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Facility location, community corrections, value-focused thinking, geographic information systems.

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Site Selection for Location of Community Corrections Centers

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I. Introduction

Community corrections centers (CCCs, also known as “halfway houses”), are residential facilities for individuals under supervision of the correctional system that serve as an alternative to incarceration, or as a means to assist in the reintegration of incarcerated individuals into civil society. CCCs provide intensive counseling, an environment for increased personal responsibility in managing a household and extensive opportunities for skill-building in employment and education. While representing among the most restrictive of community corrections strategies, CCCs share with other community corrections strategies a strong link to local communities and a goal of changed behavior to reduce the risk of reoffending.

The need for CCCs has increased in the U.S. in part because many felons imprisoned during the steep rise in crime of the 1980s and 1990s approach the end of their sentences. This need for increased capacity for treatment provided by CCCs is complicated by the fact that CCCs are by design generally small (less than 100 beds) and integrated into the local community fabric. Thus, expanding existing CCCs is generally not feasible. Instead, new CCCs must be located afresh (here, “location” refers to renovation of existing buildings or construction of new buildings to specifications appropriate for CCC programs; CCC programming and other service delivery issues, while important, are beyond the scope of this paper). Attempts to locate CCCs often result in substantial local opposition to the introduction of convicts to a residential neighborhood.

While the literature on community corrections emphasizes the role of consultation with local communities by corrections agencies in order to implement community corrections strategies, in practice the location of CCCs in the U.S. is much different. It is more often the case that an agency or non-profit organization, recognizing the need for a new CCC, will select a
single site that best balances various financial, social service and physical criteria. The organization will then approach a local representative body, such as a community club or community development corporation, and attempt to “sell” the idea of a CCC to the members, often deploying political pressure or various incentives to induce local residents to accede to this request. This process is less than optimal for two reasons. First, it may generate well-organized local opposition to the proposed CCC than can derail the process completely, independent of any policy or correctional justification for the project. Second, this process is inconsistent with the values of community corrections and thus less likely to leverage the benefits of residential location to best assist CCC residents.

The challenges associated with CCC location are not unique. Many other facilities that are intended to integrate clients to the community fabric, such as group homes for mentally or physically disabled, or treatment facilities for substance abusers, or subsidized housing, face similar intense opposition from local residents who fear adverse impacts on local amenities and diminished personal safety. As for CCCs, location of these “undesirable” facilities can be challenging, expensive, time-consuming and often unsuccessful.

The goal of this paper is twofold: to present an interdisciplinary methodology for selecting potential locations for CCCs, and to demonstrate the feasibility of this approach by applying it to actual data. We limit our focus in this paper to the “site generation” phase of CCC location; the process of ranking potential sites to choose a single most-preferred site is the topic of another paper.

It is the hypothesis of this paper that identification of potential CCC sites using spatial analysis of a large and diverse set of data identified through stakeholder discussions can result in a larger and more diverse set of location alternatives than would be generated through
conventional practice. Ultimately, it is hypothesized that CCCs that are located using site generation methods (in this paper) and site ranking methods (under investigation) will result in facilities that generate less local opposition and are associated with better client outcomes as compared to those located using conventional methods.

The methodology presented in this paper is applied to data for the Pittsburgh metropolitan area. Results indicate that intensive analysis of neighborhood and CCC characteristics can generate a variety of potential CCC locations that provide flexibility and consistency to the CCC location process.

There are three features of this study of interest to researchers. First, we demonstrate a method to identify neighborhood and facility characteristics that may influence the efficacy of CCC treatment using survey data on existing CCCs and publicly-available spatial data. Second, we advocate intensive, data-driven discussions with local stakeholders to identify goals associated with the CCC location problem. Finally, we advocate the use of geographic information systems to generate site selection alternatives.

The remainder of this paper is structured as follows. Section II surveys a variety of research domains relevant to the problem of CCC site selection. Section III presents the methodology for CCC site selection. Section IV applies the methodology to a case study of the Pittsburgh, U.S. metropolitan area. Section V concludes and identifies research extensions.

II. Theory and Practice Relevant to CCC Location

In this section we review the literature in a variety of domains related to location of community corrections centers. We address community corrections, operations
research/management science (OR/MS) models for location of undesirable facilities, spatial
decision support and conclude with theory and practice related specifically to CCC location.

Community Corrections

Community corrections is defined as activities that “engage communities, victims,
offenders, volunteers in local efforts to prevent future crime, provide effective correctional
treatment, monitor offender compliance, punish appropriately, and pay for the harm that has
occurred” (Center for Community Corrections 1997, p. 4). Community corrections activities
range from least restrictive sanctions such as fines, fees and impoundment, to moderately
restrictive sanctions such as community service and victim/offender reconciliation, to very
restrictive sanctions such as halfway houses and work release (Evans 1995, Center for
Community Corrections 1999). Community corrections practice requires identification of the
appropriate role of elected officials and local communities and securing resources for special
needs populations (see Shelton et al. 1995 for a policy guide for elected officials and Shelton
2001 for references especially for mothers and children under state supervision).

Community corrections alternatives have been shown to be effective in reducing the risk
of criminal refunding (Gendered and Paparazzi 1995, Knight and Hiller 1997, Shelton et al.
1995, National Committee on Community Corrections (undated)). However, the research
literature does not as yet contain a comprehensive evaluation of the effects of halfway houses on
criminal re-offending across jurisdictions and client types. Community corrections have also
been shown to be cost-efficient as compared to conventional incarceration (Center for
Community Corrections 1997, Shelton et al. 1995). When combined with education and
treatment services, halfway houses can be as expensive as jail on a daily basis, but average stays
in halfway houses are typically much less than those for jails or prisons.
Community corrections centers are characterized by restricted movement and structured activities in a residential context (The Center for Community Corrections 1997, National Committee on Community Corrections undated). They can provide either an alternative to incarceration, or a means by which incarcerated individuals can transition to life in civil society. CCCs are typically small (100 beds or less). Like group homes for substance abusers and mentally/physically disabled, or scattered-site subsidized housing, and unlike conventional jails or prisons, CCCs are intended to blend into the neighborhood fabric in terms of physical design and civic participation of residents and administrators.

Undesirable Facility Location

Residents of communities in which CCCs are located, or are proposed for location, may perceive additional risks to personal safety, through increased likelihood of criminal victimization, and to financial well-being, through decreased property values. Perceptions that CCCs are “undesirable facilities” must be addressed in the policy planning process. Thus, it is appropriate to address the research literature associated with location of undesirable facilities.

The term “undesirable” is a generalization of the notion of obnoxious facilities, i.e. those that pose threats to the lives of those who live close to them, and noxious facilities, i.e. those that pose a health or welfare threat to nearby residents (Daskin 1995, p. 363). Using the language of economics, an undesirable facility is one for which nearby neighbors express a positive willingness-to-pay to avoid proximity. Opposition to undesirable facilities may result in active political opposition. Examples of this NIMBY (“not in my backyard”) phenomenon abound: drug treatment centers (San Diego Union Tribune 2002), schools (DeFord 2002), deinstitutionalized persons with mental disabilities (Kim 2000) and halfway houses for fathers in violation of their child support obligations (Pittsburgh Post-Gazette 2001).
OR/MS models for location of undesirable facilities are of two general types: mathematical programming to assign values to decision variables that prescribe location of facilities in order to optimize one or more objectives, and multi-criteria decision models, that rank site alternatives directly using attributes of candidate sites. Examples of the former approach typically address two alternative policy objectives: maximize the distance between facilities, e.g. solid waste facilities, and the general population (maxisum models), or maximize the distance between the facilities themselves, e.g. the location of missile silos across a country (dispersion models). Undesirable facility location models incorporate constraints that limit, for example, the number of facilities that may be sited, or enforce requirements that population centers be assigned to a single facility. See Daskin (1995, Chapter 8), Eiselt and Laporte (1995) and Erkut and Neuman (1989) for detailed exposition of these models. Undesirable facility location models may also incorporate objectives that address concerns for economic efficiency or equity. Integrating two or more conflicting objectives requires consideration of methods for solving multiobjective mathematical programs (Cohon 1978).

Multiple criteria decision models (MCDMs) can be divided into those that allow tradeoffs between attribute levels and those that do not, and those that explicitly incorporate risk, or uncertainty, and those that do not. For example, a simple ranking of alternatives in descending order by level of attributes (“elimination by aspects”, Holsapple and Whinston 1996) addresses neither tradeoffs nor risk. The Analytic Hierarchy Process (AHP), a MCDM based on detailed elicitation of user preferences for attributes (Saaty 1980), addresses tradeoffs but not risk. Multiattribute utility theory (MAUT), a MCDM that explicitly models individual utility functions using principles developed over half a century ago (von Winterfeldt and Edwards
1989), addresses both tradeoffs and risk. Erkut and Moran (AHP; 1988) and Keeney (MAUT; 1980) have applied MCDM to location of undesirable facilities.

Math programming is preferred when policy concerns can be captured by clearly quantifiable objective functions or the number of alternative solutions is large; MCDM, when objectives are not easily quantifiable or the number of alternatives is small.

Spatial Decision Support

A spatial decision support system (SDSS) is defined as “an interactive, computer-based system designed to support a user or group of users in achieving a higher effectiveness of decision-making while solving a semistructured spatial decision problem” (Malczewski 1999, p. 281). Since location of community corrections centers can be done using OR/MS decision models, is data-intensive and has a spatial dimension, SDSS is relevant to CCC location.

Our conception of SDSS for CCC location addresses three distinct research domains: problem structuring, spatial decision support and multi-stakeholder negotiations. The approach for problem structuring used in this paper is value-focused thinking (Keeney 1992). Value-focused thinking enables stakeholders to identify goals that are important to them in solving a problem. By distinguishing between means goals and ends goals, stakeholders can develop a goals hierarchy that can be used to generate decision models. Spatial decision support incorporates spatial data, decision models and information systems design (Malczewski 1999). Multi-stakeholder negotiation denotes participation of multiple competing parties in the facility location process, e.g. community residents, community corrections representatives, political representatives, and advocates for incarcerated individuals, often facilitated by spatial decision support systems (Jankowski and Nyerges 2001).
Location of Community Corrections Centers

Location of community corrections centers has been the subject of considerable practitioner and academic inquiry, though not necessarily via the quantitative framework presented above. VanNijnatten and Gregoire (1993) report that community opposition to location of jails or halfway houses in or near residential communities is much greater when residents believe that government has already made its decision on site selection and was simply encouraging residents to acquiesce. While there is limited social science evidence regarding community impacts of halfway houses, this information not widely available. Thus, discussions regarding CCC location is dominated by political concerns and perceived risks. This “site-first, consult-second” strategy, insufficiently informed by research evidence, appears to be common in the field.

However, there are a number of “best practices” associated with location of controversial or undesirable facilities: assisted living facilities (Rowe 1998), hazardous facilities (McAvoy 1999 and Steel 2000), drug and alcohol treatment programs (Treatment Improvement Exchange 1995), jails (Ricci undated) and community corrections facilities, including halfway houses (Lindsey 2000a, 200b, Shilton 2000). Common principles include: communication among all stakeholders to clarify policy goals and address concerns in advance of discussion of particular candidate sites; dissemination of information regarding potential impacts associated with location alternatives, flexibility regarding size, programmatic characteristics and physical configuration of potential facilities during the zoning/permitting process, and relationship-building with local institutions, such as local employers of facility clients. A particular challenge in this process is estimation of likely impacts of halfway houses. Research results in this area are limited and flawed methodologically.
III. CCCLoc: A Multi-Stakeholder Community Corrections Siting Methodology

The previous section presented two decision modeling frameworks for the community corrections center location problem. A logical next step in this research would be to apply both approaches to determine which one appears most appropriate for CCC location.

However, the application of decision models to CCC location is so new, and such a contrast to the standard CCC location procedures, that it is useful to propose a methodology that includes problem structuring and solutions analysis steps that precede and follow the application of OR/MS decision models. This process, referred to as “CCCLoc”, includes the following steps:

- Data analysis
- Value-focused thinking
- Alternatives selection
- Site selection/ranking
- Sensitivity analysis
- Policy design

In this paper we limit our attention to the first three steps and the last; details of the fourth and fifth steps are deferred to a subsequent paper.

Data Analysis

The goal of this step is identification of specific variables associated with impacts of CCC location, and operationalizing these variables using available data. At the neighborhood level, one should identify attributes that distinguish communities in which CCCs are already located those without CCCs. At the CCC facility level, one should identify those characteristics
that distinguish more successful sites from those that are less successful. Examples of these variables follow.

*Criminal offending*, both by CCC residents, and by community residents influenced by CCC residents, could be measured by violent crime rates, or counts of emergency calls, or perhaps an initial risk assessment measure of CCC residents. *Neighborhood cohesiveness*, a presumed contributor to beneficial community corrections outcomes, could be measured in the following ways: density of residential, commercial and other land uses; proximity of the neighborhood to other undesirable land uses, such as environmental hazards, collections of abandoned property parcels, group homes or prisons; social science measures of community efficacy and social ties. *Local amenities*, another contributor to beneficial community corrections outcomes, could be measured using distance from potential CCC locations to high-density mass-transit hubs, to shopping and cultural resources, and to educational and employment opportunities. Predictors of *potential neighborhood opposition* to CCCs could be represented by changes in property values over time, and general negative perceptions about the direction of the community. Finally, *characteristics of current CCCs* could be represented by facility size, in terms of lot size, building size and number of beds; facility configuration, for example, converted single-family residence, converted commercial building or new construction, and mix of residents, in terms of race, ethnicity, age, type of crime convicted, and skill set.

*Value-Focused Thinking*

Value-focused thinking is best done when participants have the fullest possible understanding of the problem context, as might be provided by the Data Analysis step, above. The first step in value-focused thinking is the *collection of diverse stakeholders*. In the case of CCC location, this group might consist of representatives of state correctional agencies and
private organizations providing correctional services (including currently operating CCCs), local community representatives, such as members of community clubs, community development corporations and block watches, taxpayers and representatives of CCC clients themselves.

The next step in this process is identification of *stakeholder-specific goals hierarchies*. Each hierarchy consists of *means goals*, that is, measures of the extent to which a particular policy initiative is successful, and *ends goals*, representing core values to which at least one means goal is associated. Each stakeholder-specific goals hierarchy could then be consolidated into a single *values hierarchy* that reflects the interests of all stakeholders and enables identification of CCC location alternatives and attributes. An example of stakeholder-specific goals hierarchies and a single values hierarchy is contained in Figure 1.

[Figure 1: Hypothetical Means-Ends Objective Network Generation for CCC Location]

A successful application of value-focused thinking can provide the basis for decision models: objective functions and constraints, in the case of math programming approaches, or alternatives and attributes, in the case of multi-criteria decision models (Figure 2).

[Figure 2: Generation of Decision Model Components via Value-Focused Thinking]
Alternatives Selection

Decision models for CCC location presume a set of alternatives to be ranked, in the case of multi-criteria decision models, or a set of network nodes, or x-y coordinates, from which one or more are to be selected, in the case of math programming models. Selection of alternatives for CCC location using decision models can be done using geographic information systems. Whether alternatives are represented as aggregate spatial units, e.g. neighborhoods, or specific real estate parcels, it is possible for stakeholders to define criteria and thresholds that may serve to distinguish “acceptable” alternatives from “unacceptable” alternatives. These criteria and thresholds may be generated by value-focused thinking and data analysis. Figure 3 represents an example, using ArcView GIS, of selecting potential alternative Census tracts for CCC location in the city of Pittsburgh, USA, on the basis of neighborhood-level characteristics, in this case, poverty rate (less than 10%) and average appreciation in owner-occupied housing between 1980 and 1990 (greater than 0).

[Figure 3: Alternative Selection Using Geographic Information Systems]

Policy Design

The primary concern of a public agency or private organization charged with locating a community corrections center, is, naturally, locating the CCC. However, the conventional method of doing so is likely to generate substantial local opposition. The CCCLoc methodology is intended to address concerns based in part on “NIMBY” sentiments, disagreements regarding the values placed on the alternatives, and disagreements with the process by which the choice of
CCC(s) is made. As a result, the policy scope related to CCC location becomes much wider than is conventionally assumed. At the long-range strategic level (two to three years), the goal is to select particular “neighborhoods” in which a CCC may be sited if potential parcels that may be suitable become available. At the medium-range strategic level (one to two years), the goal is to select a particular parcel in which a CCC is to be located, within the most-desirable neighborhood chosen earlier. At the tactical level (six months to one year), the goal is to acquire the parcel and develop a community correction center. In each case, value-focused thinking, community engagement and quantitative decision models may contribute to selection of site alternatives that generate beneficial outcomes for CCC clients and minimize local opposition.

IV. Case Study: Allegheny County, PA

The motivation for this case study is the experience of a CCC operator in Pittsburgh which attempted in 2001 to locate a halfway house for fathers jailed for violating terms of their child support obligations. The location process followed consisted of the conventional strategy of site selection, followed by community engagement. Local opposition to the proposed facility was so strong that the facility was never sited.

This case study focuses on eight CCCs in Allegheny County, PA that are managed directly by the Pennsylvania Department of Community Corrections, or by private contractors. Seven of these CCCs are located in the city of Pittsburgh; the eighth is located in a working-class suburb. We use data associated with these CCCs, and the neighborhoods in which they are located, to provide insight into potential locations for a new CCC in the city of Pittsburgh. We assume that there is only a single stakeholder, the state agency seeking to site a CCC in order to maximize beneficial client outcomes and to minimize neighborhood opposition.
**Data Analysis**

We have gathered data for this case study through a number of methods: a survey of the eight CCCs, analysis of characteristics of Census tracts in which the CCCs are located, analysis of characteristics of Census tracts we have judged are “similar” to those containing CCCs, and a comprehensive set of spatial data for Allegheny County.

Extensive data analysis indicated striking distinctions between tracts that contain CCCs and citywide averages: income (lower), vacancy rates (higher), percent of housing units that are renter occupied (higher), unemployment rates (higher), changes in crime rates between 1990 and 2000 (lower), population density (higher) and the fraction of population over 25 years old without a high school diploma (higher).

These data are only suggestive, however, of distinctions between neighborhoods in which CCCs are located and those without CCCs. More specific insight regarding these distinctions can be derived using a comparison methodology. For each Census tract that contains a CCC (the “target tract”) we have selected “comparison” Census tracts that are similar in certain features to identify other neighborhood attributes that might vary. These comparison tracts are of two types: a “first-ring” comparison tract that abuts the target tract, and an “outer-ring” comparison tract located elsewhere.

Four tract-level attributes from Census 2000 data were used to assess “similarity” to the target tract for both the first and outer ring comparison tracts: population, percent of households that are African-American, percent of renter-occupied housing units, and percent of households with annual income below $10,000. A first-ring comparison tract is defined as that first-ring Census tract whose sum of the squares of the differences between characteristics of the first-ring tract and the CCC tract is minimal. An outer-ring comparison tract is a Census tract close to, but
not adjoining, target tracts whose population is not 75% higher or lower than the population of
the target tract and whose sum of squares of the differences between characteristics of the
candidate tract and the CCC tract is minimal.

Comparisons between mean values for target tracts and first-ring tracts for a variety of
attributes, including vacancy rates, percent of population without a high school diploma and
crime rates showed no statistically significant differences (Table 1). Note, however, that the
percent difference between target tracts and first-ring comparison tracts are largest for Vacancy
Rates, Percent Houses Owner-Occupied and Crime Rates, and that the t-test results for
differences in means for these attributes come closest to indicating statistical significance.

[Table 1: Comparison between Target Tracts and First-Ring Comparison Tracts]

Similar comparisons between target tracts and outer-ring comparison tracts yielded similar
results (not shown).

We now address characteristics of CCCs in Pittsburgh. We distributed a survey to eight
CCCs in Allegheny County that elicited information in the following categories: Size and
Makeup of Center; Makeup of Client Population; Activities and Services Offered, and
Community Acceptance and Integration (the survey instrument is available from the author).
Table 2 summarizes a variety of measures for the six CCCs for which we currently have
complete survey response data (CCC names have been suppressed). Five of the six CCCs serve
100 or fewer clients, with one, CCC #6, serving far in excess of this number. On average, there
are 1.98 clients per paid staff member. Clients tend to stay a little over three and one-half months
in halfway houses, and the facilities themselves report that on average 95.43 percent of their clients finish their stays employed or in school\textsuperscript{1}.

[Table 2: Summary CCC Characteristics: Client Size, Staffing, Length of Stay, Client Outcomes]

There appears to be particularly large variation in client-to-staff ratio and length of stay. Some variables show significant associations, as indicated in Table 3; Number of Clients and Percent of Known Outcomes that are Positive exhibit the strongest (negative) association.

[Table 3: Correlations between Self-Reported Program Characteristics]

Figure 6 indicates that, as compared to the Census tracts in which CCCs are located, the CCC clientele has a significantly higher proportion of African Americans, though tracts in which CCCs are located tend to have race/ethnicity characteristics that do not differ much from the city overall.

[Figure 4: Race/Ethnicity Characteristics of CCC Clients, CCC Tracts and City of Pittsburgh]

Other analyses (not shown) show similar trends: as compared to the population of tracts in which CCCs are located, CCC clients tend to be significantly younger (62\% of CCC clients are between

\textsuperscript{1} Unfortunately, we do not have access to administrative data that would allow a finer examination of client success
ages 18 – 34, as compared to 39% of the tract populations), and have significantly lower levels of educational attainment (51% of CCC clients do not have a high school diploma or GED, as compared to 23% of the tract populations that over 25 and without a high school diploma).

Another analysis of CCC survey results (Table 4) measures the extent to which respondents feel that neighborhood characteristics influence the probability of CCC client success, previously defined as continuous employment or education. By comparing the mean responses to questions the section “Community Acceptance and Integration” ranging from 0 (“Greatly Hinders Success”) through 4 (“No Effect”) to 7 (“Greatly Assists Success”), we find statistically significant responses for Employment Opportunities, Access to Public Transit and Access to Local Amenities (positive) and for Crime of Surrounding Neighborhood (negative).

[Table 4: Strength of Influence of Neighborhood Characteristics on CCC Client Outcomes]

A final analysis (Table 5) attempts to determine the influence of CCC characteristics and neighborhood characteristics on self-reported levels of acceptance of the CCC by the surrounding community. The first model determines the impact of the variables percent of senior citizens, percent unemployed, and vacancy rate of the census tract in which the CCC is located upon community feeling. The second model determines the impact of mean CCC client age, percent of CCC clients that are African American, percent of CCC clients without a high school diploma, and average length of stay upon community feeling.
Results for the first model indicate that the signs of the estimated coefficients correspond with intuition: tract unemployment and vacancy rates are positively associated with community acceptance of CCCs, while percent elderly is negatively associated with community acceptance of CCCs. However, no estimated coefficients are statistically significant at the 5% level and the R-squared value is fairly low. Results for the second, more robust model indicate that the signs of the estimated coefficients correspond to intuition with the exception of percent of clients without a high school diploma. These results do not appear to shed much light into the discrepancies between CCC clients and their surrounding communities.

Our results can be summarized as follows: at the neighborhood level, percent low-income, vacancy rates, percent of housing units that are renter occupied, changes in crime rates between 1990 and 2000, unemployment rate, population density and the fraction of population over 25 years old without a high school diploma appear to distinguish Census tracts containing CCCs from city-wide averages, but none of these variables appear to distinguish Census tracts containing CCCs from otherwise similar comparison tracts at conventional levels of statistical significance. At the facility level, Number of Clients, Ratio of Client to Paid Staff and Average Length of Stay are highly associated with measure Percent of Outcomes that are Positive. Local employment opportunities, transit accessibility and levels of local amenities appear to positively and significantly affect self-reported likelihood of beneficial client outcomes, while local crime levels have a negative and statistically significant effect on client outcomes. Only percent of CCC clients without a high school diploma has a statistically significant effect on self-reported levels of community acceptance.
Value-Focused Thinking

Assume that one ends objective, or fundamental value, is “minimize risk of criminal victimization by CCC clients”. If risk of criminal victimization is inversely associated with positive client outcomes, then, based on results in Tables 3 and 4, number of CCC clients, local employment opportunities, transit accessibility, levels of local amenities and local crime levels are promising means objectives.

Assume that another ends objective is “preserve the fabric of neighborhoods in which CCCs might be sited,” and assume that preserving the neighborhood fabric is inversely associated with levels of community opposition. Then this objective could be interpreted to mean that characteristics of CCC clients should not differ significantly from neighborhood characteristics, that characteristics of neighborhoods in which CCCs are currently located should not differ significantly those of otherwise similar neighborhoods without CCCs, and that neighborhood and CCC characteristics should not negatively affect the likelihood of community acceptance. Previous analysis has shown that no characteristics of tracts with CCCs distinguish them from otherwise similar tracts without CCCs (Table 1), and that only the percentage of CCC clients without high school diplomas is significantly (and positively) associated with levels of neighborhood acceptance (Table 5). The last result does not contribute in a meaningful way to the value-focused thinking exercise and is dropped from consideration.

Alternatives Selection

We define “destination community” as a Census tract, rather than administratively-defined “neighborhoods” (usually aggregates of Census tracts). While it is possible that residents’ own perceptions of their “neighborhood” may be inconsistent with Census tract
boundaries, the goal of this exercise is to identify feasible regions that are small enough to facilitate selection of a small number of actual parcels suitable for CCC development.

Based on the means-ends hierarchy developed above, we propose that communities into which a CCC might be sited should have reasonably high measures for local employment opportunities, transit accessibility and levels of local amenities, and reasonably low levels of crime. In addition, given the negative association between number of CCC clients and positive client outcomes, communities that are selected should contain at least one parcel whose zoning designation allows for the smallest possible size of correctional facility, 50 beds or less.\(^2\)

We translate the first four requirements listed above into criteria suitable for spatial analysis as follows. One crude measure of local employment opportunity is counts of establishments by Standard Industrial Code and Zip code (U.S. Census Bureau 2003b). Transit accessibility can be measured using data developed by the Pittsburgh Foundation (1999) to estimate the regions in Allegheny County accessible, on average, within 15, 30, 45 or 60 minutes from certain high-poverty neighborhoods. Levels of local amenities can be approximated by proximity to libraries, recreation centers and hospitals, based on data provided by the Housing Authority of the City of Pittsburgh (2002). Crime levels for the year 2000 are measured at the neighborhood level for Type I and Type II crimes by the Pittsburgh Post-Gazette (2002a,b).

We apply these measures as follows:

- **Employment accessibility**: the number of enterprises classified as “low-paid service” in the zip code containing a candidate tract must not be less than one-half standard deviation below the citywide average;

\(^2\) The City of Pittsburgh Urban Zoning Code, as amended December 31, 1999, classifies parcels into a number of categories based on land use, and aggregates zoning designations into a number of “districts”. The land use classification “Correctional Facility (Limited)” covers facilities with 50 or fewer beds; this land use is allowed for
- **Transit accessibility:** candidate tracts must be within 30 minutes’ travel by mass transit of at least one of three key destinations: Downtown, a regional shopping mall in a nearby southern suburb and another mall in far northeast portion of the city;

- **Local amenities:** candidate tracts must be located within a neighborhood that has either a library, a recreation center, or a hospital;

- **Crime levels:** candidate tracts must be located within a neighborhood whose total 2000 crime rate does not exceed one-half standard deviation above the city average.

These criteria were applied to parcel-, tract-, neighborhood- and zip code- level data, as well as custom coverages and point files for the Allegheny County by repeatedly using the “spatial overlay” feature of the ArcView 3.2 GIS (Environmental Sciences Research Institute 2001). This analysis was done twice: once, including the criterion that candidate tracts must be within 30 minutes’ travel by mass transit of at least one of three key destinations, and again, including the criterion that candidate tracts must be within 30 minutes’ travel by mass transit of all three key destinations. Results are shown in Figures 5 and 6, below.

[Figure 5: Tracts Eligible for CCC Location (Accessible to At Least One Regional Destination)]

[Figure 6: Tracts Eligible for CCC Location (Accessible to All Three Regional Destinations)]

The 20 eligible Pittsburgh tracts that are accessible to at least one of the three major regional destinations are dispersed throughout the city, including portions that do currently host CCCs. This is an indication that while the method by which potential CCC sites have been

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seven zoning designations. In contrast, the land use classification “Correctional Facility (General)” covers facilities with 50 or more beds, and is allowed under only two zoning designations.
chosen may be equitable from a societal viewpoint, there is the potential for opposition from potential host communities who may bear animus against CCC clients.

In contrast, the 5 tracts that are accessible to all three regional destinations are all concentrated in the eastern portion of the city. Moreover, these tracts are a subset of the first set of potential destinations. These results indicate that the data analysis and value-focused thinking steps of CCCLoc are critically important in generating alternatives that may very greatly in size and spatial distribution.

Finally, Figure 7 presents a detailed look at the North Oakland neighborhood which contains potential destination tracts common to the two site selection criteria shown in Figures 5 and 6. While there are fewer parcels in North Oakland eligible for CCC siting than there are in adjoining neighborhoods, there appear to be enough parcels to justify further investigation.

[Figure 7: Detail of Eligible Tracts]

V. Conclusion and Next Steps

The purpose of this study has been to provide a clear and consistent method for generating alternatives for CCC location that account for observed variations in community-level demographic characteristics and in characteristics of existing CCCs. We propose a methodology for CCC location that includes, but is not limited to, solution of OR/MS decision models, and which is designed to generate maximal knowledge about the problem domain among stakeholders, and maximal stakeholder consensus about the solution method and model results. This method integrates methods in statistical analysis, value-focused thinking and spatial
analysis, and results in a range of alternative CCC locations that can reflect preferences of multiple stakeholder groups.

We have illustrated this method, called CCCLoc, with a case study of Pittsburgh, Pennsylvania. The case study indicates that there are a substantial number of neighborhood characteristics that distinguish Census tracts that currently contain CCCs from citywide averages and from similar tracts without CCCs. However, there are no statistically significant distinctions between Census tracts that contain CCCs and other tracts without CCCs that are chosen to be similar according to a small set of criteria. CCC characteristics such as the number of clients and length of stay are associated into program efficacy; characteristics such as race/ethnicity, age profile and educational attainment provide a stark contrast to neighborhoods that currently contain CCCs and citywide averages on these measures. Neighborhood characteristics such as transit accessibility, crime rate and level of local amenities have been found to be statistically significantly associated with CCC self-reported likelihood of beneficial client outcomes. Regression analysis has found no intuitive and statistically significant associations between either characteristics of neighborhoods in which CCCs are located, or characteristics of CCCs themselves, and self-reported likelihood of community opposition to CCCs. Finally, a nontrivial number of potential destination communities are identified through GIS analysis; these communities show spatial variation that is dependent on selection criteria.

The CCCLoc methodology, and the results generated in the Pittsburgh case study, represent an advance over conventional real estate knowledge, in which a practitioner will call upon his contacts and know-how to identify a small number of parcels that may be developed into CCCs, without explicit reference to characteristics of neighborhoods or CCCs, and without addressing specific concerns of potential host communities in advance of the site selection step.
These preliminary results seem to support a multidisciplinary approach to CCC location and CCC services provision in general.

It is not clear whether application of this method will result in lower levels of opposition among community residents to CCC location as compared to conventional methods. However, it is possible that this process makes assumptions underlying the alternatives generation step explicit and auditable. Thus, opposition to CCC location based primarily on fears of potential negative externalities, or, worse, based on discriminatory attitudes towards CCC clients, may be exposed as counter to an equitable and efficient public decision process.

One important concern about the applicability of the CCCLoc methodology to real-life problems is the large amount of data and substantial information technology and management science expertise necessary to generate meaningful results. Given current limitations on agency budgets and technical expertise, it is possible that application of this methodology “on the ground” will require a variety of simplifications. Nevertheless, data collection and structured stakeholder input may result in location of CCCs that have a higher probability of long-term beneficial client outcomes and lower levels of community opposition than is currently the case.

There are a number of potential next steps to this research. Focus group analysis with actual or simulated stakeholder representatives may provide better insight as to the impact of local data on the value-focused thinking exercise, the influence of value-focused thinking on decision model generation, and the choice of alternative site selection/ranking methods. Alternative site selection/ranking methods may be applied to choose a most-preferred site and to provide insight as to the most suitable decision model.
Acknowledgements

This research was funded by the National Consortium on Violence Research under a Career Development Fellowship. Al Blumstein helped identify the fundamental decision problem. Mary K. Shilton helped identify and frame the main social science and policy issues. Robert Belcik, Glenn Callihan and Pat Malloy provided community corrections practitioner expertise. Robert Carpenter provided real estate practitioner expertise. Michael Niemeyer designed the survey instrument and evaluated survey responses and neighborhood-level data.

References


Housing Authority of the City of Pittsburgh. 2002. Pittsburgh boundary and point files.


Figures and Tables:

Means-Ends Hierarchy: Public/private corrections organizations

**Ends:**
- Rehabilitation of incarcerated individuals
- Minimize community opposition

**Means:**
- Choice of CCC sites that minimize risk of reoffending
- Allow communities real say in CCC location

Means-Ends Hierarchy: Destination Communities

**Ends:**
- Minimize risk of criminal victimization
- Preserve neighborhood fabric

**Means:**
- Restrict CCC clients to nonviolent offenders
- Ensure each community bears its "fair share"

Means-Ends Hierarchy: CCC clients

**Ends:**
- Successful transition of clients to civil society

**Means:**
- Local accessibility to supportive services
- CCC location in stable, high-amenity communities

Means-Ends Hierarchy: Taxpayers

**Ends:**
- Minimize program costs
- Minimize costs associated with reoffending and dependence on public services

**Means:**
- Avoid high-cost destination communities and facilities
- Accessibility to employment/training resources

Means-Ends Hierarchy: All Stakeholders

**Ends:**
- Rehabilitation
- Minimize costs

**Means:**
- Cooperation between multiple stakeholders in policy design
- Access of CCC clients to supportive Services and resources

[Figure 1: Hypothetical Means-Ends Objective Network Generation for CCC Location]
Means-Ends Hierarchy (all stakeholders)

Multi-Objective Math Programming Model
- **Objectives**
  (minimize distance between CCCs and local amenities, minimize perceived inequity, …)
- **Constraints**
  (locate fixed number of facilities, prohibit pairs of CCCs within minimum separation Distance…)

Multi-Criteria Decision Model
- **Alternatives**
  (neighborhood/parcel 1, neighborhood/parcel 2, …)
- **Attributes**
  (neighborhood crime rate, neighborhood poverty rate, CCC proximity to transportation, …)

[Figure 2: Generation of Decision Model Components via Value-Focused Thinking]
(Image created with ArcView GIS V3.2)

[Figure 3: Alternative Selection Using Geographic Information Systems]
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Target Tract Mean</th>
<th>Diff. Between Target Tract and 1st Ring Comp. Tract Means</th>
<th>% Difference</th>
<th>T-Value</th>
<th>P-Value</th>
<th>Significant?*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacancy Rates: 2000</td>
<td>23.10</td>
<td>4.30</td>
<td>18.61</td>
<td>1.13</td>
<td>.2966</td>
<td>No</td>
</tr>
<tr>
<td>Unemployment Rates: 2000</td>
<td>6.36</td>
<td>0.48</td>
<td>7.47</td>
<td>0.41</td>
<td>.6917</td>
<td>No</td>
</tr>
<tr>
<td>Percent Houses Owner-Occupied: 2000</td>
<td>30.33</td>
<td>-5.86</td>
<td>19.32</td>
<td>-1.30</td>
<td>.235</td>
<td>No</td>
</tr>
<tr>
<td>Percent Without H.S. Diploma: 2000</td>
<td>23.25</td>
<td>0.41</td>
<td>1.77</td>
<td>0.14</td>
<td>.8963</td>
<td>No</td>
</tr>
<tr>
<td>Percent Pop. Age 20-34: 2000</td>
<td>32.45</td>
<td>1.39</td>
<td>4.27</td>
<td>0.62</td>
<td>.5536</td>
<td>No</td>
</tr>
<tr>
<td>Percent Contract Rent Less than $250 Per Month: 2000</td>
<td>18.47</td>
<td>0.28</td>
<td>1.49</td>
<td>0.06</td>
<td>.9537</td>
<td>No</td>
</tr>
<tr>
<td>Percent African American: 2000</td>
<td>29.69</td>
<td>-2.52</td>
<td>8.49</td>
<td>-0.61</td>
<td>.5599</td>
<td>No</td>
</tr>
<tr>
<td>Median Household Income: 2000</td>
<td>26,476**</td>
<td>3815.63**</td>
<td>14.41</td>
<td>0.63</td>
<td>.5489</td>
<td>No</td>
</tr>
<tr>
<td>Crime Rates: 2000</td>
<td>34.42</td>
<td>11.74</td>
<td>34.11</td>
<td>1.13</td>
<td>.2957</td>
<td>No</td>
</tr>
</tbody>
</table>

\[N = 8\]

Source: U.S. Census Bureau 2003a.

*Statistical significance cut-off is a t-value of >= 1.96 or <=-1.96 and a p-value of <= .05.

** This result is distorted by an outlier of Census Tract 2205 (North Shore) whose median household income is $70,125, far above any of the other tracts.

[Table 1: Comparison between Target Tracts and First-Ring Comparison Tracts]
<table>
<thead>
<tr>
<th>Community Corrections Center</th>
<th>Number of Clients</th>
<th>Ratio of Clients to Paid Staff</th>
<th>Average Length of Stay (Days)</th>
<th>Percent of Known Outcomes that are Positive**</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCC #1 (State-run)</td>
<td>39</td>
<td>2.60</td>
<td>180</td>
<td>100</td>
</tr>
<tr>
<td>CCC #2 (State-run)</td>
<td>20</td>
<td>1.11</td>
<td>105</td>
<td>100</td>
</tr>
<tr>
<td>CCC #3 (State-run)</td>
<td>12</td>
<td>1.20</td>
<td>120</td>
<td>100</td>
</tr>
<tr>
<td>CCC #4 (Private)</td>
<td>50</td>
<td>1.67</td>
<td>90</td>
<td>97.0</td>
</tr>
<tr>
<td>CCC #5 (Private)</td>
<td>32</td>
<td>2.67</td>
<td>90</td>
<td>89.5</td>
</tr>
<tr>
<td>CCC #6 (Private)</td>
<td>222</td>
<td>2.61</td>
<td>83</td>
<td>86.1</td>
</tr>
<tr>
<td><strong>Average:</strong></td>
<td><strong>62.50</strong></td>
<td><strong>1.98</strong></td>
<td><strong>96.98</strong></td>
<td><strong>95.43</strong></td>
</tr>
<tr>
<td><strong>Standard Deviation:</strong></td>
<td><strong>79.29</strong></td>
<td><strong>0.74</strong></td>
<td><strong>36.18</strong></td>
<td><strong>6.12</strong></td>
</tr>
</tbody>
</table>

Source: Survey of Pittsburgh-area CCCs by author

*Average length of stay for all CCCs is weighted by the number of clients at each CCC

** *A positive outcome is defined as employment or continuing education

[Table 2: Self-Reported CCC Characteristics, Allegheny County, PA]
<table>
<thead>
<tr>
<th></th>
<th>Number of Clients</th>
<th>Ratio of Clients to Paid Staff</th>
<th>Average Length of Stay (Days)</th>
<th>Percent of Known Outcomes that are Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Clients</td>
<td>1</td>
<td>0.496</td>
<td>-0.375</td>
<td>-0.766</td>
</tr>
<tr>
<td>Ratio of Clients to Paid Staff</td>
<td>0.496</td>
<td>1</td>
<td>0.115</td>
<td>-0.672</td>
</tr>
<tr>
<td>Average Length of Stay (Days)</td>
<td>-0.375</td>
<td>0.115</td>
<td>1</td>
<td>0.616</td>
</tr>
<tr>
<td>Percent of Known Outcomes that are Positive</td>
<td>-0.766</td>
<td>-0.672</td>
<td>0.616</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Survey of Pittsburgh-area CCCs by author

[Table 3: Correlations between Self-Reported CCC Program Characteristics]
Source: Survey of Pittsburgh-area CCCs by author, U.S. Census Bureau 2003a

[Figure 4: Race/Ethnicity Characteristics of CCC Clients, CCC Tracts and City of Pittsburgh]
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Mean*</th>
<th>T-Value</th>
<th>P-Value</th>
<th>Significant?**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment Opportunities</td>
<td>5.83</td>
<td>11.00</td>
<td>.0001</td>
<td>Yes</td>
</tr>
<tr>
<td>Access to Public Transit</td>
<td>6.00</td>
<td>5.48</td>
<td>.0028</td>
<td>Yes</td>
</tr>
<tr>
<td>Access to Local Amenities</td>
<td>6.17</td>
<td>7.05</td>
<td>.0009</td>
<td>Yes</td>
</tr>
<tr>
<td>Poverty of Surrounding Neighborhood</td>
<td>3.83</td>
<td>-1.00</td>
<td>.3632</td>
<td>No</td>
</tr>
<tr>
<td>Crime of Surrounding Neighborhood</td>
<td>3.50</td>
<td>-2.24</td>
<td>.0756</td>
<td>Yes</td>
</tr>
<tr>
<td>Homeowners in Surrounding Neighborhood</td>
<td>4.00</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>Neighbors’ Feelings About the Center</td>
<td>4.57</td>
<td>1.08</td>
<td>.3208</td>
<td>No</td>
</tr>
</tbody>
</table>

N = 6

Source: Survey of Pittsburgh-area CCCs by author

*Based on 0-to-7 scale of impacts: 0 = “Greatly Hinders Success”; 4 = “No Effect”; 7 = “Greatly Assists Success”

**Statistical significance cut-off is a t-value of >= 1.96 or <=-1.96 and a p-value of <= .05.

[Table 4: Strength of Influence of Neighborhood Characteristics on CCC Client Outcomes]
### Table 5: Estimated Impacts of Neighborhood Characteristics and CCC Characteristics on Neighborhood Acceptance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1: Effects of Neighborhood Characteristics on Community Acceptance (parameter estimates and t-values)</th>
<th>Model 2: Effects of CCC Characteristics on Community Acceptance (parameter estimates and t-values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.848 (0.57)</td>
<td>-0.790 (-0.10)</td>
</tr>
<tr>
<td>Percent Senior in Tract</td>
<td>-0.034 (-0.27)</td>
<td>-</td>
</tr>
<tr>
<td>Unemployment Rate in Tract</td>
<td>0.155 (0.60)</td>
<td>-</td>
</tr>
<tr>
<td>Vacancy Rate in Tract</td>
<td>0.052 (0.49)</td>
<td>-</td>
</tr>
<tr>
<td>Average Age of CCC Clients</td>
<td>-</td>
<td>0.156 (0.63)</td>
</tr>
<tr>
<td>Percent of CCC Clients that are African-American</td>
<td>-</td>
<td>-0.008 (-0.70)</td>
</tr>
<tr>
<td>Percent of CCC Clients without High School Diploma</td>
<td>-</td>
<td>0.029* (4.37)</td>
</tr>
<tr>
<td>Average Length of Stay of CCC Clients (days)</td>
<td>-</td>
<td>-0.006 (-0.96)</td>
</tr>
</tbody>
</table>

*Significant at 5% level

[Figure 5: Tracts Eligible for CCC Location (Accessible to At Least One Regional Destination)]

(Image created with ArcView GIS V3.2)
[Figure 6: Tracts Eligible for CCC Location (Accessible to All Three Regional Destinations)]
[Figure 7: Detail of Eligible Tracts]