

What Social Impacts of Foreclosed Housing Redevelopment are Important to Local Actors? How Can We Measure Them?

Michael P. Johnson & Rachel Bogardus Drew
Department of Public Policy and Public Affairs
McCormack Graduate School of Policy and Global Studies
University of Massachusetts Boston

New England Study Group
Federal Reserve Bank of Boston
February 16, 2012



**McCORMACK GRADUATE SCHOOL OF POLICY
AND GLOBAL STUDIES**
UNIVERSITY OF MASSACHUSETTS BOSTON

Overview of Presentation

Acquisition and redevelopment of foreclosed properties by community organizations helps to mitigate the social impacts of foreclosures on neighborhoods and residents

Social impacts can be measured in a variety of ways

- ▶ Lost value to proximate properties
- ▶ Strategic value of foreclosed property locations

Models can estimate magnitudes of such effects to identify potential acquisition candidates and social impacts of alternative development strategies

Application of models to a local case study demonstrates how these measures can be used in practice

Funding Support

- ▶ Joseph P. Healey Grant Program, “Decision Modeling for Foreclosed Housing Acquisition in a Large Urban Area” (with Felicia Sullivan; David Turcotte, University of Massachusetts Lowell), July 2009 – July 2010
- ▶ National Science Foundation, “Collaborative Proposal: Decision Models for Foreclosed Housing Acquisition and Redevelopment” (with Jeffrey Keisler; Senay Solak and Armagan Bayram, University of Massachusetts Amherst; David Turcotte and Emily Vidrine, University of Massachusetts Lowell), August 1, 2010 – July 30, 2012

Motivation

Foreclosure crisis has had severe impacts on individuals and housing markets:

- ▶ As of the end of 2010, over 4 million homeowners were severely delinquent on their mortgage payments or in the foreclosure process.
- ▶ Real equity declined by 60 percent from 2006-2010, and 11 million homeowners were underwater on their mortgages

(Joint Center for Housing Studies, 2011)

Federal government has spent over \$11 billion in foreclosure-related programs:

- ▶ Neighborhood Stabilization Program
- ▶ American Recovery and Reinvestment Act
- ▶ Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010

But progress, measured by number of homeowners with modified loans, or number of foreclosed properties acquired and redeveloped, has fallen short of expectations

Role of Community-Based Organizations

CBOs lead local responses to foreclosure crisis and are essential to neighborhood stabilization and revitalization:

- ▶ Homebuyer education
- ▶ Foreclosure counseling
- ▶ Renter advocacy
- ▶ Family support
- ▶ Housing and economic development
- ▶ Community planning

Mission-driven CBOs have significant experience and expertise, but often lack commensurate technical resources to generate maximum impact (Mallach, 2008)

Objectives of Research Projects

▶ Healey Grant Project:

- ▶ Field research to understand current practice
- ▶ Identify CBO partner(s) to extend decision models
- ▶ Use GIS to support strategy design

▶ NSF Grant Project:

- ▶ Incorporate uncertainty and multiple periods
- ▶ Mixed-methods for decision modeling
- ▶ Multi-site case study of decision modeling implementation

Focus on Social Impacts

- ▶ Through Healey grant, identified social impacts of foreclosures as a driving force behind CBO interventions
 - ▶ How do foreclosures impair neighborhood stability?
 - ▶ How do CBOs conceive of social impacts, and how are they measured?
- ▶ Research questions
 - ▶ What characteristics of foreclosed housing are salient to the problem of community-based foreclosed housing acquisition and redevelopment?
 - ▶ How can such characteristics be quantified?
 - ▶ How can they be used in decision models?

Social Impacts of Foreclosed Housing

Families:

- ▶ Financial insecurity and economic hardship
- ▶ Personal and family stress, disruption and ill health
- ▶ Increased school mobility for children (ULI, 2012)

Communities:

- ▶ Property values, vacancies, prices and rents
- ▶ Disorder, crime and violence
- ▶ Public sector costs and fiscal health

Data to estimate many of these impacts are limited or not easily quantifiable (Kingsley, Smith and Price, 2009)

What Attributes Are Relevant for Acquisition and Redevelopment?

Social value

- ▶ Impacts upon community distress measures associated with foreclosed housing
 - ▶ Criminal offending
 - ▶ Blight
 - ▶ Property values

Strategic value

- ▶ Ability of redevelopment projects to further CDC goals
 - ▶ Proximity to neighborhood amenities and disamenities
 - ▶ Support for economic redevelopment

Development value

- ▶ Probability of project success
 - ▶ Acquisition and redevelopment costs
 - ▶ Likelihood of successful acquisition

One CBO's Perspective on Social Impacts

We identify and measure attributes of candidate foreclosed properties known to be important to a particular CDC:

- ▶ Property values
 - ▶ What is the expected foregone loss in property values associated with successful acquisition and redevelopment of certain foreclosed housing units?
- ▶ Strategic values
 - ▶ What location-based measures of foreclosed properties embody a CDC's strategic goals and resident preferences?

Focus on Property Values

Real estate theory proposes that changes in housing unit and neighborhood quality are eventually capitalized into property values

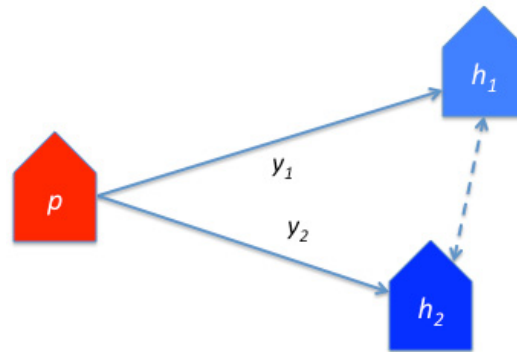
Extensive literature on impacts on foreclosed housing on property values of nearby units (Harding et al, 2009; Campbell et al, 2009; Hartley, 2010; Wassmer, 2010)

In the absence of other documented impacts, focus on avoided property value losses as primary dollar-valued benefit associated with foreclosed housing acquisition and redevelopment

We develop a model based on discrete-time Markov chains to compute expected total property value losses associated with a specific foreclosed unit

How do Foreclosures Affect Neighboring Properties?

We measure the aggregate impact of a single foreclosure on all proximate properties:



Assumptions:

- ▶ Impacts are linearly additive across proximate properties
- ▶ Second-order effects are negligible
- ▶ Density and distribution of proximate properties do not influence impacts

What Data are Necessary for a Model of Avoided Property Value Losses?

- (1) The stage of the foreclosure process of the distressed unit at the time of potential acquisition by a CDC
- (2) The distance between the distressed property and each proximate property
- (3) Appraised values of all properties proximate to a distressed property
- (4) The percent loss in property values associated with a given foreclosure state and distance
- (5) Possible property foreclosure states
- (6) The probability that the distressed property will be in a given stage of the foreclosure process in the future

(1) – (4) can be derived from publicly-available property data and findings in the real estate finance literature
(5) is available from current housing research
(6) requires specialized analytic models

The Property Value Impacts (PVI) model

We want to calculate the expected lost value to a property proximate to a foreclosure:

$$L_{ph}^t(i,d) = v_h \cdot \left(\sum_{k \in S_p} y_{ph}(k,d) \cdot P_{ik}^t \right)$$

where:

p = a foreclosed candidate property for acquisition;

i, k = discrete states for p at a given point in time;

h = a property proximate to p ;

P_{ik}^t = the probability that p , currently in state i , will be in state k t -periods from now

v_h = current value of property h ;

d = the distance between p and h ;

$Y_{ph}(k,d)$ = percent discount on value of h that is d from p known to be in foreclosure state k currently

Markov Chain of Foreclosure States

Need to estimate the probability of a property occupying a particular foreclosure state at some time in the future

P_{ik}^n = the probability of property p being in state k n periods into the future given current state i ; the i - k th entry of the n -step transition matrix P^n (Ross 2009).

Assume:

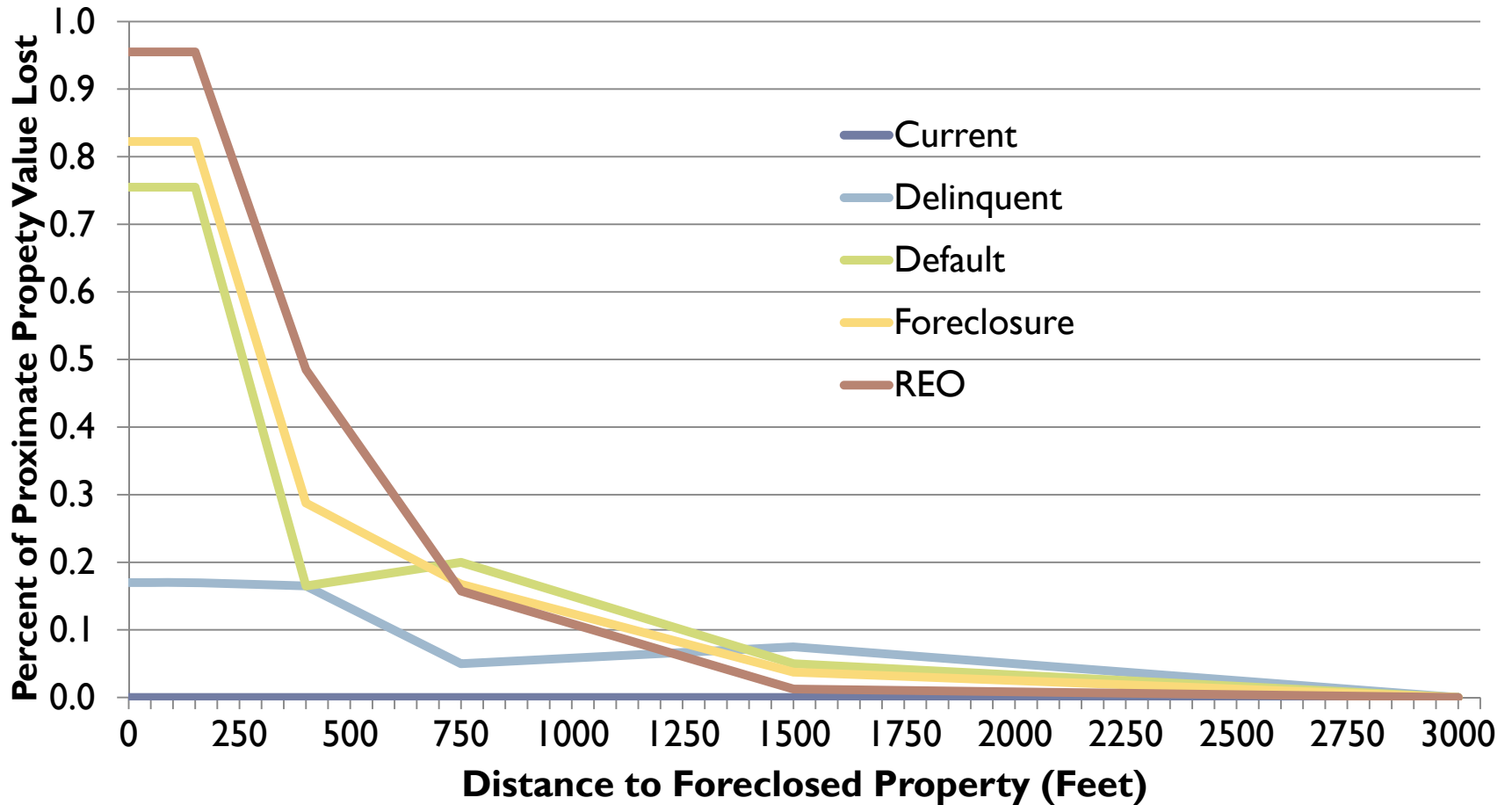
- ▶ A property can only occupy one state per period, and that the length of the period can vary by state.
- ▶ All states communicate with each other and are recurrent

How Can We Adapt Published Results on Property Value Impacts?

We combine the foreclosure stages observed by Harding et al. (2009) into five categories, and develop piece-wise linear functions of the estimates of property value discount, $y_{ph}(k,d)$, by distance and stage of foreclosure:

Stage (i)	Current	Delinquent	Default	Foreclosure	REO
Distance (d)					
0	0.00	0.17	0.76	0.82	0.96
250	0.00	0.17	0.52	0.61	0.77
500	0.00	0.13	0.18	0.25	0.39
750	0.00	0.05	0.20	0.17	0.16
1000	0.00	0.06	0.15	0.12	0.11
...					
...					
...					
3000	0.00	0.00	0.00	0.00	0.00

Discount Functions by Stage and Distance



Strategic Value Analysis

How can we represent the value of a foreclosed acquisition opportunity with respect to a CDC's mission?

- ▶ Unit characteristics
- ▶ Proximity to local amenities and disamenities

Antecedents:

- ▶ Implicit markets for housing attributes (Rosen 1974)
- ▶ Hedonic price functions (Bartik and Smith 1987)
- ▶ Household utility maximization as a function of housing attributes (Sheppard 1999)
- ▶ 'Push' and 'pull' factors in hedonic models (Li and Brown 1980) and facility location models (Eiselt and Laporte 1995)

Limited research on amenities that influence housing acquisition and redevelopment decisions of CBOs

What are Amenities and Disamenities?

Amenities:

- ▶ Schools, parks, cultural venues, full-service grocery stores, other CDC-developed housing, transit stops, 'strategic corridors'

Disamenities:

- ▶ Crime 'hot spots', vacant lots, distressed housing, excessively busy intersections

Notions of amenities and disamenities that are believed to influence strategic value of properties may vary widely

A Theory of Strategic Value for Foreclosed Housing Acquisition

Assumptions:

- ▶ Proximity to amenities and disamenities within a given neighborhood are the only relevant considerations
- ▶ Amenities and disamenities can be grouped into discrete categories (e.g. 'schools', 'crime locations')
- ▶ Decision maker has defined preferences for categories of amenities and disamenities
- ▶ Decision maker has defined preferences for amenities (overall) as compared to disamenities

Strategic value of a given property is a function of:

- ▶ Aggregate value of property with respect to all local amenities
- ▶ Aggregate value of property with respect to all local disamenities

Strategic Value: Functional Forms

Individual resident frame: only the closest amenity and disamenity influence locational decisions

$$A_i^l(r) = \frac{1}{\min\{d_{ij}^l\}}$$

$$D_i^p(r) = \min\{d_{ik}^p\}$$

CDC frame: all local amenities and disamenities influence locational decisions

$$A_i^l(c) = \sum_{j=1}^J \frac{1}{(d_{ij}^l)^2}$$

$$D_i^p(c) = \sum_{k=1}^K (d_{ik}^p)^2$$

Standardize strategic value measures for consistency, and aggregate by class and amenity/disamenity

Case Study: Chelsea, MA

About Chelsea

- ▶ A small urban and diverse community adjacent to Boston
- ▶ Has been especially hard hit by the foreclosure crisis

Between 2009 – 2010 we collaborated with a local CDC to understand foreclosed housing development processes, gather data and refine our decision models

- ▶ A recognized leader in foreclosure acquisitions
- ▶ A commitment to community stabilization and resident engagement

We apply property value impacts and strategic value models to 35 foreclosed residential properties identified by the CDC as potential acquisition candidates as of October 2009

Description of Candidate Properties

Statistic	Number of properties within 500ft	Average value of proximate properties	Number of other foreclosed properties within 500ft	Assessed value of candidate properties
Minimum	104	\$284,683	0	\$263,800
Maximum	193	\$497,653	11	\$531,100
Mean	150.2	\$350,386	5.9	\$378,031
25th Percentile	127	\$319,669	3	\$323,600
Median	155	\$350,592	6	\$379,700
75th Percentile	174.5	\$372,878	9	\$421,550

Transition Matrix

Status at time t	Status at time t+1				
	Current	Delinquent	Default	Foreclosure	REO
Current	0.870	0.130	0.000	0.000	0.000
Delinquent	0.047	0.105	0.762	0.084	0.003
Default	0.042	0.028	0.828	0.101	0.002
Foreclosure	0.040	0.000	0.048	0.869	0.043
REO	0.070	0.000	0.000	0.000	0.930

Source: Federal Reserve Bank of Boston; all residential loans in Chelsea that were active in 2010

- ▶ Monthly transition rates between stages are low
 - ▶ Foreclosure process can be slow
 - ▶ CDCs may not act right away
- ▶ Markov chain multiplies matrix over multiple time periods to estimate future transition rates

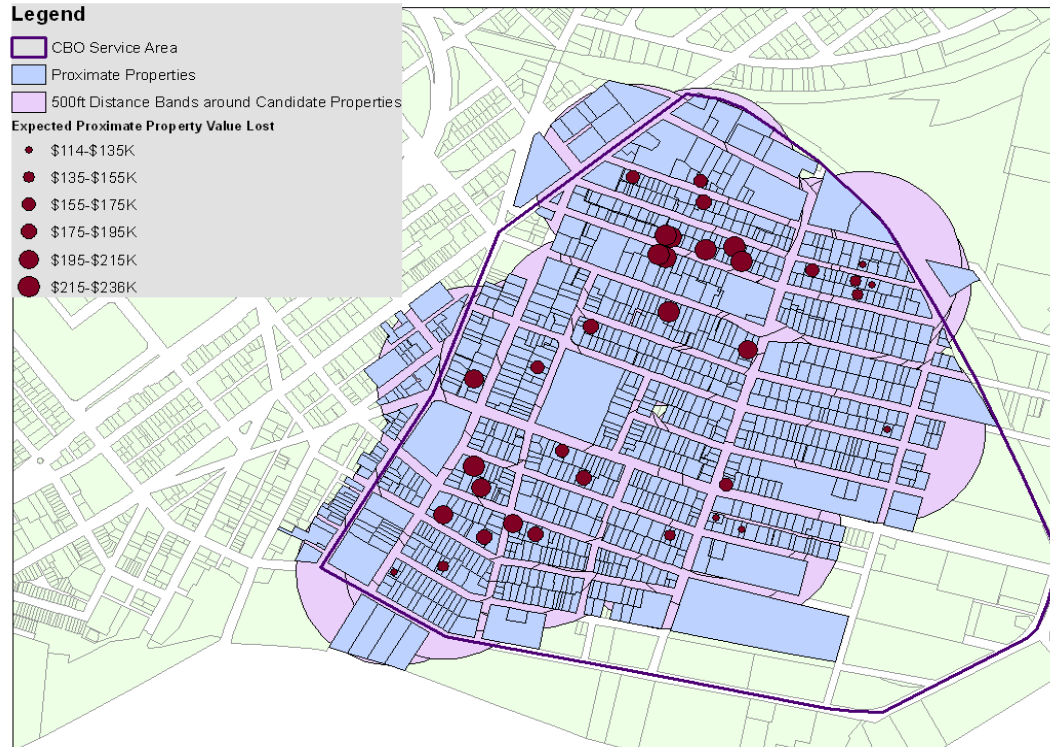
Property Value Impacts: Computational Results

Minimum	\$114,879
Maximum	\$235,834
Mean	\$181,421
25 th Percentile	\$148,682
Median	\$190,812
75 th Percentile	\$214,420

Distributions	Frequency	Average Proximate Property Value Impacts
By Property Type		
1-Fam	3	\$150,808
2-Fam	12	\$186,146
3-Fam	20	\$183,178
By Foreclosure Status		
Petition	21	\$180,707
Auction	8	\$173,787
REO	6	\$194,099

Annual interest rate = 3.5%; time period for analysis = 8 months

Spatial Distribution of Estimated PVI

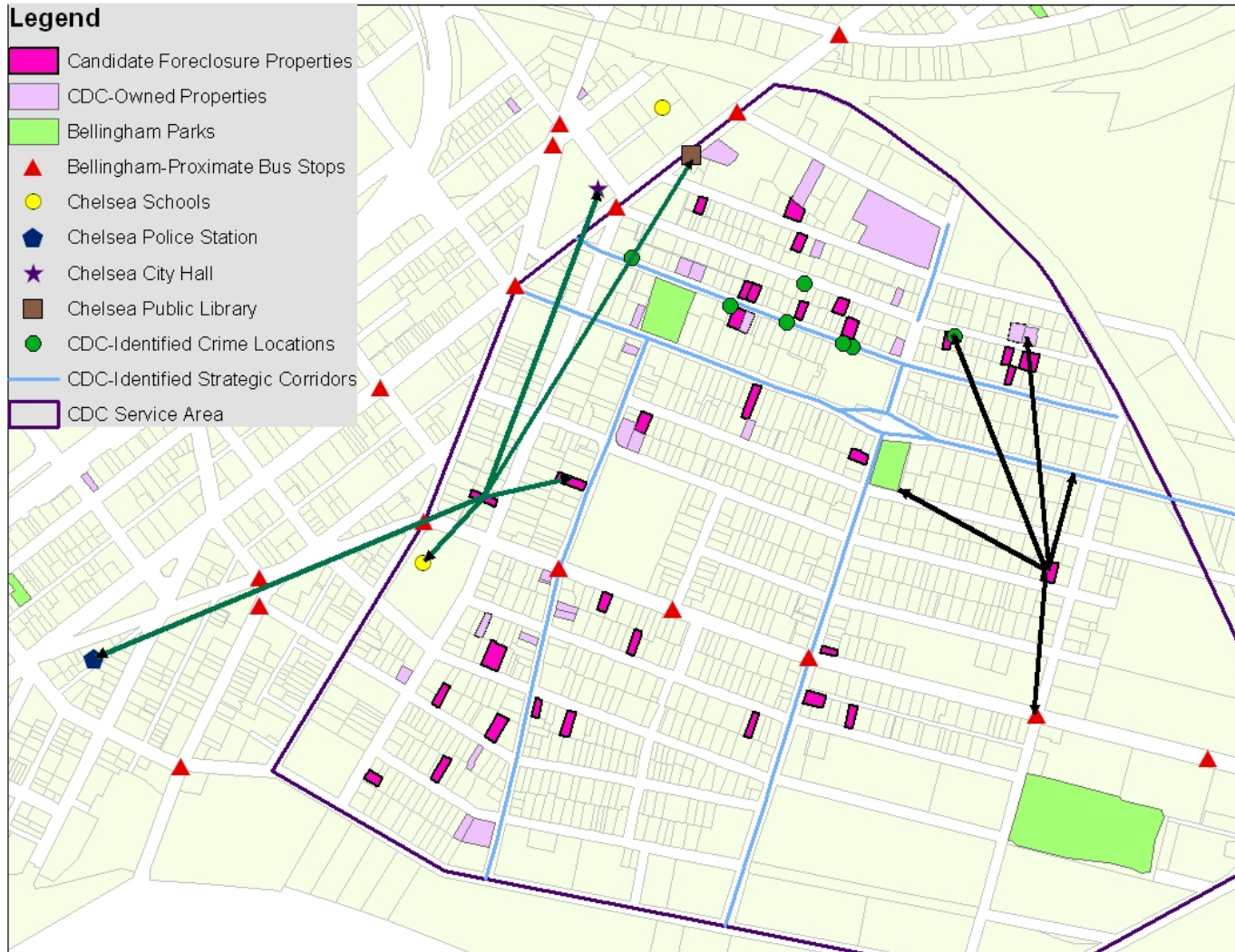


Estimated property value impacts show variation over space, property type and foreclosure status

What Property Value Impact Model Results Mean for Practice?

- ▶ Of 35 available foreclosed properties, the CDC eventually purchased three of them, ranked 4th, 6th, and 32nd in terms of expected proximate PVI in our model, resulting in a total of \$580,000 in estimated averted proximate property value losses.
- ▶ Had the CDC purchased the top three properties by expected proximate PVI, the total estimated proximate PVI would have been \$705,500 → estimated social loss of 21.6% in foregone property value impacts.

Strategic Value: Distribution of Amenities and Disamenities



Researchers' and CDC's Views of Amenities and Disamenities Differ

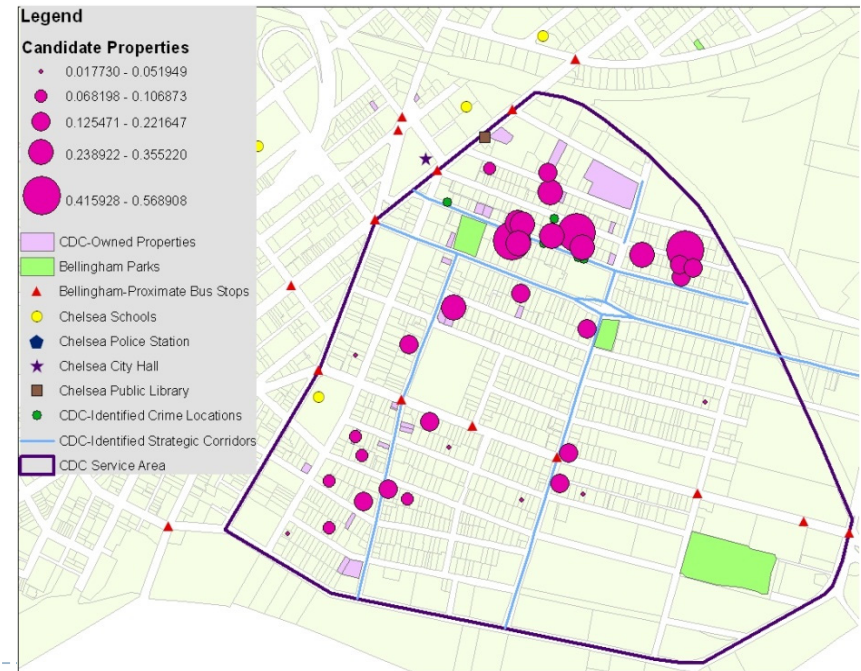
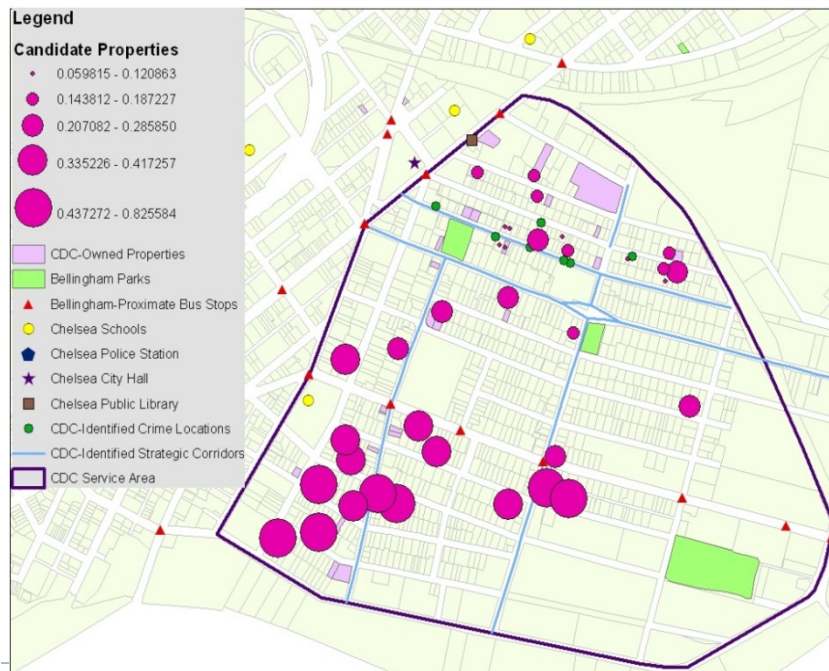
Feature Type	# of Proximate Locations	Source of Data	Relevant to CDC?	Criteria for Inclusion
Amenities				
Schools	5	Mass GIS	No	Any school in or within 500 meters of the CDC service area
Bus stops	27	Mass GIS	No	Any bus stop in or within 500 meters of the CDC service area
Parks & open space	3	Mass GIS	No	Any recreational space in or within 500 meters of the CDC service area
CDC-owned properties	28	CDC	Yes	Properties owned as of 2011 EXCEPT foreclosure acquisitions after October 2009
Police Stations	1	Mass GIS	No	Police stations in or within 500 meters of the CDC service area
City Hall	1	Mass GIS	No	City hall
CDC-identified strategic corridors	4	CDC	Yes	Identified by the CDC in 2009
Libraries	1	Mass GIS	No	Public library branches in or within 500 meters of the CDC service area
Disamenities				
Other foreclosed properties	33	CDC	Yes	Properties in the CDC service area in foreclosure as of October 2009
Crime locations	7	CDC	Yes	Identified by CDC in May 2010

Strategic Value Estimates Vary by Frame, Feature set, and Weights

Average [Std. Deviation]	Weights	Resident Frame	CDC Frame
Full set of amenities/ disamenities	Base	0.254 [0.086]	0.199 [0.082]
	Alternative	0.286 [0.168]	0.242 [0.164]
CDC-specified features only	Base	0.249 [0.139]	0.185 [0.133]
	Alternative	0.252 [0.163]	0.208 [0.170]

Individual resident frame, full feature set, alternative weights

CDC frame, CDC-specified features, base weights



What are the Relationships between Different Strategic Value Estimates?

Weights		Base Weights				Alternative Weights					
		Features		Full		CDC		Full		CDC	
		Frame	Res	CDC	Res	CDC	Res	CDC	Res	CDC	
Base	Full	Res	1.00								
		CDC		1.00							
	CDC	Res	-0.63	-0.42	1.00						
		CDC	-0.55	-0.36		1.00					
Alt	Full	Res			-0.69	-0.63	1.00				
		CDC			-0.45	-0.42		1.00			
	CDC	Res	-0.40	-0.09			-0.45	-0.13	1.00		
		CDC	-0.29	-0.05			-0.38	-0.15		1.00	

- ▶ The base and alternative weights, and the resident and CDC frames, are **positively** associated with each other
- ▶ The full and CDC-specific feature sets are **negatively** associated with each other, especially within resident frames → how features are identified and viewed matters more than weights and frames

What Strategic Value Analysis Results Mean for Practice?

Weights	Features	Frame	Average of purchased properties	Average of top three properties	% Lost Strategic Value
Base case	Full	Resident	0.251	0.414	39.4%
		CDC	0.243	0.376	35.5%
	CDC	Resident	0.374	0.520	28.0%
		CDC	0.315	0.471	33.2%
Alternative	Full	Resident	0.230	0.619	62.8%
		CDC	0.270	0.635	57.5%
	CDC	Resident	0.425	0.633	32.8%
		CDC	0.397	0.669	40.7%

Significant losses, as measured by percent of normalized estimated strategic value associated with actual CDC purchases compared to top three properties within each analysis category

Application to Decision Models

Decision science models can help CDCs make property acquisition decisions if:

- ▶ Objectives (including social impact measures) are conflicting
- ▶ Priorities on objectives differ across decisionmakers

Multi-criteria decision models can assist decision-makers by:

- ▶ Making explicit the assumptions behind alternative decisions
- ▶ Helping estimate the scale of impacts of different decisions

If different measures of foreclosure impacts that are important to CDCs vary across candidate properties and are not highly correlated, then they are candidates for inclusion in decision models

Can We Apply MCDM to Foreclosed Housing Acquisition Decisions?

Correlations with Strategic Value Estimates:

Weights	Feature Sets	Frames	PVI values	Assessed property value
Base weights	Full	Resident	-0.07	-0.02
		CDC	-0.20	-0.04
	CDC	Resident	0.32	0.05
		CDC	0.35	0.00
Alternate weights	Full	Resident	-0.36	-0.06
		CDC	-0.47	-0.04
	CDC	Resident	0.08	-0.08
		CDC	0.14	-0.15

Absence of large, positive correlations between measures is supportive of MCDM for foreclosed housing decisions

Discussion

Property value impacts:

- ▶ First known instance known of modeling foreclosure impacts using Markov models
- ▶ Recent field research indicates that other CDCs may not place great importance on property value impacts
- ▶ Sensitivity analyses show 12% increase when planning horizon decreased from eight to four periods, negligible impact of changes in interest rate

Strategic value computations:

- ▶ First known instance of quantifying 'strategic value' of candidate foreclosed housing acquisitions
- ▶ Field research with community partners is essential to identifying salient amenities and disamenities

PVI, SVA and assessed value (proxy for market value) are candidates for inclusion in multi-criteria decision models for foreclosed housing acquisition and redevelopment

Expanding Our Work

Assess impacts of findings:

- ▶ To what extent do SVA and PVI reflect actual concerns, data for Chelsea? Are they significant for policy and practice? Can they be replicated?
- ▶ Is Chelsea atypical?

Additional case studies with two more CDCs

To answer our title question requires new methods:

- ▶ Problem structuring methods
- ▶ Value-focused thinking

For updates and more information:
http://umb.libguides.com/foreclosed_housing

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