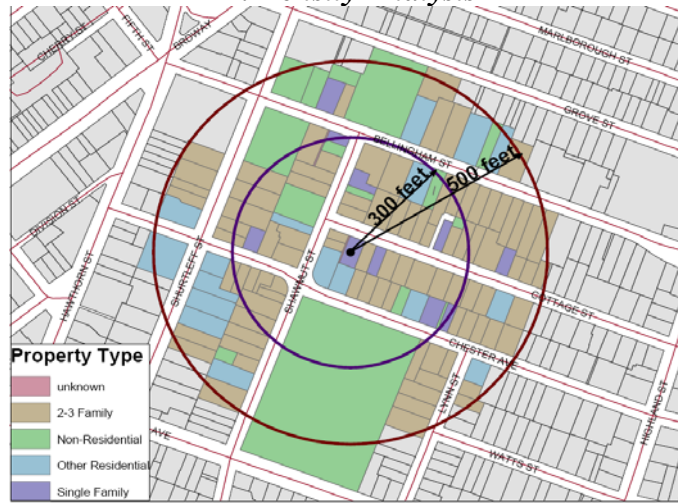
Our experience to date has also helped inform our approach to the current project. We will use case study methodology to capture the unique characteristics of organizations and their service

---

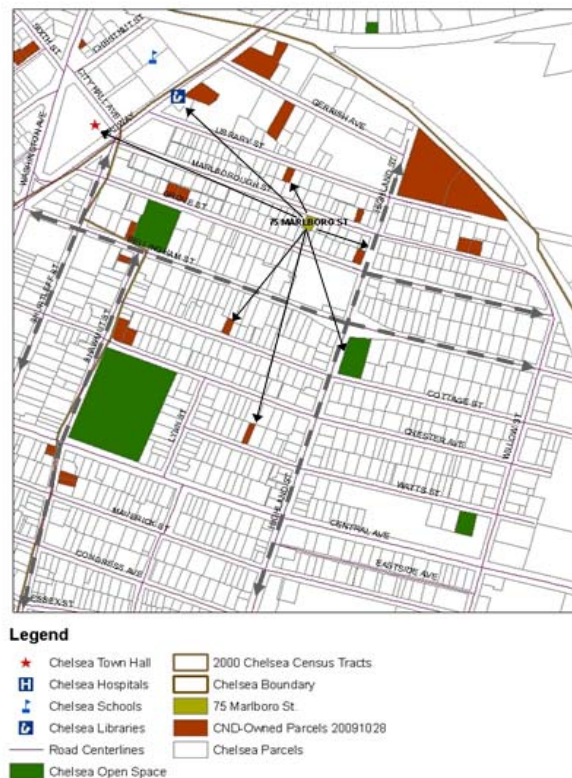
<sup>5</sup> Joseph P. Healey Grant Program, "Decision Modeling for Foreclosed Housing Acquisition in a Large Urban Area", July 2009—June 2010.

areas, and guide appropriate outcomes to meet specific organizational needs and objectives. We will work *with* partner organizations, rather than serving as external observers or consultants, to take advantage of the rich expertise and skills of CDC staff. It is our belief that the combination of our understanding of the foreclosure acquisition problems and solutions of CDCs, our experience in decision modeling for community-based applications, and the collaboration with community partner organizations, will increase the likelihood of beneficial outcomes for both practitioners and researchers.

**Figure 2: Sample Schematics for Representing CDC Decision Acquisition Factors**  
**A. Density Analysis**



**B. Proximity to Strategic Neighborhood Features**





**Figure 3: Proof-of-Concept Spreadsheet-Based Decision Support Application for Foreclosed Housing Acquisition**

***A. Candidate Property Data Input Form: Physical Characteristics***

**User Information**

Please enter attributes to classify, sort and search the data-base for existing real estate property before utilizing the "decision model" tool. If candidate attributes are available regarding acquisition and redevelopment, please select "Development Attributes" (not required for a search).

User can use select as many attributes as needed to preform a search.

**Data Entry - Primary Input**

**Locational Attributes**

Street Address

City/Town

State

Zip Code

**Property Attributes**

Status

Property Type

Tenure Type

# of Units

**Market Attributes**

Petition Date

Auction Date

Servicer

Owner

Locational Attributes				Property Attributes			Market Attributes				
Address	City/Town	State	Zip Code	Status	Property Type	Tenure Type	# Units	Petition Date	Auction Date	Servicer	Owner

New Delete Search Save Development Attributes

***B. Candidate Property Data Input Form: Decision Modeling Characteristics***

**Dynamic Attribute Input Form**

Please enter property attributes for a new candidate for acquisition and redevelopment.

Social Cost  \$

Social Benefit  \$

Simulated Values

Strategic Value  (ft.)

Likelihood of Project Success

OK Cancel

**Plan for Current Project:** The current project has three primary objectives. First, we will develop useful and appropriate decision tools in collaboration with CDCs to apply to their foreclosure acquisition and redevelopment activities. Second, we will advance theory on developing decision models for community-based applications, including field study methods.

Third, we will inform future policies that better reflect the complex processes, multiple objectives, and operational challenges of CDCs engaged in foreclosure acquisitions for neighborhood stabilization. While the second objective will primarily be of interest to academic researchers, it is our intention that the first and third objectives will add value to the current and future work of community-based organizations and bring about real solutions for repairing the damage done to communities by the foreclosure crisis.

Our current project, which has received support from the National Science Foundation for two years, has been underway for about four months<sup>6</sup>. Clearly, there is still considerable work left to be done. The current task for the project team is to identify potential community partner organizations that will agree to work with us on model design, implementation and evaluation. These community partners will be chosen to reflect characteristics consistent with the decision models' intended impacts. Towards this end, the project team will choose at least two CDCs that can demonstrate the following criteria:

- Evidence of strategic approaches to selecting, acquiring, and redeveloping foreclosed properties;
- Identification of a defined service area with a high concentration of foreclosures and foreclosure-related externalities impacting community stabilization;
- Access to financial resources (e.g. NSP funding) to facilitate foreclosure acquisitions and redevelopment;
- Adequate organizational and technical resources to support long-term collaboration with academic researchers;
- Recognition within the field as a leading organization in the efforts to stabilize communities through foreclosure acquisitions in conjunction with other community building activities;
- Based in Massachusetts and serving Massachusetts communities hard hit by the foreclosure crisis, and
- Purchasing properties with some form of NSP funding OR in adherence to NSP guidelines for the purchase of foreclosed properties

These criteria are informed by the existing literature on assessing CDC capacity for affordable housing redevelopment (Mallach, 2008), as well as project objectives. The project team is currently in the process of reaching out to CDCs that meet these criteria. Our intention is to meet with staff from organizations interested in collaborating with us on this project, and choose two based on the strength of their compatibility with these criteria and their suitability for the tactical or strategic model designs as described above. Additionally, we will select organizations that are similar enough to each other in terms of their capacity to acquire foreclosed housing and the level of housing market distress in their service areas, to better isolate the effects of the different model treatments on acquisition and neighborhood outcomes. Once CDCs are chosen, the team will conduct a series of meetings with partner organizations to develop participatory approaches to define measures, questions, and objectives of the project.

---

<sup>6</sup> National Science Foundation, "Collaborative Proposal: Decision Models for Foreclosed Housing Acquisition and Redevelopment," August 1, 2010—July 30, 2012. Award # 1024968.

The short-term tactical decision model developed out of these collaborations will assess the optimal portfolio of potential acquisitions and the choice of CDCs to acquire particular units now or to wait, given multiple criteria (e.g. social benefits, likelihood of project success, strategic value). Based on our previous findings that deterministic models that do not incorporate uncertainty are less practically useful for CDCs, our approach in this project will use stochastic dynamic models for multi-period decision processes under different market conditions. Meanwhile, the strategic decision model will provide more general, long-term guidance to CDCs in defining acquisition strategies, with emphasis on the community investment objective rather than individual property acquisition decisions. Such guidance will consider different geographic locations for acquisition actions, optimal levels of investment in each geographical location and prioritization of different categories of properties. The models will consider multiple objectives representing various social utility measures, and capture the uncertain dynamics of market conditions and budget limitations. Both models will also incorporate variables specific to the organizations and service areas covered, as well as budget and availability constraints. Where necessary and appropriate, we will develop customized information technology applications that can assist CDC practitioners in applying our models to their short-term and longer-term acquisition and redevelopment decisions, using the proof-of-concept prototype developed in the course of our initial, University of Massachusetts-funded project, as inspiration.

Concurrent to the development of models and their implementation with community partners, the project will also conduct in-depth case studies of partner organizations, how they formulate their acquisition problems and decisions, what solutions they develop, and whether solutions born out of decision models are effective and adaptable to their needs. Case studies are an appropriate research method for analyzing phenomena within their organizational and institutional context, and for capturing the relationships between actors and their environments (Yin, 2003). Case studies can also help build and enhance theory on how CDCs generally make their acquisition decisions, and test the efficacy of decision models in the field<sup>7</sup>.

At the conclusion of this project, we expect that the qualitative and quantitative approaches we use will provide a richer understanding of both current and possible future approaches to foreclosure acquisition decision-making. Our analysis will also compliment the existing academic and practitioner literature on housing and community development, emphasizing best practices. By being reflective of current practice, balancing needs of academic research and practitioners, and applying mixed and interdisciplinary methods, the outcomes of this effort will benefit both academics and practitioners concerned with mitigating the effects of the foreclosure crisis on low-income neighborhoods. The models developed and implemented, in the spirit of community-based operations research, will acknowledge that the real solution may lie in a deeper understanding of the problem, objectives and goals beyond the scope of this project. The process of thinking about alternative decisions and policies, as much as or more than implementing specific quantitative models which yield specific prescriptions or rules, will extend the theory and practice of community-based operations engaged in neighborhood revitalization.

---

<sup>7</sup> For example, case studies conducted by NeighborWorks America (2009) informed their 12 principles of Responsible Redevelopment.

## References Cited

- Apgar, W.C. & Duda, M. (2005). "Collateral Damage: The Municipal Impact of Today's Mortgage Foreclosure Boom." Minneapolis, MN: Homeownership Preservation Foundation, May 11.
- Campbell, J. Y., Giglio, S., and Pathak, P. (2009). Forced Sales and House Prices. *National Bureau of Economic Research, Working Paper Series*, Working Paper 14866.
- Goodstein, R. M., and Lee, Y. Y. (2010). Do Foreclosures Increase Crime? *FDIC Center for Financial Research*, Working Paper No. 2010-05.
- Harding, J. P., Rosenblatt, E., & Yao, V. W. (2009). The Contagion Effect of Foreclosed Properties. *Journal of Urban Economics*, 66(3), 164-178.
- Immergluck, D., & Smith, G. (2006). The Impact of Single-Family Mortgage Foreclosures on Neighborhood Crime. *Housing Studies*, 21(6), 851 – 866.
- Johnson, M. P., Turcotte, D., and Sullivan, F. M. (2010). What Foreclosed Homes Should a Municipality Purchase to Stabilize Vulnerable Neighborhoods? *Networks and Spatial Economics*, 10(3), 363-388.
- Johnson, M.P., Turcotte, D., Sullivan, F.M. and R.B. Drew. (2010). "Improving Policy Design and Practice for Acquisition and Redevelopment of Foreclosed Residential Housing in Urban Communities". Cleveland, OH: Federal Reserve Bank of Cleveland 2010 Policy Summit, June 9, 2010.
- Johnson, M. P. and Smilowitz, K. (2007). Community-Based Operations Research. In T. Klastorin (Ed.), *Tutorials in Operations Research 2007*. Hanover, MD: Institute for Operations Research and the Management Sciences, pp. 102-123.
- Kingsley, G. T., Smith R. E., and Price, D. (2009). "The Impacts of Foreclosures on Families and Communities." A Report to the Open Society Institute, Washington, DC: The Urban Institute.
- Larson, R. C., and Odoni, A. R. (2007). *Urban Operations Research, 2<sup>nd</sup> Edition*. Dynamic Ideas.
- Leonard, T., & Murdoch, J. (2009). The Neighborhood Effects of Foreclosure. *Journal of Geographical Systems*, 11(4), 317-332.
- NeighborWorks America (2009). "Responsible Approaches to Neighborhood Stabilization: Case Studies in Action." Washington DC: Neighborhood Reinvestment Corporation.
- Mallach, A. (2008). How to Spend \$3.92 Billion: Stabilizing Neighborhoods by Addressing Foreclosed and Abandoned Properties. Federal Reserve Bank of Philadelphia, Community Affairs Division, Discussion Paper Series (October). Accessed September 6, 2010 online at [http://www.philadelphiafed.org/community-development/publications/discussion-papers/DiscussionPapers\\_Mallach\\_10\\_08\\_final.pdf](http://www.philadelphiafed.org/community-development/publications/discussion-papers/DiscussionPapers_Mallach_10_08_final.pdf).
- Midgley, G., and Ochoa-Arias, A. (2004). *Community Operational Research: OR and Systems Thinking for Community Development*. New York, N. Y.: Kluwer Academic/Plenum Publishers.
- Pollock, S.M., Rothkopf, M.H. and Barnett, A. (1994). *Handbooks in Operations Research and Management Science, Vol. 6: Operations Research and the Public Sector*. Amsterdam: North-Holland.
- Yin, R. K. (2003). *Case Study Research: Design and Methods, Third Edition*. Thousand Oaks, CA: SAGE Publications.