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## Trajectories of Neighborhood Attainment after Prison

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### Abstract

A potentially important but understudied aspect of prisoner reentry is the neighborhood environments experienced by formerly incarcerated people. We know that many formerly incarcerated people return to very disadvantaged neighborhood environments and that returning to disadvantaged neighborhoods after prison increases the risk of recidivism and reduces employment. Yet very little is known about the social, economic, and institutional processes that sort formerly incarcerated people into different neighborhoods after release or their trajectories of neighborhood attainment over time. Motivated by a conceptualization of prisoner reentry and reintegration as a process that unfolds over time, we examine trajectories of neighborhood environments after release. Motivated by the literatures on neighborhood attainment, social capital, and the role of criminal justice institutions in structuring the lives of former prisoners, we examine sources of variation in neighborhood attainment. We use administrative data from the Michigan Department of Corrections on formerly incarcerated people paroled in 2003 and followed for two years after release. Descriptive results from a latent class trajectory model show that most white and black formerly incarcerated people experience flat trajectories, with little upward or downward residential mobility over time. Findings from multi-level growth curve models suggest that institutional factors are particularly important for the neighborhood attainment of whites, while human capital and social ties are particularly important for blacks. Among both blacks and whites, pre-prison and first post-prison neighborhood conditions exhibit a strong association with post-prison neighborhood attainment, although these associations are larger for blacks than whites.

### 1. Introduction

Since the mid-1970s, the prison population in the United States has increased dramatically, and as a result the number of formerly incarcerated people reentering society also grew significantly (Western 2006; Guerino, Harrison, and Sabol 2010). The reintegration of formerly incarcerated people is thus a critical aspect of understanding incarceration and its consequences, and the expansion of prisoner reentry has sparked new interest in the factors associated with successful reintegration after release (Visher & Travis 2003).

An important but understudied aspect of prisoner reentry is neighborhood context. We know that many formerly incarcerated people return to very disadvantaged neighborhoods, characterized by poverty, joblessness, and high rates of crime and disorder (Cadora, Swartz, and Gordon 2003; Lynch and Sabol 2004; Solomon and Thomson 2004), and that returning to disadvantaged neighborhoods after prison increases the risk of recidivism and reduces employment (Hipp et al 2010, Kubrin & Stewart 2006, Mears et al 2008, Morenoff and Harding 2011).

Despite this evidence on the importance of neighborhood context for the reintegration of formerly incarcerated people, very little is known about the social, economic, and institutional processes that sort formerly incarcerated people into different neighborhoods after release. Only about 40 percent of formerly incarcerated people ever live in their pre-prison neighborhood in the two years following release from prison (Harding, Morenoff and Herbert 2013), suggesting a role for other processes in determining post-prison residences. Formerly incarcerated people tend to suffer from very high rates of residential instability, particularly in the period immediately after release (Cadora, Swartz, and Gordon 2003; Lynch & Sabol 2004; Solomon & Thomson 2004, Harding et al 2013, Herbert, Morenoff and Harding 2015), and such residential instability is partly a result of incarceration itself (Warner 2015). Research has also found that there are stark racial differences in the neighborhood contexts formerly incarcerated people experience after prison (Massoglia, Firebaugh and Warner 2013). Although minorities tend to move into poorer neighborhoods than whites after prison, this is mainly due to the more general landscape of residential segregation by race rather than the impact of incarceration itself. Moreover, only whites experience worse neighborhood conditions after prison than before (Massoglia et al 2013, Warner 2014), but blacks experience greater residential instability (Warner 2015).

In this paper, we build on this prior work in two ways. First, motivated by a conceptualization of prisoner reentry and reintegration as a process that unfolds over time, we examine trajectories of neighborhood environments after release. Second, motivated by the literatures on neighborhood attainment, social capital, and the role of criminal justice institutions in structuring the lives of formerly incarcerated people, we examine other sources of variation in neighborhood attainment, beyond race. We use administrative data from the Michigan Department of Corrections on formerly incarcerated people paroled in 2003 and followed for two years after release.

We first examine whether there are distinguishable trajectories of neighborhood context among formerly incarcerated people. Descriptive results from a group-based trajectory model show that most white and black formerly incarcerated people experience little upward or downward residential mobility over time after release, at least in the first two years. In other words, initial neighborhood conditions tend to persist. We then test various theories about sources of variation in trajectories of neighborhood context by using multi-level growth curve models. Results from the growth curve analysis indicate that institutional factors are particularly important for the neighborhood attainment of whites, while human capital and social ties are particularly important for blacks. Among both blacks and whites, pre-prison and first post-prison neighborhood conditions exhibit a strong association with

post-prison neighborhood attainment, although these associations are larger for blacks than whites.

## 2. The Importance of Neighborhood Context for Prisoner Reentry

When formerly incarcerated people return home they face significant barriers to acquiring housing, education, work experience and social capital as well as high rates of problems with mental and physical health (Visher and Travis 2003). They may encounter disadvantages in the labor market because of their lower education level, low job skills and disruptions in employment (Visher and Travis 2003) as well as the negative effects of the stigma of a criminal record for employment (Pager 2003). Indeed, the prospects for successful reentry are often dim, as the chances of returning to prison within three years range from 50 to 75% or greater depending on individual and geographic characteristics (Langhan and Levin 2002).

In addition to individual disadvantages, neighborhood contexts also play a role in prisoner reentry. Those returning from prison are concentrated in disadvantaged neighborhoods (Visher and Travis 2003; Solomon and Thomson 2004). Poor neighborhoods disproportionately suffer not only from scant economic resources but also from weakened community ties that impede community cohesion, trust, and informal social control (Sampson 1997). Furthermore, social services tend to be over-burdened in poor neighborhoods (Hipp et al. 2008, 2009). With regard to formal social control, criminal justice supervision systems such as parole and probation as well as police monitoring are likely to be more intense in poor neighborhoods (Lerman and Weaver 2014, Grattet et al. 2011). Most studies that have been able to access residential information in administrative records on returning prisoners – including those conducted in California (Hipp et al 2010), Florida (Mears et al 2008), and Multnomah County, Oregon (Kubrin and Stewart 2006) – have found that the risk of recidivism (measured by arrests, felony convictions, parole violations, or returns to prison) is greater and the prospects for employment lower (Morenoff and Harding 2011) for those living in more disadvantaged tracts or counties (for a review, see Morenoff and Harding 2014). In sum, because many formerly incarcerated people move initially into disadvantaged neighborhoods and because such neighborhoods appear to increase recidivism and reduce employment, avoiding or escaping disadvantaged neighborhoods may be a critical dimension of formerly incarcerated people's successful reintegration.

## 3. Conceptual Framework: Neighborhood Attainment among Formerly Incarcerated People

Here we develop a broader conceptual framework for understanding possible influences on neighborhood context among formerly incarcerated people. We draw on the more general literatures on neighborhood attainment and social capital as well as an emerging literature on the role of criminal justice institutions in structuring the daily lives of formerly incarcerated people (particularly those on community supervision, such as parole). We draw on three theoretical frameworks: human capital, social ties, and institutional factors. In addition, we suggest the importance of the first post-prison neighborhood for later trajectories of

neighborhood attainment and consider possible differences by race in how each of these factors influences neighborhood attainment.

### 3.1 Human Capital

One challenge in avoiding or escaping disadvantaged neighborhood contexts is formerly incarcerated people's low levels of human capital. In the neighborhood attainment literature, the key insight of the human capital perspective is that individuals are likely to move to better neighborhoods when they have greater human capital. Empirical research generally supports this prediction, with evidence that highly educated and high income individuals tend to move into more desirable neighborhoods (e.g. South and Crowder 1997). With regard to formerly incarcerated people, human capital may help them to avoid or escape poor neighborhoods by providing economic and social resources for investing in neighborhood attainment. For example, employment experience prior to prison may help formerly incarcerated people find work after release if they can return to their former employers or call on ties to former co-workers to aid in their job search (Nelson et al. 1999, Sampson and Laub 1993).

Yet many prisoners have low levels of education and minimal work experience when they are convicted (Western 2006). Furthermore, the disruption in labor market participation due to imprisonment may result in further erosion of human capital that eventually leads formerly incarcerated people to encounter difficulties in reentering the labor market after prison (Petersilia 2003). Very low levels of human capital, as indicated by job experience and education, may also mean that there is not enough variation in human capital among formerly incarcerated people for human capital to be predictive of neighborhood attainment after prison.

### 3.2 Social Ties

A second theoretical perspective on neighborhood attainment among formerly incarcerated people is the role of social ties. Social ties are a primary resource that formerly incarcerated people rely on for finding a place to live after prison (Visher and Travis 2003; Harding et al 2014). Since formerly incarcerated people are unlikely to have the resources to live alone after prison, their first residence after prison depends substantially upon individuals who provide housing or financial support. Family members in particular offer housing assistance as well as emotional and financial support during the early period of post-prison life (Nelson et al. 1999, Travis 2001, 2003). Formerly incarcerated people are likely to leverage their social relationships after release, not only for housing, but also in other domains, such as job search (Solomon et al 2001), transportation, and material or emotional support (Nelson et al 1999, Wyse, Harding, and Morenoff 2014).

If local social ties reestablished after prison release play a significant role in housing arrangements and successful reentry of formerly incarcerated people, they may prevent formerly incarcerated people from moving out of their current neighborhoods. In the general population, strong social relationships with people living nearby tend to provide local resources that would be lost by moving. The strength of social ties in the neighborhood, therefore, may deter residential mobility (Kan 2007). Formerly incarcerated people may

depend more on local resources in the early periods of reentry process than those who have not been to prison recently. Thus, we expect that former-prisoners' upward residential mobility will be less likely when they rely on romantic partners or family members for housing. Because marriage is more common among individuals with higher education, formerly incarcerated people who are married may experience greater residential stability and better neighborhood conditions due to the resources provided by a spouse's resources.

### 3.3 Criminal Justice Institutions

The institutional constraints imposed by criminal justice supervision after prison may also influence neighborhood attainment after prison. As the linked increases in incarceration and reentry have disproportionately affected poor neighborhoods, the criminal justice system has become a key institution for residents' social and economic lives (Harding, Morenoff, and Herbert 2013). Prior research suggests that police practices vary considerably across neighborhoods, in such a way that "disadvantaged areas are both over policed and under policed" (Lerman & Weaver 2014: 204). On the one hand, poor and non-white jurisdictions tend to have less police protection per recorded crime (Thacher 2010). On the other hand, in more disadvantaged, higher-crime neighborhoods, police are more likely to arrest suspects they encounter and use coercive force and less likely to provide citizens with assistance and information or file incident reports (Smith 1996, Sun et al 2008). Although we are aware of no research that examines whether this also applies to community corrections officers, we might hypothesize that similar dynamics may be at work with regard to community supervision such as parole and probation. If so, that would suggest that formerly incarcerated people in high poverty neighborhoods may be subject to greater surveillance and arrest for minor offenses. For parolees, this may directly impact their residential mobility through custodial "intermediate" sanctions that are alternatives to return to prison for parole violators. For example, when formerly incarcerated people on parole use drugs, authorities may send them to the drug treatment center rather than to prison. Sixty-five percent of parolees experience intermediate sanction institutions at least once in the 24 months following release, and one-third of residential mobility of formerly incarcerated people can be attributed to the criminal justice system through these intermediate sanctions (Harding, Morenoff, and Herbert 2013). These processes may not only trigger residential mobility, but also movement into higher poverty neighborhoods after custodial sanctions. There may be an indirect effect of such sanctions on neighborhood attainment as well if they interfere with employment or social ties.

Institutional constraints based on criminal history and type of crime are another obstacle formerly incarcerated people may encounter in finding housing in more desirable neighborhoods. In the housing market, landlords often require disclosure of criminal history and are reluctant to rent to those with a criminal record (Helfgott 1997). A criminal record also prevents formerly incarcerated people from receiving support from public housing programs (Geller and Curtis 2011). The importance of a criminal record may depend on type of crime and parole conditions. Sex offenders, for example, are legally restricted from moving into certain areas near parks, schools and daycares. Empirical evidence from a California parolee study shows that sex offenders are released into more disadvantaged neighborhoods and tend to move into more disadvantaged neighborhoods (Hipp, Turner, and

Jannetta 2010). Parolees subject to electronic monitoring may also be precluded from moving from officially allowed areas. Thus the criminal justice system may exert an independent influence on neighborhood attainment through aspects of supervision such as intermediate sanctions and regulations on residential locations.

### **3.4 Path dependence in neighborhood attainment: the role of initial post-release neighborhoods**

The period immediately following release may be particularly important for future trajectories of formerly incarcerated people. This is a period of reconnecting with friends and family, looking for work, and seeking mental health, substance abuse, and other health treatments in the community, as well as close surveillance from parole officers (Visher 2001; Visher and Travis 2003). When the neighborhood of their first residence provides ample social resources for social and economic reintegration, such as job leads, formerly incarcerated people may have a greater chance of escaping or avoiding disadvantaged neighborhoods. Conversely, we might expect that neighborhoods where opportunities to return to crime or drug use are more common and access to employed neighbors is low could set a formerly incarcerated person on a more disadvantaged neighborhood trajectory.

These arguments suggest that initial neighborhoods may determine future neighborhood trajectories by affecting future outcomes that are predictive of future neighborhood attainment (e.g. employment, substance abuse) leading to what we might call “path dependence.” Path dependence in neighborhood attainment among formerly incarcerated people is not necessarily inconsistent with the high rates of residential mobility that they experience, as formerly incarcerated people who move frequently usually move from one poor neighborhood to another (Cahill and LaVine 2008). The path dependence hypothesis is also consistent with the more general literature on neighborhood attainment, which shows considerable consistency over time in neighborhood characteristics. For instance, Sharkey finds that neighborhood economic conditions and racial composition exhibit strong persistence across the life course and across generations (Sharkey 2008, 2013).

In sum, the characteristics of the first neighborhood after prison release may be crucial in determining subsequent neighborhood attainment. Of course, it may also be the case that the same factors that affect selection into disadvantaged neighborhoods immediately after release also govern future neighborhood attainment. In either case, we expect to observe strong path dependence, or a strong association between initial neighborhood characteristics and future neighborhood characteristics.

### **3.5 Racial Differences**

Given the importance of race in structuring neighborhood attainment (Massoglia et al. 2013, Warner 2014), we hypothesize that human capital, social ties, institutions, and path dependency may have different effects on the neighborhood trajectories of white versus black formerly incarcerated individuals. In many cases, we expect to see attenuated effects among blacks as compared to whites due to the disadvantages that blacks face in housing even in the absence of incarceration.

The effect of human capital on residential mobility in the general population may not work evenly across racial groups, as return on human capital investment is higher for whites than blacks. Highly educated blacks, for example, are more likely than whites with the same education level to live in disadvantaged neighborhoods (Rosenbaum and Friedman 2007). This racial difference in the link between human capital and neighborhood context implies that the role of human capital among formerly incarcerated people in neighborhood attainment may also vary across racial groups. If human capital influences neighborhood attainment among formerly incarcerated people, and the racial difference in return to human capital investment in the non-criminal population is replicated among formerly incarcerated people, we might expect that human capital carries more weight for whites than for blacks in predicating neighborhood conditions. Conversely, it is also possible that the role of human capital is either similar for both racial groups or more important for blacks than whites. Given the importance of families in providing post-release housing and the concentration of less educated blacks in the most disadvantaged neighborhoods, more educated blacks may have comparatively more access to housing in better neighborhoods – in comparison to less educated blacks – through their more educated family members.

The benefits of social relationships in neighborhood attainment after prison may also differ between black and white formerly incarcerated individuals. Because many prisoners come from poor neighborhoods and their social ties also are likely to be concentrated in disadvantaged neighborhoods, one might hypothesize that social ties might be of little value in avoiding and escaping disadvantaged neighborhoods after prison. Because black formerly incarcerated people come disproportionately from poor neighborhoods and poor families prior to their incarceration, black formerly incarcerated people may be even less able than whites to leverage social ties to improve neighborhood attainment after prison. On the other hand, given the importance of family in providing post-release housing, attachments to more advantaged family members may be one of the only paths to more advantaged neighborhoods among blacks. Being married in particular may provide access to more advantaged neighborhoods among blacks, given lower rates of marriage among poorer blacks.

Racial minorities may also be less affected than white formerly incarcerated people by institutional factors because they are already more concentrated in more disadvantaged neighborhoods, where intermediate sanctions and judicial surveillance are strongly imposed. If black parolees are subject to stronger surveillance than white parolees, intermediate sanctions may matter less for black parolees. In contrast, white formerly incarcerated people who live in poor neighborhoods, where surveillance is more common, may be more affected by institutional processes than other white parolees who lived in more advantaged neighborhoods.

As for path dependency, the role of the first neighborhood in residential mobility may work differently for white versus black formerly incarcerated people. It may be more difficult for blacks to move into a more advantaged neighborhood environment, not only because black formerly incarcerated people tend to move into the most disadvantaged neighborhoods after release, but also because they face structural barriers, such as discrimination in housing markets, that prevent blacks in general and blacks with criminal records in particular from

renting or buying a home in more advantaged neighborhoods. Therefore, we expect to see a stronger association between first post-prison neighborhood disadvantage and subsequent neighborhood disadvantage among blacks than whites.

In sum, prior theory and empirical evidence suggests that human capital, social ties, criminal justice institutions and first post-prison neighborhood conditions should account for within race variation in neighborhood attainment after prison, and that some of these influences are likely to vary by race. However, no prior study has systemically examined the role of these factors in predicting trajectories of neighborhood contexts after release. This study draws on a unique dataset of Michigan parolees to examine the neighborhood attainment of formerly incarcerated people, both immediately after prison and in the two years that follow.

## 4. Methodology

### 4.1 Data

Through a collaborative arrangement with the Michigan Department of Corrections (MDOC), we compiled a unique dataset based on detailed administrative records on a cohort of 11,064 Michigan prisoners who were placed on parole in Michigan during 2003. More than 90 percent of Michigan's released prisoners are released on parole, one of the higher conditional release rates among American states. Our analyses in this article are based on a randomly selected one third sample ( $n = 3,689$ ) of this population on which we collected more detailed data on post-prison residences – including the location of all places of residence and type of residence – by coding narrative case notes that parole agents updated regularly on each parolee. All of the variables used in our analysis have been extensively cleaned, which involved checking for duplicate records, for multiple people with the same ID number, and logical inconsistencies across variables, as well as detailed reading of the case notes where appropriate to resolve discrepancies.

To measure the characteristics of neighborhoods surrounding the pre and post-prison residential addresses coded from MDOC data, we constructed census tract variables that measure the neighborhood characteristics discussed below. Post-prison census tract characteristics are drawn from Census Bureau data, including both the 2000 Census and the 2005–2009 American Community Survey census tract files, with characteristics in intermediate years estimated by linear interpolation.<sup>1</sup> We also collected pre-and post-prison employment information from the Michigan Unemployment Insurance (UI) Agency to assess quarterly employment and total gross wages in the formal labor market for our sample.<sup>2</sup>

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<sup>1</sup>While linear interpolation is a commonly applied method for measuring neighborhood characteristics in intercensal years given available data, ideally we would measure the neighborhood variables for each census tract at each time point. Two potential issues are raised by linear interpolation. The first is that neighborhood measures may have more measurement error further from the interpolation endpoints (here, 2000 and 2007, the midpoint of the 5-year ACS tract-level estimates for 2005-2009). The second is that interpolation may distort measures of neighborhood change over time. Although it is impossible to examine these possible problems with the data at hand, we note that the relatively short time period we are working with should mitigate these issues to some degree. All of our data are from adjacent years near the middle of the interpolation period, and it is unlikely that neighborhood conditions changed dramatically during the 24 month-interval we studied each individual. For more on potential issues in using linear interpolation, see Miles et al. (2015) and Weden et al. (2015).

<sup>2</sup>To match subjects with their quarterly employment statuses, all social security numbers (SSN) available in MDOC databases for the 2003 parole cohort were sent to the Michigan Unemployment Insurance Agency and Workforce Development Agency for matching. In



Overall, there was very little missing data on most variables (less than 3% in general). One exception is pre-prison measures of employment status, for which 17.4% of individuals have missing values. These missing values are due to entry into prison before the third quarter of 1997, when the coverage of our UI data begins. Accordingly, we control for years in prison in all models. All variables with missing data were multiply imputed (using Stata v13), and five multiply imputed data sets were created. All variables used in our analysis were also used as covariates in the imputation models. All statistical models were estimated on each of the five imputed data sets, and the results were combined into a single set of estimates.

We do not observe the residence of all individuals in our sample for the full 24 months. Individuals who die, are discharged from parole, move out of Michigan, are re-incarcerated in prison, or abscond before the 24<sup>th</sup> month are censored from the data at the point at which these events occur. (Absconders may re-enter the data file when they return to parole.) These events are clearly not random with respect to neighborhood attainment, so we deal with them in three ways. First, we control for whether the individual has experienced each of these events at some point in the observation period (Table 1 below shows the frequency of such events). Second, we impute neighborhood disadvantage for missing person-months and include these records in our models, using the same multiple imputation methods discussed above, employing all baseline and time-varying covariates for this imputation as well as prior and, where available, subsequent neighborhood disadvantage scores.<sup>3</sup> Third, we re-estimated our main models on only individuals with neighborhood measurements at all 24 months, and found that results are substantively similar (models not shown).

## 4.2 Variables

**Neighborhood disadvantage score**—Following prior research on neighborhood attainment among formerly incarcerated people (e.g. Massoglia et al 2013), we created a tract-level neighborhood disadvantage scale. Neighborhood disadvantage is an averaged scale composed of the following standardized tract-level variables: household poverty rate, unemployment rate, proportion of households that receive public assistance, proportion of families that are female-headed, proportion of adult residents with less than a high school degree, proportion of adult residents with college degrees, median family income, proportion of families whose income exceeds \$75,000, and proportion of working adults in professional or managerial professions (with the latter four measures reversed in polarity). The resulting scale was standardized on all Michigan census tracts and has a reliability of 0.94 (Cronbach's alpha). This variable was attached to each subject's residence record using the

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some cases, more than one SSN was available for each subject. For 11 individuals in the sample, MDOC had no SSN, so these individuals have no UI data. Returned UI records were matched with names from MDOC databases, including aliases, to eliminate incorrect SSNs. Approximately five percent of the sample had no UI data match their SSN, indicating they never had any formal employment in Michigan between 1997 and 2010. If more than one SSN that MDOC had recorded for the same person matched records in the UI data, project staff selected the best match by comparing employer names listed in the UI records with those listed in the MDOC records (from parole agent reports). This procedure resulted in one-to-one matches of individual records between MDOC and UI records for more than 99% of sample members. For less than one percent of the sample, a single SSN could not be selected after matching on the parolee's name and the name(s) of that person's employer(s). In such cases, UI data were retained for all SSNs listed in the MDOC records for a given individual, under the assumption that such people worked under multiple SSNs.

<sup>3</sup>An alternative strategy would be to create censoring weights. In many ways this is conceptually and empirically similar to multiple imputation, in that both methods draw upon the same data to correct for censoring. We chose multiple imputation because censoring weights seemed undesirable in a context such as this one where there are countervailing causes of censoring. Because censoring can occur because the individual discharges from parole (essentially a positive outcome) or because the individual dies or returns to prison (a negative outcome), a statistical model may do a poor job of predicting censoring even with very informative covariates.

geocoded census tract at the end of each month after release from prison for the first 24 months.

**Main independent variables**—We extracted and cleaned variables on measures of human capital, social ties, and institutional factors. Human capital measures include last recorded level of education from the MDOC database and formal employment in the year before imprisonment as well as employment and wage information during the post-incarceration period from the UI database. Measures of social ties include number of dependents and marital status at prison intake and cohabitants in post-release private residences (parent(s), romantic partner, other family, or other/none). Institutional factors include type of institutional residence (e.g., treatment or care facility, hotel/motel, mission/shelter/homeless, short-term correctional institutions, or jail), being a sex offender, electronic monitoring, and parole supervision level. Some of these independent variables (employment and wages after prison, institutional residences, cohabitants in private residences, supervision level, electronic monitoring) vary over time. Time varying predictor variables are lagged by one month.<sup>4</sup>

**Control variables**—From MDOC databases, we also obtained basic demographic information such as gender, age at parole, and race and criminal history and other statuses (e.g., type of most serious offense, years in prison, number of prison sentences, self-reported substance abuse history, record of mental illness treatment).<sup>5</sup> In addition to the demographic and criminal history variables, we control for pre-prison neighborhood conditions. The pre-prison addresses of our subjects were obtained from paper copies of pre-sentence investigation reports, in which addresses are usually verified by the MDOC agent preparing the report. For those who entered prison on a parole violation, pre-prison addresses were coded from parole violation reports and parole agent case notes. Using the pre-prison addresses, we coded three variables related to pre-prison neighborhood: neighborhood disadvantage of the pre-prison residence based on the year of entry into prison (using linear interpolation for estimates in years between decennial censuses), urbanicity, and whether the current residence is in the same tract as the pre-prison residence. These pre-prison neighborhood variables serve as strong control variables for otherwise unobserved predictors of the type of neighborhood in which each individual typically lives. In other words, when examining the role of our main independent variables linked to the theories discussed above, it is important to keep in mind that these associations are net of the level of disadvantage of the pre-prison neighborhood, providing a potentially strong control for otherwise unobservable time-constant factors affecting selection into disadvantaged neighborhoods. Table 1 presents descriptive statistics for all variables.

### 4.3 Models

We begin by describing the trajectories we observe in our data by estimating a group-based latent trajectory model (Nagin 1999; 2005; 2009) and present the results graphically. The

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<sup>4</sup>Thirty-nine individuals (1.1%) in our study sample were sent to jail right after prison. For these individuals, we coded their first neighborhood and residence type based on the first residence with community exposure.

<sup>5</sup>We also estimated models with more detailed crime type variables. Results from this sensitivity analysis did not considerably differ from our final results.

goals of the trajectory model in our study are twofold: first, to describe the trajectories of neighborhood conditions of both white and black formerly incarcerated people over 24 months, and second, to examine whether there are sub-groups within our sample that follow distinct trajectories. Most conventional statistical models for analyzing patterns of change with longitudinal data, including the growth curve models we use below, implicitly attempt to explain individual deviance from a single parameter, the mean trend in the sample. However, approaches based on the single trend assumption ignore the possibility of more than one distinct trajectory within the study sample (Nagin 1999; 2005). By first conducting the group-based trajectory model, we test the single trend assumption before implementing the growth curve model. As will be clear below, results from the group based trajectory model largely support a core assumption of growth curve models that all subjects have a single overall trajectory (that differs based on observed characteristics).

In the second part of our analysis, we investigate which factors explain the trajectories of neighborhood disadvantage using growth curve models. To model neighborhood disadvantage over time by month, we employ growth curve models in which months ( $t$ ) are nested within individuals ( $i$ ). In this analysis, the data set includes monthly observations on each individual for the first 24 months after release. The model can be written as a set of hierarchical equations (although estimation is based on a single, combined equation):

$$\text{Level-1 Model: } Y_{ti} = \pi_{0i} + \pi_{1i}T + r_{ti}$$

$$\text{Level-2 Model: } \pi_{qi} = \beta_{q0} + \sum_{s=1}^S \beta_{qs} X_{si} + u_{qi} \text{ for } q = 0, 1.$$

Where  $Y_{ti}$  is the neighborhood disadvantage score observed for person  $i$  at month  $t$ ,  $\pi_{0i}$  is a person specific intercept (the value of  $Y$  when all of the  $X$  variables are set to 0),  $T$  is a linear term for months since release, and  $X$  is a set of time varying covariates, including a measure of time. In our models,  $\pi_{0i}$  represents the level of disadvantage of the first neighborhood where the parolee lives after prison (coded as month=0). Both the intercept and the time trend coefficient from the level-1 model ( $\pi_{1i}$ ) can be viewed as outcomes of the level-2 model, where the predictors ( $X$ ) are characteristics of individuals, and the error terms ( $u$ ) are person specific random effects (assumed to be normally distributed). The  $\beta_0$  coefficients capture the effects of covariates on initial neighborhood disadvantage. In other words, these coefficients tell us how the disadvantage score of the first neighborhood differs as a function of characteristics of individuals. The  $\beta_1$  coefficients capture the cross-level interactions between time and covariates. These coefficients tell us how trajectories of change over time in neighborhood context differ as a function of characteristics of formerly incarcerated people. We estimate both the group based trajectory model and the growth curve model for whites and blacks separately.

## 5. Results

### 5.1 Trajectories of neighborhood disadvantage

The first stage of our analysis employs the group-based trajectory models, which seek to divide the sample into groups with common trajectories of neighborhood disadvantage. A key decision in such models is the number of such groups. In order to obtain an optimal number of groups, we tested eight models that included from one to eight trajectory groups. While there are a variety of model-selection criteria that trade-off model fit and parsimony in various ways, the most commonly used criterion for group-based trajectory models is the BIC score, based on the sample size, the log likelihood, and the number of parameters estimated. The model with the least negative BIC score is preferred. The BIC scores reported in Table A in the Appendix indicate that the seven-group model is preferred in both the white and black analyses (BIC=-25031.0 for whites, and BIC=-34975.8 for blacks). In other words, the seven-group model is the best representation of a set of longitudinal paths of neighborhood conditions in the data.

Figures 1 and 2 show the mean trajectories for each of the seven groups among whites and blacks respectively. For a more intuitive understanding, we plotted each trajectory on a reversed neighborhood disadvantage scale, with high numbers indicating a more advantaged neighborhood. Note that the shapes of the seven trajectories in the black and white parolee samples are almost identical; the primary differences between races are the proportion of cases in each of the trajectories and their positions relative to the y-axis, indicating that – consistent with prior studies – blacks generally live in more disadvantaged neighborhoods. For ease of exposition, we label the trajectory groups as follows: “Stay in least disadvantaged neighborhood” (44.3% for whites, 16.8% for blacks), “Stay in less disadvantaged neighborhood” (29.9% for whites, 16.9% for blacks), “Downward mobility” (4.2% for whites, 3.8% for blacks), “Stay in disadvantaged neighborhood” (10.6% for whites, 20.4% for blacks), “Upward mobility” (4.5% for whites, 5.8% for blacks), “Stay in more disadvantaged neighborhood” (4.1% for whites, 23.0% for blacks), and “Stay in most disadvantaged neighborhood” (2.3% for whites, 13.4% for blacks).

Although more blacks than whites are concentrated in the most disadvantaged neighborhoods over the 24 months following release, both racial groups show identical patterns of neighborhood trajectories. In both the white and black models, five out of seven subgroups differ only in the average level of neighborhood disadvantage (the intercept), whereas the slopes of their trajectories are parallel and essentially flat. Only 8.7 percent of whites and 9.6 percent of blacks belong to either the “Upward” or “Downward” groups. We also note that individuals with a high probability of being in the upward or downward neighborhood mobility trajectories are more likely to be censored before the 24<sup>th</sup> month, mostly due to return to prison or discharge from parole.

Underlying these neighborhood trajectories are different patterns of residential mobility, as the actual number of residential moves varied across the seven trajectory subgroups for both races. In general, formerly incarcerated people tend to experience more frequent residential mobility than the general population (Geller and Curtis 2011), a pattern that we also see in these data. Table A3 in the appendix shows the average number of residential moves

between census tracts for each trajectory subgroup. The average individual in our study experienced about 3.37 residential moves over 24 months (3.367 for whites and 3.369 for blacks). Not surprisingly, individuals who belong to the “Upward” or “Downward” mobility groups show higher than average rates of residential mobility in both racial groups (5.74 for whites in the downward mobility group, 3.92 for whites in the upward mobility group, 4.25 for blacks in the downward mobility group, and 5.04 for blacks in the upward mobility group). Another pattern is that whites who stayed in the least disadvantaged neighborhood show lower residential mobility (2.47) than any other whites, whereas the group with the lowest rate of residential moves among blacks is those who stayed in the most disadvantaged neighborhoods (2.72). This is consistent with more general patterns of neighborhood inequality by race. Note also that none of the neighborhood trajectory subgroups are comprised of a majority of individuals who experienced no moves, as the residential move rates are high by conventional standards of residential mobility in all groups.<sup>6</sup> This means that neighborhood trajectories involving no upward or downward mobility over time are not simply a product of individuals experiencing no residential moves.

Thus the first key finding of this study is the relative stability of neighborhood characteristics for most of our subjects in the two years following release. Very few formerly incarcerated people experience upward or downward residential mobility. In other words, initial neighborhood conditions after release are fairly stable, despite a very high rate of moving between residences and neighborhoods observed in prior research (Harding et al 2013). Although formerly incarcerated people appear to move frequently, as individuals they tend to move between neighborhoods with similar socio-demographic characteristics. Consistent with this finding, we will see in the growth curve models below that covariates matter more for neighborhood disadvantage in the first month than for trajectories over time, and that the first post-prison neighborhood characteristics are highly predictive of later neighborhood disadvantage.

## 5.2 Growth Curve Models of Neighborhood Disadvantage

In the second part of our analysis, we examine the influence of human capital, criminal history, social ties, and institutional factors on neighborhood trajectories by using multilevel growth curve models, estimated separately for blacks and whites. Our modeling strategy is to begin with a baseline model that includes the growth curve time trend (linear specification of months since release), causes of attrition, and our control variables (criminal histories, demographics, and pre-prison neighborhood characteristics).<sup>7</sup> We then add sets of variables measuring human capital, social ties, and institutional factors one set at a time in models 2, 3, and 4. Model 5 is a full model including all variables. In Model 6, we add the first post-prison neighborhood disadvantage variable to the full model (Model 5) and exclude the first neighborhood measurement from the analytic sample.<sup>8</sup>

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<sup>6</sup>One convention in the housing literature is that more than one move per year is considered an indicator of residential instability (Herbert et al. 2015).

<sup>7</sup>We experimented with more complicated functional forms for time, but found no substantively significant nonlinearities. The appropriateness of the linear approximation is also visible in Figures 1 and 2. We also experimented with different functional forms for age but found that it did not affect the results. The models shown include the most flexible functional form for age because its role is primarily as a control variable.

Estimates from these models are presented in Table 2 (for whites) and Table 3 (for blacks). Each model is displayed in two columns. The first column contains the coefficients for the intercept that reflect effects of predictors on the disadvantage level of the first neighborhood where individuals moved after prison. (The exception is Model 6, in which the coefficients for the variables predicting the intercept indicate the association between each variable and the level of neighborhood disadvantage at month 2.) The second column contains coefficients for predictors of the linear time trend. These represent the associations between each predictor and the change in the individual's trajectory of neighborhood disadvantage over time (i.e., the interactions between predictors and time).

In Table 2, Model 1 includes demographics, pre-prison neighborhood characteristics, and criminal history variables. Although we view these variables as control variables in our examination of the role of human capital, social ties, and criminal justice institutional factors in neighborhood attainment, we briefly discuss their results since no prior research of which we are aware has examined the relationship between this complete set of variables and neighborhood attainment after prison. Among the demographics, age shows moderate association with neighborhood disadvantage among whites, with older whites moving to more disadvantaged neighborhoods after prison. In addition, those with a recorded history of mental illness move to more disadvantaged neighborhoods. Most of the variables that control for reasons for eventual attrition are also associated with neighborhood disadvantage, as those who are eventually returned to prison, who eventually move out of state, or who eventually die move to considerably more disadvantaged neighborhoods immediately after release.

Model 1 also shows that pre-prison neighborhood conditions are strongly associated with the disadvantage level of the first neighborhood after release. The first neighborhood's disadvantage score becomes higher by 0.240 (about a quarter of a standard deviation) when the disadvantage level of pre-prison neighborhoods is higher by one standard deviation. After controlling other factors (in Model 5), the influence of the pre-prison neighborhood is similar. Also, compared to formerly incarcerated people who lived in a central city before prison, formerly incarcerated whites from rural areas are likely to live in less disadvantaged neighborhoods after prison. When formerly incarcerated whites return to the census tract where they lived before prison, they tend to live in less disadvantaged neighborhoods. In our sample, more than 65 percent of formerly incarcerated whites moved to a different census tract after prison release. The coefficients from models 1 and 5 imply, then, that whites are likely to experience a degradation of their neighborhood environment unless they return to their pre-prison neighborhoods. This result is consistent with the finding from previous research that white ex-criminals have "more to lose" from incarceration in prison with regard to neighborhood conditions (Massoglia et al 2013).

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<sup>8</sup>In our sample, 637 individuals (18.6%) contributed no residential moves over the course of their first 24 months after release. The vast majority of these individuals (94.2%) were censored at some point because of death, moving out of the state, being discharged from parole, absconding, or returning to prison. In order to assess the impact of such "non-movers" on our results, we estimated models without these individuals, but the results did not differ from our final models. We believe this is because we have controlled for reason for censoring in the models and because individuals who are censored contribute fewer monthly observations to the models than the rest of the sample.

Another finding from Model 1 (and Model 5) in Table 2 is that the association between pre-prison and post-prison neighborhood conditions attenuates over time. When we examine the time slopes, we see that the pre-prison neighborhood disadvantage level shrinks to only about a tenth of a standard deviation at the end of the 24<sup>th</sup> month ( $0.240 - 0.006 * 24 = 0.096$ ). The gap between whites who return to the same census tract and those who move to a different tract after release is also reduced over time (e.g.,  $-0.244 + 0.011 * 24 = 0.02$ ). This implies that pre-prison neighborhood conditions have a significant and strong influence on neighborhood conditions after prison release, but these effects attenuate over time.

Finally, Model 1 also shows that some of the criminal history variables are significantly associated with neighborhood disadvantage among whites. Whites with more serious self-reported drug and alcohol use histories move to less disadvantaged neighborhoods after prison, although positive drug or alcohol tests after release are not associated with subsequent neighborhood disadvantage. Whites who have served more time in their most recent prison term move to slightly more disadvantaged neighborhoods after release, while those with more prison sentences are more likely than first time offenders to live in more advantaged neighborhoods. Although this result might be surprising, we suspect this reflects desistance from crime after repeated prison spells, separation from family and friends from more disadvantaged neighborhoods, or the location of noncustodial institutional housing available to ex-offenders. Whites who have committed drug crimes move to less disadvantaged neighborhoods than those who have committed assaultive crimes.

Model 2 adds human capital variables. Here we see few statistically significant associations between human capital variables and neighborhood disadvantage after prison, and those coefficients that are statistically significant are substantively small. Those with a GED return to slightly more disadvantaged neighborhoods than those with less than a high school degree, but according to the time slopes this difference attenuates over time. None of the other education intercept coefficients are significant and none of the time slopes suggest large differences in trajectories over time. Pre-prison employment is not associated with neighborhood disadvantage immediately after prison, but those who were employed before prison do have significantly different trajectories over time, such that by the 24<sup>th</sup> month after release, they live in neighborhoods about a tenth of a standard deviation less disadvantaged than those not employed before prison ( $0.050 + 24(-0.007) = -0.118$ ). Surprisingly, there also appears to be no effect of post-prison employment or wages on neighborhood mobility among whites. None of the post-prison employment measures are significant predictors of subsequent neighborhood disadvantage.<sup>9</sup> We suspect that this is a result of the relatively low earnings of most formerly incarcerated people in conjunction with the reliance on family and romantic partners for housing documented in the prior literature (Harding et al 2014). However, another possible explanation is the lack of information on informal employment in the UI data.

We now turn to social ties among whites. Model 3 adds number of dependents, marital status at prison intake, and types of private residences. The number of dependents is significantly

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<sup>9</sup>We experimented with many different specifications for these variables as well as entering wages and employment separately in the model, and none resulted in post-prison employment or earnings effects that were statistically significant.

associated with slightly more disadvantaged neighborhoods, perhaps reflecting the need for larger housing, but this coefficient is quite small in substantive terms (each dependent is associated with an increase in neighborhood disadvantage of only three one-hundredths of a standard deviation). Marital status is not a significant predictor of neighborhood disadvantage. There are no significant differences between the various types of private residences (living with a romantic partner, other family, or in non-family private residences) compared to living with one's parents. The primary distinction of importance revealed by this model is the one between living in a private residence and institutional housing, which tends to be located in neighborhoods with greater disadvantage than that of the typical white neighborhood in Michigan.

We now turn to a more complete examination of institutional factors as predictors of neighborhood attainment among whites, focusing on Models 4 and 5. These models also include institutional residence type (compared to a private residence), electronic monitoring, sex offender status, and the intensity of parole supervision. As discussed above, institutional residence types have strong influences on the level of disadvantage of first neighborhoods after prison, and their effects remain fairly consistent over time. Formerly incarcerated people who were sent to intermediate sanction institutions such as jails, correctional institutions, or treatment centers in the prior month live in more disadvantaged neighborhoods compared to others who live in any type of private housing (Model 4). These are by far the strongest predictors in the model, and they remain strong even when all other variables are controlled in the model (Model 5) and when the level of disadvantage in the first post-release neighborhood is controlled (Model 6).<sup>10</sup> With regard to parole supervision variables, whites on electronic monitoring are more likely to begin their post-prison lives in more disadvantaged neighborhoods, although the time slopes reveal that this effect moves to zero and reverses direction by about the 11th month after release (most electronic monitoring occurs in the first 90 days after release). Those on maximum supervision live in more advantaged neighborhoods. We suspect this simply reflects the types of high-risk offenders who are placed on maximum supervision: those who committed serious violent crimes rather than more minor violent crimes, drug crimes, or property crimes and may be from more advantaged backgrounds.

Table 3 shows parallel models estimated on the sample of blacks. Again Model 1 is a baseline model including criminal history, demographics, reasons for attrition, and pre-prison neighborhood conditions. Demographic characteristics show a greater association with neighborhood disadvantage among blacks, with older blacks and black women experiencing neighborhoods with higher levels of disadvantage. The time slopes suggest the age effects persist while the gender effects attenuate over time. Among reasons for attrition, only eventually returning to prison is associated with initial neighborhood disadvantage; the association is negative but attenuates over time, indicating that those who return to custody start out in less disadvantaged neighborhoods but experience increasing neighborhood

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<sup>10</sup>Note that the reference category for residences is different in Models 5 and 6 than in Model 4 because Models 5 and 6 include all private and institutional residence types. In Models 5 and 6, the reference category for all residences is living with parents in a private residence. This does not seem to change the conclusions, however, likely because living with parents is the most common private residence type and there are no substantial differences in neighborhood disadvantage across private residence types. This will also hold in the models for blacks discussed below.



disadvantage over time. With regard to criminal history variables, type of offense, pre-prison self-reported substance abuse history, and years in prison are not significant predictors of neighborhood attainment among blacks. There is some indication that those blacks who have been sentenced to prison more times initially experience lower levels of neighborhood disadvantage than first-time prisoners, but this association is small and quickly attenuates over time. Blacks with post-prison positive substance abuse tests, especially with high frequency, tend to live in more disadvantaged neighborhoods. This association is large and enduring.

The baseline model for blacks also shows a strong and enduring association between pre-prison neighborhood disadvantage and post-prison neighborhood disadvantage. The coefficient on pre-prison neighborhood disadvantage is 0.41 in Model 1 and 0.396 in Model 5, when many other variables are controlled. These coefficients are even larger than those for whites. Moreover, blacks who return to the tract where they lived before prison experience more disadvantaged neighborhood environments by 0.137 (almost a seventh of a standard deviation) compared to those who moved into different neighborhoods after prison. This is the opposite of what we saw for whites. As with whites, a rural pre-prison neighborhood is also significantly associated with less disadvantaged neighborhoods after prison among blacks.

Unlike among whites, the association between pre-prison neighborhood conditions and post-prison neighborhood conditions does not disappear as rapidly over time for blacks. While the association between disadvantage level of pre-prison neighborhoods and post-prison neighborhood condition is attenuated over 24 month periods, its size is still substantial 24 months after release ( $0.392 - 0.004 * 24 = 0.296$ ). Moreover, the time slope coefficient for returning to the same neighborhood indicates that compared with others who moved to different tracts, blacks who went back to the same neighborhood after prison tended to live in more disadvantaged conditions over the whole 24-month period. These significant and fairly constant effects of pre-prison neighborhood characteristics may reflect a vicious cycle identified in the prior literature: many black prisoners are drawn from disadvantaged neighborhoods (Clear 2007), and they return to disadvantaged neighborhoods after prison (Cadora, Swartz, and Gordon 2003).

Model 2 adds the human capital variables. In contrast to whites, higher levels of education significantly improve neighborhood conditions for blacks relative to other blacks. Compared to those with less than 12 years of education, the first neighborhood conditions for blacks with a high school degree are better by 0.203 (about a fifth of a standard deviation) while those with the highest levels of education (12-19 years) are better by 0.303 (almost a third of a standard deviation). Both of these associations, however, are largely attenuated over time, as indicated by the time slope coefficients. Consistent with prior research on the labor market returns to a GED for blacks (Tyler et al 2000), there seems to be no benefit to a GED for neighborhood attainment. In the full model (Model 5), the coefficients on the education variables remain similar.

Model 3 includes the baseline variables and the social ties variables. Marital status for blacks is significantly associated with neighborhood conditions. Married blacks are more likely

than never married blacks to live in more advantaged neighborhoods. However, number of dependents is not significantly associated with the level of neighborhood disadvantage among blacks. Another measure of social ties is the type of residence where an individual lives. As with whites, there are no differences in neighborhood disadvantage by type of private residence. The neighborhoods around private residences for blacks do seem to be more disadvantaged than those around institutional residences, however. While institutional residences are in areas relatively disadvantaged compared to the typical white neighborhood, they are in areas relatively advantaged compared to the typical black neighborhood in Michigan.

Model 4 focuses on institutional factors, including more detailed institution types. As with whites, living in a homeless shelter or treatment program exposes a formerly incarcerated black person to a significantly more disadvantaged neighborhood (Model 4 and 6). Other institutional factors (electronic monitoring and sex offender status) do not seem to play a role in neighborhood attainment among blacks.

Thus far we have primarily focused on describing residential mobility patterns and examined effects of three sets of factors (human capital, social capital, and institutional factors) on initial residential neighborhoods and change in neighborhood attainment over time. Recall that the results from the group-based trajectory models indicate that the variation in neighborhood conditions within both racial groups is primarily constant over time, and very few individuals experience change over time in their neighborhood conditions. When we examine the slope coefficients in the growth curve models, few of the independent variables are associated with change over time, and when they are, they attenuate initial differences. The implication from these findings is the importance of initial periods in determining future trajectories of neighborhood attainment. Another test of this finding is to explicitly model path dependence by including the disadvantage level of the first post-prison neighborhood in the growth curve model. This is what Model 6 does in Table 2 for whites and Table 3 for blacks.

For both blacks and whites, the coefficient on the disadvantage level of the first post-prison neighborhood on the next month's neighborhood disadvantage level is larger than any other predictors in the model (0.489 for whites, and 0.679 for blacks). Regardless of whether they move into different census tracts, the neighborhood disadvantage in the second month following prison release is substantially associated with initial neighborhood conditions.

The inclusion of the disadvantage level of the first post-prison neighborhood in the model does not change our conclusions about the role of human capital, social ties, or institutional factors in neighborhood attainment after prison. Some criminal history variables for whites in Model 5 are attenuated after the inclusion of first neighborhood disadvantage (e.g., number of prison sentences and drug abuse history). The influence of the pre-prison neighborhood is also substantially attenuated from 0.232 to 0.107, although it remains statistically significant. Institutional factors, in contrast, maintain their influence among whites when first post-prison neighborhood disadvantage is controlled in Model 6.<sup>11</sup> Among blacks, the association between pre-prison neighborhood and later post-prison neighborhood conditions is also substantially reduced when first post-prison neighborhood disadvantage is

controlled. Coefficients of other predictors significant in Model 5 are also only slightly reduced in Model 6. In particular, blacks with more education live in less disadvantaged neighborhoods, even when the first post-prison neighborhood is held constant, although the coefficient on marriage for blacks is reduced by over a third and is no longer statistically significant in Model 6. This indicates that marital status may be particularly important in determining the neighborhood in the initial period after release, but less so thereafter.

## 6. Discussion

As a consequence of the dramatic increase in mass incarceration in the United State since the 1970s, the number of individuals returning to communities from prison also increased tremendously. Returning prisoners are concentrated in impoverished neighborhoods that are often characterized by scant social and economic resources, poor informal social control, and intense formal supervision. Prior research suggests that such neighborhood contexts tend to impede formerly incarcerated people from reintegrating into society, reducing prospects for employment and raising the risk of re-incarceration. This article has examined which formerly incarcerated people experience different trajectories of neighborhood attainment after release, focusing on the role of human capital, social ties, and institutional factors as possible explanations of variation in neighborhood context over time. We also examined path dependency by assessing the importance of first post-prison neighborhood characteristics for later neighborhood attainment.

Three primary findings emerged from our analyses. First, both blacks and whites experienced little upward or downward neighborhood mobility in the 24 months after their release. Only nine percent of whites and ten percent of blacks experienced either upward or downward mobility in the disadvantage level of the neighborhood, while the vast majority of formerly incarcerated people remained in similar neighborhood environments. As expected from the previous studies that find racial differences in neighborhood context after the prison, blacks entered and remained in more disadvantaged neighborhoods than whites.

Second, there are important differences between blacks and whites in the role of the three theoretical perspectives (human capital, social ties, and institutional factors) in explaining within-race variation in neighborhood disadvantage after prison. Among whites, institutional residence, such as treatment facilities, homeless shelters, and short-term correctional institutions, resulted in exposure to more disadvantaged neighborhood after prison release, as these institutional residences tend to be located in areas that are more disadvantaged than the typical white neighborhood. This is consistent with prior research on post-prison neighborhoods that emphasizes the role of the larger geography of racial segregation in determining formerly incarcerated people's residential options (Massoglia et al 2013).

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<sup>11</sup>After controlling for the conditions of the first neighborhood, whites who had been released on electronic monitoring had a lower likelihood of living in disadvantaged neighborhoods compared to those released without electronic monitoring. This simply reflects the timing of most electronic monitoring early in the parole period when institutional residences are also more common. The average disadvantage level of first neighborhoods is 1.025 for whites with electronic monitoring and -0.0067 for others. However, the average disadvantage level of the 24th month neighborhood is -0.0317 for whites released to electronic monitoring and -0.0789 for others. Most of the whites on electronic monitoring (98.2%) resided in "correctional institutions not used for sanctions" during their first month, but by the second month, more than 68% of whites on electronic monitoring lived elsewhere. In other words, most whites on electronic monitoring moved from correctional institutions, which were usually located in poor neighborhoods, to private residences in less disadvantaged neighborhoods.

Among blacks, lack of human capital is associated with entering more disadvantaged neighborhoods, and social ties (specifically, being married) appears protective against living in disadvantaged neighborhoods. Only certain types of institutional residences increase exposure to neighborhood disadvantage among blacks (treatment programs and homeless shelters). These effects are robust to controls for pre-prison neighborhood conditions and (with the exception of marital status among blacks) even when initial post-prison neighborhood conditions are controlled. How these effects are operating and why they do so differently by race are important questions for future research.

Third, pre-prison and first post-prison neighborhood contexts are one of the strongest predictors of later post-prison neighborhood disadvantage for both blacks and whites. Formerly incarcerated people who lived in less disadvantaged neighborhoods before incarceration or are from rural areas tend to start their post-prison lives in relatively less disadvantaged neighborhoods. Not surprisingly given its closer proximity in time, the first post-prison neighborhood is even stronger than the pre-prison neighborhoods in predicting the neighborhood disadvantage level of later residences. Those who restarted their community lives after prison in poor neighborhood conditions are likely to stay in those poor conditions, while those who entered into less disadvantaged places tended to remain in similar neighborhood conditions over the subsequent two-year period. This path dependency pattern is similar for blacks and whites. However, the magnitudes of the pre-prison and first post-prison neighborhood effects for blacks are bigger than those for whites. This racial difference in the effects of former neighborhoods is consistent with prior research that shows that whites but not blacks experience downward residential mobility as a result of incarceration in prison (Massoglia et al 2013).

The continuity of neighborhood disadvantage levels over the two years following prison release suggests the importance of early post-prison periods for future neighborhood attainment. In this study, the neighborhood disadvantage level during the second month is more strongly dependent on the first post-prison neighborhood than the first month's disadvantage level is on the pre-prison neighborhood. The complex process of re-establishing living conditions in early post-prison life may be one mechanism through which the path dependence of neighborhood conditions is set in motion. During the initial periods after release, formerly incarcerated people determine where they will live, whom they will live with, and how they can contribute to these households or establish their own households, subject to the restrictions imposed by parole (Visher and Travis 2003). For example, individuals on parole are typically prohibited from living with others with a criminal record, and sex offenders face restrictions on living with children or near parks or schools. As suggested by prior research on the effects of neighborhoods on post-prison outcomes, initial neighborhood conditions may influence later neighborhood options by limiting economic or social resources for moving out of a disadvantaged neighborhood. However, path dependence may also be generated by unobserved common causes of both initial and later neighborhood attainment. Future studies should examine the processes that generate the continuity of neighborhood conditions documented here.

With regard to policy and practice, the importance of initial neighborhood conditions for future neighborhood attainment (path dependency) highlights the need for greater attention

to the period immediately after release from prison. This finding suggests that intervention in this early period may be more efficient and effective, as it has the potential to change trajectories of reintegration at their origins. Moreover, in conjunction with the widespread concentration of formerly incarcerated people in the most disadvantaged neighborhoods, this finding is consistent with existing evidence in favor of community-based interventions in the neighborhoods most impacted by mass incarceration. For example, the Maryland Reentry Partnership Initiative (REP) program illustrates the potential effectiveness of community level intervention. Developing partnerships with community-based services providers, the REP program's community-level intervention reduced recidivism among formerly incarcerated people (Roman et al. 2007). Intervention focused on the early period after release may help poor neighborhoods to build their capacity to provide social supports and informal social control for formerly incarcerated people.

Our results also highlight the importance of institutional housing for the residential and neighborhood trajectories of the formerly incarcerated. From a policy perspective, these results suggest that locating institutional housing in more disadvantaged neighborhoods plays a significant role in exposing formerly incarcerated people to more disadvantaged neighborhoods due to the high frequency of residence in institutional housing in this population, particularly among whites. From a methodological perspective, one concern is that institutional housing may simply reflect other problems the formerly incarcerated are experiencing after release, such as continued substance use, which can lead to assignment to treatment programs or parole violator programs. Although we have controlled for history of mental illness and substance abuse, criminal history, parole supervision level, release onto electronic monitoring, and a time-varying measure of positive substance abuse tests, there may be other unmeasured factors influencing placement in institutional housing. Future research is needed to further unpack the relationships between individuals' histories, post-release behaviors, institutional housing, and neighborhood attainment.

We close by noting important limitations of this study. One limitation is the relatively short follow-up period of our study. It may be that long-term follow up would reveal more pronounced differentiation of trajectories of neighborhood attainment across individuals and a stronger predictive role for time-varying covariates and a corresponding decline in the importance of the first post-prison neighborhood. We note, however, that prior research with a longer follow-up finds that the effect of incarceration on residential mobility declines steadily over time following release (Warner 2015). We also believe that our relatively short time period is counterbalanced by our more detailed monthly residential data and our ability to track different types of residences and institutional housing.

A second limitation is that our measures of human capital, social ties, and institutional factors are likely incomplete. For example, marital status, number of dependents, and cohabitants in private residences do not fully capture all aspects of formerly incarcerated people's social ties and the social resources they may have. Future research should attempt to measure the social ties of formerly incarcerated people more completely and more directly. With regard to human capital, the UI data from which our quarterly employment and earnings variables were drawn do not include informal employment. Previous research commonly notes that the employment and earnings of formerly incarcerated people

calculated from UI data are considerably lower than that from self-reported survey data, mainly due to the absence of informal income in UI data (Grogger 1995, Tyler and Kling 2002, see also Kornfeld and Bloom [1999] and Hotz and Scholz [2001] on the validity of UI data in low income populations more generally). It is possible that our finding that pre- and post-prison employment and earnings are not predictive of neighborhood conditions may be due to the omission of informal work.

A third limitation is that our research design is not well-suited to making causal inferences about any one particular factor in improving or retarding neighborhood attainment. As one of the first studies to examine neighborhood attainment after prison within racial groups, we focus instead on assessing the association between multiple potential causal factors and neighborhood disadvantage over time.

A final limitation is that our analysis is limited to a single state, and social and economic conditions as well as criminal justice policies vary considerably from state to state. Michigan is characterized by high unemployment, by declining opportunities for employment in low skill occupations, and by high rates of racial and economic residential segregation. Michigan also has few Latino or Asian residents, so we can only analyze racial differences between blacks and whites. In terms of criminal justice policies and practices, we note that Michigan's rates of incarceration and parole are close to the national averages. Michigan also accounts for a nontrivial share (4-5%) of the nation's parole population. Our findings regarding the importance of institutional residences may be particularly sensitive to state-specific resources and policies related to parole supervision, particularly parole revocation. However, the rate of return to prison among Michigan parolees was 17 percent in 2006, the same as the national average for state parolees (Sourcebook of Criminal Justice Statistics Online 2011).

A related limitation is that our study period is relatively old, as our research subjects were sampled from those paroled in 2003. Changes in the criminal justice system and the economy since then could affect generalizability. According to the Bureau of Justice Statistics, the rate of prison release in Michigan was similar in 2003 (142 per 100,000) and 2014 (143 per 100,000). The state unemployment rate was 7.5% in 2003, sharply peaked at 14.7% in 2009, and then dropped back down to 7.1% by 2014. However, the inflation adjusted median household income fell 20% from \$62,691 in 2000 to \$49,929 in 2013 (Wackerman et.al 2014). These similarities and differences between 2003 and more recent years further underscore the need for additional tests of the hypotheses developed here.

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## Appendix

**Table A1**

BIC and AIC scores for Model Selection in Group-Based Trajectory Models

	Whites			Blacks		
	N	BIC	AIC	N	BIC	AIC
1 Group Model	1646	-28432.8	-28376	1944	-38784.1	-38725.6
2 Group Model	1646	-27362.6	-27286.9	1944	-37672.9	-37594.9
3 Group Model	1646	-26452.9	-26358.3	1944	-36833.5	-36735.9
4 Group Model	1646	-26079.2	-25965.7	1944	-36318.7	-36201.7
5 Group Model	1646	-25734.1	-25601.7	1944	-35743.2	-35606.7
6 Group Model	1646	-25381.5	-25230.1	1944	-35707.1	-35551.1
7 Group Model	1646	-25031.0	-24860.7	1944	-34975.8	-34800.3
8 Group Model	1646	-51122.5	-51103.0	1944	-36259.8	-36240.9

**Table A2**

Descriptions of Neighborhood Disadvantage Score Trajectory Groups (7 group model)

Whites		Intercept	SE	% of group	SE
1st Group	Downward	-0.52	0.06	4.2%	0.70
2nd Group	Stay in least disadvantaged Neighborhood	-0.42	0.01	44.3%	1.66
3rd Group	Stay in less disadvantaged Neighborhood	-0.01	0.02	29.9%	1.51
4th Group	Stay in disadvantaged Neighborhood	0.28	0.04	10.6%	0.92
5th Group	Upward	2.24	0.05	4.5%	0.57
6th Group	Stay in More disadvantaged Neighborhood	1.40	0.05	4.1%	0.54
7th Group	Stay in Most disadvantaged Neighborhood	2.00	0.06	2.3%	0.39
Blacks					
1st Group	Downward	-0.23	0.14	3.8%	0.52
2nd Group	Stay in least disadvantaged Neighborhood	0.08	-0.03	16.8%	0.99
3rd Group	Stay in less disadvantaged Neighborhood	0.94	-0.06	16.9%	1.02
4th Group	Stay in disadvantaged Neighborhood	1.46	-0.02	20.4%	1.12
5th Group	Upward	2.67	-0.19	5.8%	0.63
6th Group	Stay in More disadvantaged Neighborhood	2.00	0.00	23.0%	1.14
7th Group	Stay in Most disadvantaged Neighborhood	2.43	0.04	13.4%	0.90

**Table A3**

Number of Residential Moves Between Census Tracts by Trajectory Group and Race

	White		Black	
	Mean	S.D	Mean	S.D
1 <sup>st</sup> Group: “Downward mobility”	5.736	2.575	4.246	2.468
2 <sup>nd</sup> Group: “Stay in least disadvantaged neighborhood”	2.470	2.189	3.530	2.960
3 <sup>rd</sup> Group: “Stay in less disadvantaged neighborhood”	4.153	3.341	4.052	3.367
4 <sup>th</sup> Group: “Stay in disadvantaged neighborhood”	4.410	3.385	3.213	2.949
5 <sup>th</sup> Group: “Upward mobility”	3.921	2.655	5.038	3.005
6 <sup>th</sup> Group: “Stay in more disadvantaged neighborhood”	3.812	2.928	2.953	2.632
7 <sup>th</sup> Group: “Stay in most disadvantaged neighborhood”	3.368	2.966	2.721	2.222
Total	3.367	2.907	3.369	2.891

Note: The means and standard deviations are weighted by the probability of being assigned in each group.

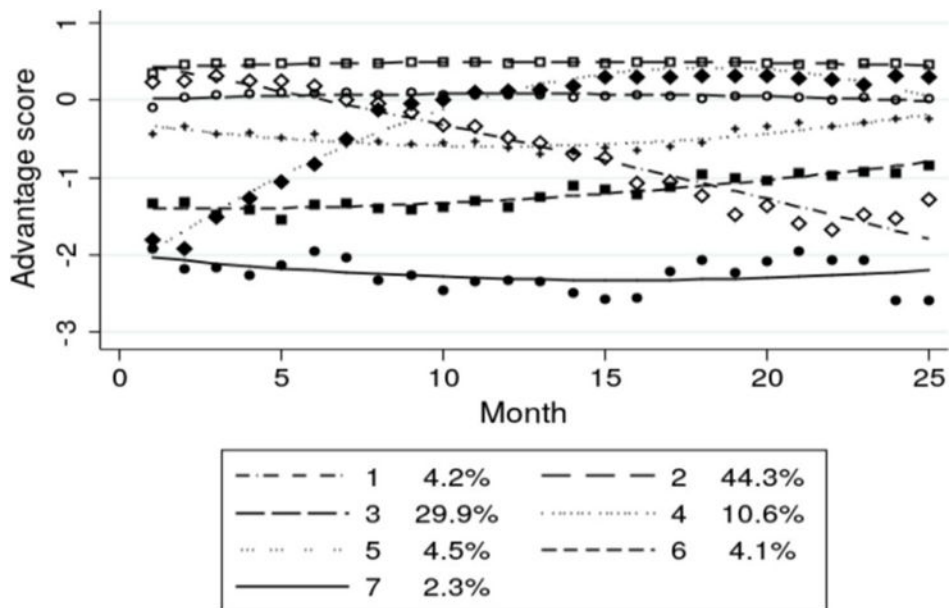
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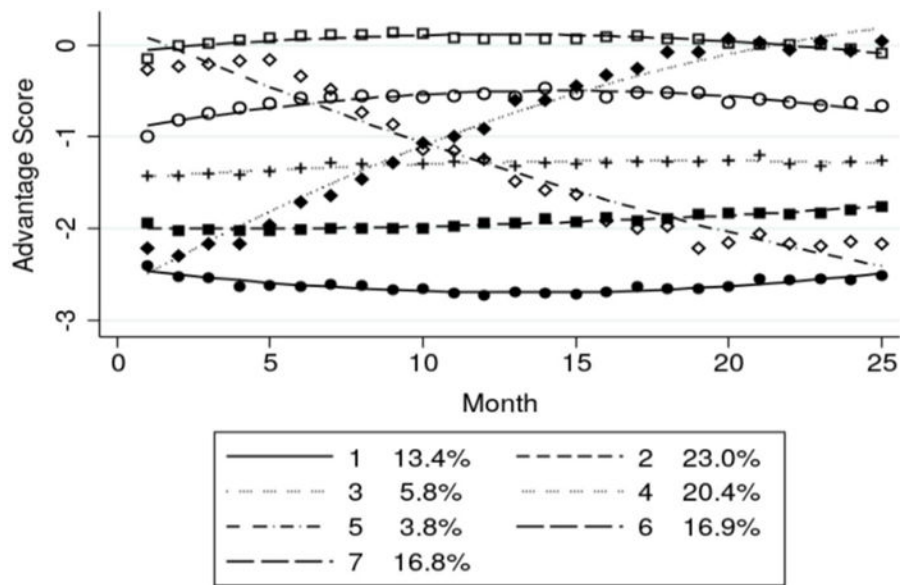


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**Figure 1.**  
 Neighborhood Advantage Score Trajectories over 24 months: Whites  
 1<sup>st</sup> Group: “Downward mobility” (4.2%)  
 2<sup>nd</sup> Group: “Stay in least disadvantaged neighborhood” (44.3%)  
 3<sup>rd</sup> Group: “Stay in less disadvantaged neighborhood” (29.9%)  
 4<sup>th</sup> Group: “Stay in disadvantaged neighborhood” (10.6%)  
 5<sup>th</sup> Group: “Upward mobility” (4.5%)  
 6<sup>th</sup> Group: “Stay in more disadvantaged neighborhood” (4.1%)  
 7<sup>th</sup> Group: “Stay in most disadvantaged neighborhood” (2.3%)



**Figure 2.**  
 Neighborhood Advantage Score Trajectories over 24 months: Blacks  
 1<sup>th</sup> Group: “Downward mobility” (3.8%)  
 2<sup>th</sup> Group: “Stay in least disadvantaged neighborhood” (16.8%)  
 3<sup>th</sup> Group: “Stay in less disadvantaged neighborhood” (16.9%)  
 4<sup>th</sup> Group: “Stay in disadvantaged neighborhood” (20.4%)  
 5<sup>rd</sup> Group: “Upward mobility” (5.8%)  
 6<sup>nd</sup> Group: “Stay in more disadvantaged neighborhood” (23.0%)  
 7<sup>st</sup> Group: “Stay in most disadvantaged neighborhood” (13.4%)

**Table 1**

Descriptive statistics

	All Subjects		Whites		Blacks	
	% (mean in italics)	n (SD in italics)	% (mean in italics)	n (SD in italics)	% (mean in italics)	n (SD in italics)
Average neighborhood disadvantage score	0.649	1,149	-0.0645	0.759	1.29	1,059
17-25	35.372	662	21.15%	312	15.91%	350
26-30	18.31%	615	15.71%	355	18.10%	260
36-40	17.01%	635	15.95%	371	18.92%	264
41-45	17.56%	606	17.10%	323	16.47%	283
46-50	16.76%	495	14.14%	261	13.31%	234
51-55	13.69%	374	10.39%	202	10.30%	172
56-60	10.34%	147	3.14%	95	4.84%	52
61-65	4.07%	53	1.51%	28	1.43%	25
66-70	1.47%	20	0.60%	10	0.51%	10
71-76	0.55%	9	0.30%	4	0.20%	5
Sex	0.25%	3,338	92.50%	1,531	92.10%	1,807
Female	7.70%	278	7.50%	124	7.90%	154
Race	45.80%	1,655				
White	54.20%	1,961				
Black						
Mental illness	78.65%	2,814	70.60%	1,160	85.40%	1,654
No mental illness recorded						
Mental illness recorded	21.35%	764	29.40%	482	14.60%	282
Custody (average % over 24 months)	31.14%	0.4631	29.02%	0.4539	32.93%	0.4700
Abscond (average % over 24 months)	18.11%	0.3851	12.59%	0.3318	22.77%	0.4193
Out of state (average % over 24 months)	1.57%	0.1242	2.03%	0.1410	1.18%	0.1079
Discharge (average % over 24 months)	6.34%	0.2437	8.13%	0.2733	4.83%	0.2145
Death (average % over 24 months)	0.42%	0.0649	0.34%	0.0585	0.49%	0.0698
pre-prison neighborhood disadvantage score	0.755	1,214	-0.096	0.753	1.478	1,051
Pre-prison urbanicity	50.50%	1,778	21.30%	344	75.30%	1,434
Central City	40.50%	1,427	60.30%	976	23.70%	451
Suburban	9.00%	318	18.40%	298	1.00%	20
Rural	66.60%	2,215	65.70%	1,014	67.30%	1,201
Different tract						
Same tract as pre-prison						

	All Subjects			Whites			Blacks		
	% (mean in italics)	n (SD in italics)	% (mean in italics)	n (SD in italics)	% (mean in italics)	n (SD in italics)	% (mean in italics)	n (SD in italics)	
First post-prison neighborhood disadvantage score	33.40%	1,113	34.30%	530	32.70%	583	0.791	1.157	1.01
<u>Criminal History</u>									
Number of prior prison sentences									
1st Prison Sentence	47.50%	1,716	52.60%	870	43.10%	846			
2nd Prison Sentence	25.90%	935	24.50%	406	27.00%	529			
3rd Prison Sentence	13.80%	500	12.50%	207	14.90%	293			
4th Prison Sentence	6.80%	244	6.00%	100	7.30%	144			
5th or more Prison Sentence	6.10%	221	4.40%	72	7.60%	149			
Type of offense									
Assaultive	28.00%	1,013	27.20%	450	28.70%	563			
Drug offender	26.00%	940	11.70%	193	38.10%	747			
Non assaultive offender	46.00%	1,663	61.10%	1,012	33.20%	651			
Non	51.00%	1,844	51.50%	852	50.60%	992			
Alcohol Only	4.10%	149	6.00%	99	2.50%	50			
THC only	7.70%	278	4.30%	71	10.60%	207			
Hard Drug only	5.20%	187	3.70%	62	6.40%	125			
Alcohol + THC	6.00%	216	6.90%	114	5.20%	102			
Hard Drug +Alcohol+THC	26.10%	942	27.60%	457	24.70%	485			
Not tested	53.20%	1,923	57.50%	951	49.60%	972			
non positive	41.10%	1,485	39.10%	647	42.70%	838			
one positive	4.40%	159	2.80%	46	5.80%	113			
Two positives	1.10%	40	0.50%	9	1.60%	31			
Three or more positives	0.30%	9	0.10%	2	0.40%	7			
Years in prison	2.896	3,054	2.626	2,727	3.124	3,289			
<u>Residence Type</u>									
Parent	29.43%	0.456	29.79%	0.457	29.09%	0.454			
Romantic Partner	19.74%	0.398	20.11%	0.401	19.41%	0.395			
Other Family	18.69%	0.390	13.68%	0.344	23.20%	0.422			
Other Private	15.13%	0.358	19.24%	0.394	11.43%	0.318			
Receiving Treatment/Care	3.41%	0.181	3.47%	0.183	3.35%	0.180			
Hotel/Motel	1.01%	0.100	1.15%	0.107	0.89%	0.094			

	All Subjects			Whites			Blacks		
	% (mean in italics)	n (SD in italics)		% (mean in italics)	n (SD in italics)		% (mean in italics)	n (SD in italics)	
Mission/Shelter/Homeless	1.14%	0.106		1.19%	0.109		1.10%	0.104	
Correctional institution	3.92%	0.194		4.22%	0.201		3.65%	0.188	
Jail	7.53%	0.264		7.14%	0.258		7.87%	0.269	
<u>Other Institutional Factors</u>									
Non-supervised	10.50%	379		10.10%	167		10.80%	212	
Minimum	23.60%	854		26.70%	442		21.00%	412	
Medium	34.90%	1,260		30.60%	506		38.40%	754	
Maximum	31.10%	1,123		32.60%	540		29.70%	583	
No electronic monitoring	92.60%	3,344		91.20%	1,510		93.70%	1,834	
Electronic monitoring	7.40%	268		8.80%	145		6.30%	123	
Not sex offender	92.30%	3,337		89.70%	1,484		94.50%	1,853	
Sex offender	7.70%	279		10.30%	171		5.50%	108	
<u>Human capital</u>									
0-11 years	42.43%	1,517		36.85%	604		47.16%	913	
GED	30.91%	1,105		33%.01	541		29.13%	564	
12 years	20.45%	731		23.00%	377		18.29%	354	
12~19 years	6.21%	222		7.14%	117		5.42%	105	
Unemployed	83.10%	2,534		80.50%	1,168		85.50%	1,366	
Employed	16.90%	515		19.50%	283		14.50%	232	
Pre-prison employment	0.226	0.418		0.277	0.448		0.183	0.386	
Mean Quarterly Employment	842.66	2464.26		1163.27	2940.12		571.17	1932.39	
Mean Quarterly Gross wages									
<u>Other Social Tie Measures</u>									
Number of Dependents	1.259	1.313		1.035	1.204		1.448	1.37	
Never Married	64.20%	2,309		57.80%	952		69.60%	1,357	
Married	12.20%	440		13.00%	215		11.50%	225	
Divorced/separated	22.70%	815		28.10%	463		18.00%	352	
Other	1.00%	35		1.10%	18		0.90%	17	
Marital status at prison intake									

Table 2

Growth Curve Models of Neighborhood Disadvantage for White Formerly Incarcerated People

	Model1		Model2		Model3		Model4		Model5		Model6	
	intercept	slope	intercept	slope	intercept	slope	intercept	slope	intercept	slope	intercept	slope
Months since release	0.003		0.005		0.009 *		0.013 ***		0.011 **		0.011 **	
<u>Demographics</u>												
26-30 (ref 18-25)	0.003	0.000	-0.003	0.001	-0.003	0.000	-0.001	0.000	-0.022	0.001	0.002	0.000
31-35	0.067	-0.004	0.058	-0.003	0.047	-0.004	0.065	-0.004	0.016	-0.002	0.014	-0.002
36-40	0.044	-0.004	0.030	-0.002	0.015	-0.004	0.027	-0.003	-0.014	-0.002	-0.017	-0.002
41-45	0.066	-0.001	0.052	0.000	0.016	-0.001	0.018	0.002	-0.023	0.002	-0.049	0.003
46-50	-0.004	-0.004	-0.017	-0.003	-0.052	-0.004	-0.048	-0.002	-0.079	-0.002	-0.094 *	-0.002
51-55	0.180 *	-0.007	0.167 *	-0.006	0.107	-0.006	0.1	-0.003	0.084	-0.006	0.048	-0.005
56-60	0.161	-0.009	0.149	-0.008	0.117	-0.009	0.107	-0.006	0.090	-0.008	0.110	-0.010
61-65	0.128	-0.022 *	0.110	-0.021 *	0.089	-0.022 **	0.034	-0.018 *	0.065	-0.022 **	0.066	-0.023 **
66-71	-0.158	0.003	-0.174	0.002	-0.069	-0.001	-0.132	0.000	-0.118	-0.001	-0.060	-0.004
Gender												
Female (ref Male)	0.049	-0.004	0.047	-0.004	0.064	-0.004	0.067	-0.006 *	0.078	-0.005	0.026	-0.003
Mental health												
Mental illness recorded	0.071 **	-0.002	0.067 **	-0.002	0.051	-0.002	0.05	-0.001	0.053	-0.002	-0.004	0.001
Custody	0.060 *	0.000	0.068 *	-0.001	0.023	0.001	0.067 *	-0.001	0.064 *	-0.001	0.102 ***	-0.003
Abscond	-0.036	0.010 **	-0.033	0.009 **	-0.042	0.011 **	-0.028	0.009 **	-0.012	0.008 **	-0.068	0.012 ***
Reasons for Attrition												
Move out state	1.319 ***	-0.049 ***	1.324 ***	-0.049 ***	1.380 ***	-0.051 ***	1.412 ***	-0.053 ***	1.338 ***	-0.050 ***	1.325 ***	-0.049 ***
Discharged	-0.113	0.010 *	-0.089	0.008	-0.098	0.008 *	-0.079	0.007	-0.081	0.007	-0.051	0.005
Death	0.970 *	-0.042	0.959 *	-0.041	1.036 **	-0.046	1.101 **	-0.050	0.964 *	-0.045	1.081 **	-0.046
<u>Pre-Prison Neighborhood</u>												
Pre-prison neighborhood disadvantage score	0.231 ***	-0.003 *	0.232 ***	-0.003 **	0.231 ***	-0.003 **	0.236 ***	-0.003 **	0.232 ***	-0.003 **	0.107 ***	0.001
Pre-prison urbanicity												
Suburban(ref Central City)	0.015	-0.006 *	0.017	-0.006 **	0.022	-0.006 **	0.034	-0.007 **	0.023	-0.006 **	-0.007	-0.005 *
Rural	-0.153 ***	-0.002	-0.148 **	-0.002	-0.141 **	-0.003	-0.130 **	-0.003	-0.140 **	-0.003	-0.068	-0.005 *
Same tract as pre-prison (ref. Different)	-0.289 ***	0.010 **	-0.293 ***	0.011 ***	-0.203 ***	0.006 ***	-0.192 ***	0.006 ***	-0.224 ***	0.008 ***	-0.161 ***	0.004 *
<u>Criminal History</u>												
Number of prior prison sentences	-0.082 **	0.005 *	-0.098 ***	0.006 **	-0.075 **	0.004 *	-0.071 **	0.004 *	-0.084 **	0.005 **	-0.059 *	0.004



	Model1	Model2	Model3	Model4	Model5	Model6
	intercept	slope	intercept	slope	intercept	slope
3 <sup>rd</sup> Prison Sentence	-0.066	0.005	-0.084*	0.006*	-0.058	0.004
4 <sup>th</sup> Prison Sentence	-0.007	0.002	-0.025	0.003	0.000	0.002
5 <sup>th</sup> or more Prison Sentence	0.029	0.002	0.015	0.002	0.036	0.002
Drug (ref Assaultive)	-0.093*	0.003	-0.093*	0.003	-0.093*	0.003
Non assaultive	0.046	-0.003	0.042	-0.003	0.014	-0.002
Alcohol Only (ref None)	0.043	0.001	0.043	0.001	0.053	0.001
THC only	-0.079	0.006	-0.084	0.006	-0.064	0.006
Hard Drug only	0.056	-0.005	0.060	-0.006	0.009	-0.003
Alcohol + THC	-0.198***	0.009**	-0.199***	0.009**	-0.183***	0.008**
Hard Drug +Alcohol+THC	-0.069*	0.005**	-0.072**	0.005**	-0.067*	0.004**
non positive (ref never tested)	0.008	-0.004***	0.006	-0.004***	0.010	-0.004***
One positive	0.063	-0.004	0.064	-0.004	0.085*	-0.005
Two positives	0.076	-0.002	0.075	-0.002	0.115	-0.004
Three or more positives	-0.103	0.007	-0.096	0.007	-0.103	0.007
Years in Prison	-0.011**	0.000	-0.016**	0.001	-0.003	0.000
Human Capital						
GED (ref 0~11yr)		0.077**		-0.005***		0.070**
12 years		0.062		-0.005**		0.067*
12~19 years		0.066		-0.006		0.062
Employed(ref Unemployed)		0.050		-0.007***		0.006
Employed (ref Non employ)		0.101		-0.012		0.119
log Wage		-0.024		0.004		-0.032
log Wage2		0.000		0.000		0.001
Social Ties						
Number of Dependents			0.034**	-0.001	0.036**	0.015
Married (ref Never Married)			-0.059	0.002	-0.063	-0.021
Divorced/separated			0.006	0.003	0.003	0.030
Other			0.134	0.006	0.121	0.032
Pre-Prison Drug Abuse History						
3 <sup>rd</sup> Prison Sentence						-0.057
4 <sup>th</sup> Prison Sentence						-0.075
5 <sup>th</sup> or more Prison Sentence						-0.068
Drug (ref Assaultive)						-0.060
Non assaultive						-0.005
Alcohol Only (ref None)						0.067
THC only						-0.051
Hard Drug only						-0.001
Alcohol + THC						-0.078
Hard Drug +Alcohol+THC						-0.015
non positive (ref never tested)						0.003
One positive						-0.004**
Two positives						0.070
Three or more positives						0.125
Years in Prison						-0.132
Human Capital						-0.003
GED (ref 0~11yr)						0.070**
12 years						0.067*
12~19 years						0.062
Employed(ref Unemployed)						0.006
Employed (ref Non employ)						0.119
log Wage						-0.032
log Wage2						0.001
Social Ties						
Number of Dependents						0.036**
Married (ref Never Married)						-0.001
Divorced/separated						0.002
Other						0.003
Pre-Prison Drug Abuse History						
3 <sup>rd</sup> Prison Sentence						0.004
4 <sup>th</sup> Prison Sentence						0.002
5 <sup>th</sup> or more Prison Sentence						0.003
Drug (ref Assaultive)						0.004
Non assaultive						-0.001
Alcohol Only (ref None)						0.000
THC only						0.006
Hard Drug only						-0.005
Alcohol + THC						0.009**
Hard Drug +Alcohol+THC						-0.015
non positive (ref never tested)						0.003
One positive						-0.004**
Two positives						0.070
Three or more positives						0.125
Years in Prison						-0.132
Human Capital						-0.003
GED (ref 0~11yr)						0.070**
12 years						0.067*
12~19 years						0.062
Employed(ref Unemployed)						0.006
Employed (ref Non employ)						0.119
log Wage						-0.032
log Wage2						0.001
Social Ties						
Number of Dependents						0.036**
Married (ref Never Married)						-0.001
Divorced/separated						0.002
Other						0.003

	Model1	Model2	Model3	Model4	Model5	Model6
	intercept	intercept	intercept	intercept	intercept	intercept
	slope	slope	slope	slope	slope	slope
Romantic Partner			0.002		0.002	0.003
Other Family			0.003		0.003	0.003
Other Private			0.000		0.033	0.016
Institutional Residence			0.467***	-0.021***		
<u>Institutional Factors</u>						
Private Residence				(Reference)		
Receiving Treatment/Care			0.363***	0.363***	0.263***	0.269***
Hotel/Motel			0.255***	0.255***	0.132**	0.080
Mission/Shelter/Homeless			0.639***	0.639***	0.446***	0.382***
Correctional institution			0.711***	0.711***	0.480***	0.492***
Jail			0.185***	0.185***	0.111***	0.098**
Sex offender (ref. non sex offender)			0.05	0.05	0.040	0.062
Electronic monitoring (ref not-monitored)			0.066	0.066	0.124**	-0.388***
Minimum (ref Non-supervised)			0.026	0.026	0.035	0.061*
Medium			-0.055**	-0.055**	-0.039	-0.030
Maximum			-0.063**	-0.063**	-0.053*	-0.051*
First post-prison neighborhood disadvantage score						0.414***
Constant	0.086	0.075	-0.064	-0.072	-0.061	-0.054
<u>Variance Components</u>						
Month	0.4976	0.4936	0.458331	0.4539949	0.4607	0.3746
individual	0.0246	0.0244	0.0229331	0.0225528	0.0224	0.0198
N person-months	41375	41375	41375	41375	41375	39720
N individuals	1655	1655	1655	1655	1655	1655

Note:

\* p<.05,

\*\* p<.01, and

\*\*\* p<.001

**Table 3**

**Growth Curve Models of Neighborhood Disadvantage for Black Formerly Incarcerated People**

	Model1		Model2		Model3		Model4		Model5		Model6	
	intercept	slope	intercept	slope	intercept	slope	intercept	slope	intercept	slope	intercept	slope
Months since release	0.016***		0.014***		0.015***		0.016***		0.013**		0.021***	
<u>Demographics</u>												
Age												
26-30 (ref 18-25)	0.096	0.000	0.115*	-0.001	0.106*	0.000	0.094	0.000	0.125**	-0.001	0.047	0.002
31-35	0.042	-0.001	0.077	-0.003	0.071	-0.002	0.039	-0.001	0.098	-0.003	0.046	-0.001
36-40	0.041	0.002	0.082	0.000	0.071	0.001	0.031	0.002	0.097	0.000	0.010	0.003
41-45	0.140**	-0.004	0.200***	-0.006	0.172**	-0.005	0.135*	-0.004	0.227***	-0.007	0.105*	-0.002
46-50	0.217***	-0.004	0.276***	-0.006	0.260***	-0.005	0.208***	-0.004	0.303***	-0.007	0.122*	0.000
51-55	0.336***	-0.008	0.423***	-0.011	0.381***	-0.009	0.327***	-0.007	0.448***	-0.012	0.262***	-0.005
56-60	0.194	0.007	0.293*	0.004	0.223	0.007	0.188	0.008	0.303*	0.005	0.113	0.012
61-65	0.843***	-0.016	0.935***	-0.021	0.927***	-0.018	0.846***	-0.016	1.013***	-0.023	0.525**	-0.005
66-71	0.100	0.000	0.054	0.001	0.182	-0.003	0.047	0.002	0.012	0.003	-0.210	0.011
Gender												
Female (ref Male)	0.157**	-0.010***	0.174***	-0.010***	0.167**	-0.010***	0.156**	-0.010***	0.166**	-0.010***	-0.045	-0.002
Mental health												
Mental illness recorded (ref No)	-0.055	0.000	-0.051	0.000	-0.053	0.000	-0.054	0	-0.056	0.000	-0.034	-0.001
Reasons for Attrition												
Custody	-0.354***	0.011***	-0.347***	0.010***	-0.340***	0.011***	-0.291***	0.008***	-0.295***	0.008***	-0.273***	0.007***
Abscond	0.048	-0.003	0.042	-0.003	0.045	-0.003	0.053	-0.003	0.040	-0.003	0.022	-0.001
Move out state	0.506	0.002	0.502	0.002	0.505	0.002	0.506	0.002	0.479	0.003	0.569	-0.003
Discharged	0.146	-0.006	0.158	-0.007	0.151	-0.007	0.171	-0.007	0.168	-0.008	0.172	-0.008
Death	0.015	0.011	0.001	0.012	0.014	0.011	0.046	0.009	0.087	0.009	-0.034	0.017
<u>Pre-Prison Neighborhood</u>												
Pre-prison neighborhood disadvantage score	0.410***	-0.005***	0.399***	-0.004***	0.403***	-0.004***	0.411***	-0.005***	0.392***	-0.004***	0.179***	0.004***
Pre-prison urbanicity												
Suburban(ref Central City)	-0.061	0.001	-0.055	0.000	-0.060	0.001	-0.056	0.001	-0.060	0.001	-0.028	0.000
Rural	-0.327**	0.013	-0.313*	0.012	-0.336**	0.012	-0.314*	0.011	-0.317*	0.011	-0.230*	0.009
Same tract as pre-prison (ref. Different)	0.179***	-0.001	0.179***	-0.001	0.159***	0.000	0.161***	0	0.166***	-0.001	0.137***	0.001
<u>Criminal History</u>												
Number of prior prison sentences	-0.085**	0.005**	-0.096**	0.005**	-0.086**	0.005**	-0.091**	0.005*	-0.095**	0.005*	-0.040	0.003
2 <sup>nd</sup> Prison Sentence (ref 1 <sup>st</sup> )												

	Model1		Model2		Model3		Model4		Model5		Model6	
	intercept	slope	intercept	slope	intercept	slope	intercept	slope	intercept	slope	intercept	slope
Type of offense												
3 <sup>rd</sup> Prison Sentence	-0.067	0.008**	-0.079	0.008**	-0.064	0.008**	-0.073	0.007**	-0.078	0.007**	0.006	0.004
4 <sup>th</sup> Prison Sentence	-0.095	0.006	-0.127*	0.006	-0.103	0.006	-0.107	0.006	-0.126*	0.006	-0.014	0.001
5 <sup>th</sup> or more Prison Sentence	-0.106	0.005	-0.125*	0.005	-0.112	0.005	-0.109	0.005	-0.137*	0.005	-0.062	0.002
Drug(ref Assaultive)	0.010	-0.006**	0.003	-0.005**	0.010	-0.006**	0.014	-0.005**	0.008	-0.005**	0.015	-0.006**
Non assaultive	-0.026	-0.005	-0.029	-0.005	-0.020	-0.005	-0.022	-0.004	-0.020	-0.005	-0.002	-0.005
Pre-Prison Drug Abuse History												
Alcohol Only (ref None)	-0.073	-0.008	-0.081	-0.007	-0.068	-0.008	-0.078	-0.008	-0.074	-0.008	-0.098	-0.006
THC only	-0.025	0.004	-0.019	0.004	-0.029	0.004	-0.021	0.004	-0.032	0.005	-0.069	0.006
Hard Drug only	-0.011	-0.001	-0.015	-0.001	-0.027	0.000	-0.007	-0.001	-0.048	0.001	-0.107*	0.003
Alcohol + THC	0.058	-0.001	0.054	-0.001	0.056	-0.001	0.068	-0.001	0.060	-0.001	0.005	0.001
Hard Drug +Alcohol+THC	0.010	-0.002	0.010	-0.002	0.003	-0.002	0.006	-0.002	0.000	-0.002	-0.036	0.000
Substance abuse tests in past month												
non positive (ref never tested)	0.081***	-0.002	0.080***	-0.002	0.084***	-0.002	0.078***	-0.003	0.079***	-0.003	0.074***	-0.002
One positive	0.064	0.004	0.064	0.004	0.062	0.003	0.056	0.003	0.061	0.003	0.058	0.003
Two positives	0.072	0.003	0.067	0.004	0.070	0.003	0.067	0.002	0.049	0.003	-0.006	0.008
Three or more positives	0.355**	-0.016	0.365**	-0.017	0.335**	-0.016	0.336**	-0.019	0.202	-0.006	0.187	-0.005
Years in Prison	-0.007	0.000	-0.002	0.000	-0.010*	0.000	-0.008	0.000	-0.005	0.000	0.000	0.000
<u>Human Capital</u>												
GED(ref 0-11yr)			-0.055	0.003					-0.051	0.003	-0.047	0.003
12 years			-0.203***	0.005*					-0.203***	0.005**	-0.131***	0.003
12-19 years			-0.303***	0.015***					-0.302***	0.016***	-0.208***	0.013***
Pre-prison employment			-0.046	0.000					-0.041	0.000	-0.035	0.000
Lagged LM Performance			0.461	-0.029					0.495	-0.030	0.450	-0.029
log Wage			-0.169	0.009					-0.180	0.010	-0.168	0.010
log Wage2			0.013	-0.001					0.014	-0.001	0.013	-0.001
<u>Social Ties</u>												
Number of Dependents					-0.013	0.000			-0.012	0.000	-0.020*	0.001
Marital status at prison intake												
Married (ref Never Married)					-0.142**	0.002			-0.140**	0.002	-0.080	0.000
Divorced/separated					-0.005	-0.001			0.000	-0.001	-0.030	0.000
Other					-0.119	0.010			-0.033	0.006	0.134	-0.001

		Model1		Model2		Model3		Model4		Model5		Model6	
		intercept	slope	intercept	slope	intercept	slope	intercept	slope	intercept	slope	intercept	slope
Private Residence Type (ref: Parent)	Romantic Partner												
	Other Family	-0.050	0.001	0.013	0.001	0.002	-0.001	0.027	0.000	0.034	-0.001	-0.028	0.000
	Other Private							0.005	0.000	-0.014	0.000		
	Institutional Residence	-0.071***	0.000										
<u>Institutional Factors</u>													
Institutional Residence Type	Private Residence							(reference)					
	Receiving Treatment/Care			0.143**	-0.004			0.103	-0.002	0.134*	-0.004		
	Hotel/Motel			-0.082	0			-0.066	-0.001	-0.071	-0.001		
	Mission/Shelter/Homeless			0.313***	-0.012*			0.199**	-0.006	0.229**	-0.007		
	Correctional institution			-0.009	0.004			-0.015	0.004	-0.022	0.005		
	Jail			-0.346***	0.010**			-0.314***	0.008*	-0.382***	0.012**		
Sex offender (ref. non sex offender)				-0.061	0.006			-0.030	0.005	0.050	0.002		
Electronic monitoring (ref not-monitored)				-0.061	-0.005			-0.049	-0.005	-0.040	-0.005		
Level of supervision	Minimum (ref Non-supervised)			0.008	0			0.006	0.000	0.012	0.000		
	Medium			-0.01	0.001			-0.017	0.001	-0.007	0.001		
	Maximum			0.005	0.005**			-0.001	0.006**	-0.002	0.006**		
First post-prison neighborhood disadvantage score										0.558***	-0.021***		
Constant		0.555***		0.602***		0.600***		0.718***		0.662***		0.417	
<u>Variance Components</u>													
Month		0.6434		0.637		0.6413836		0.6414983		0.6351		0.4752	
individual		0.0325		0.0323		0.0325117		0.0323733		0.032		0.0278	
N person-months		49024		49024		49024		49024		49024		47063	
N individuals		1961		1961		1961		1961		1961		1961	

Note:

\* p<.05,

\*\* p<.01, and

\*\*\* p<.001