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# Work as Foraging:
# A Smartphone Study of Job Search and Employment after Prison

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ABSTRACT: The past several decades have seen a decline in employment rates and labor force participation, particularly among low-skilled, minority men living in poor areas. As low-skill jobs disappear from poor places, how do marginalized jobseekers navigate this landscape? Using over 8,000 daily measures of search and work collected from smartphones distributed to 133 men recently released from prison, this article presents the concept of work as foraging, where people work a variety of extremely precarious opportunities than span across job types. Sequence analysis methods describe distinct patterns of search and work that unfold over time, where most people cease their search efforts after the first month and maintain a state of very irregular and varied work. Although there is substantial heterogeneity in patterns, foraging is a common strategy of survival work.

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Work has disappeared, as Wilson (1996) asserted more than twenty years ago. Since Wilson's writing, joblessness has continued to rise, with fewer adults working and fewer adults looking for work. This is particularly true among young, low-skilled, and minority men. In 1980, over 60 percent of young, low-skilled black men without high school degrees were employed; by 2008, that number had dropped to fewer than 42 percent. When adjusted to also include the incarcerated, employment is an astoundingly low 26 percent (Pettit 2012). The loss of jobs, particularly in inner cities and poor neighborhoods, is the result of multiple, complex, and evolving labor market dynamics—e.g., technological changes, shifting industries and occupations, greater reliance on subcontractors and flexible arrangements, and spatial mismatch, among other regional and macroeconomic trends (see Brand 2015; Kain 1968; Wilson 1996). In Wilson's study, as well as most research on employment, work is defined as formal labor market jobs with some expectation of permanency and routine (1996:75). These jobs not only provide income but also offer daily structure, life satisfaction, and feelings of self-worth (Jahoda 1981). Researchers and policymakers often focus on these formal labor market jobs, even though they are out of reach for the majority of low-skilled, minority men who are officially categorized as jobless.

When "regular" jobs disappear from poor neighborhoods, what type of work do people find? Several studies point to the critical role of temporary jobs in the lives of marginalized workers in high poverty neighborhoods (Edin and Lein 1997; Edin, Lein, and Nelson 2002; Edin and Nelson 2001; Edin and

Shaefer 2015; Harding et al. 2014; Venkatesh 2006; Western et al. 2015). In these studies, individuals acquire short-term jobs, such as casual labor, seasonal positions, and self-employment, as their primary orientation to the labor market. Among the unemployed and jobless, cobbling together side jobs or temporary gigs is the well-recognized reality of work. But, apart from studies that document the existence of these jobs, there are few detailed or systematic studies that document day-to-day experiences. Questions remain, such as how often and how regularly do people work in these types of jobs? What kind of work do they do, and how consistently do they do this work? In sum, what is the everyday experience of job search and work when regular employment has disappeared?

To understand these experiences, I collected unique real-time, self-report information from smartphones among a cohort of men returning from prison to Newark, New Jersey. Studying daily experiences of job search and work in the immediate months after prison enabled me to define a natural starting point for embarking on job search among those who face high barriers to the labor market. The reentry context also has direct policy and programmatic implications for supporting jobseekers after prison. Using sequence analysis methods with over 8,000 daily observations for a sample of 133 men recently released from prison, I found that most people ceased looking for work after the first month and maintained a state of very sporadic and temporary work. Jobseekers engaged in *foraging* behavior for low-skill work, in which jobs were obtained on a very irregular basis. Rather than

specializing in a specific trade or occupation, people worked in a range of low-skill jobs—from landscaper to warehouser to concession stand operator—all within a short amount of time. Although it was most common for men to quickly cease search activities and to find sporadic work, some had very different search and work patterns, particularly older men who were highly committed to their job search. Yet, despite these differences, the nature of work as foraging was common and widespread.

The concept of foraging implies a previously unrecognized depth of instability and variation across job types, which has short- and long-term consequences that contrast sharply with the consequences of regular employment. This distinction moves forward scholarship on low-skill, poor quality work, which typically either groups together all types of work as employment or excludes temporary work entirely. These approaches minimize (or ignore) the consequences of work as foraging, which has implications for how we understand and study working lives among those at the very margins of the labor market. In the incarceration and reentry literature, specifically, the notion of foraging complicates how we view employment's benefits for important outcomes, such as social integration and desistance.

## WORK AS FORAGING

The term foraging—or the pursuit of short-term, income-generating opportunities across a range of job types—comes from ecological behavioral models (Stephens and Krebs 1986) and was originally used to describe how

youth switch between legal and illicit activities (Fagan and Freeman 1999). Although my use of the term departs from the original in several ways,[1] both emphasize that work is primarily a short-term, instrumental transaction for income. This conceptualization contrasts with perspectives that emphasize multi-faceted benefits of employment—e.g., contributing to positive identity, increasing feelings of self-worth, and building an expertise or skill set. However, foraging for work views these aspects as secondary, such that the primary motivation is income.

Foraging highlights the very uncertain, haphazard, and precarious nature of survival work among jobseekers navigating the margins of the labor market. Work is characterized by a long-term situation of extremely temporary opportunities. These opportunities last not for months or weeks, as sometimes suggested in the literature, but for days (and often, only one or two days). Although studies of poor urban neighborhoods describe the critical role of short-term jobs, the foraging concept emphasizes the *day-to-day* precarity of navigating very scarce opportunities. These jobs are not "second" jobs or complements to regular employment; rather, intermittent

[1] Fagan and Freeman (1999) introduced the term to describe how youth frequently switched between legal work and illicit opportunities. They suggested that youth make frequent, quick decisions about work and crime, such as whether to take a job at McDonald's or commit burglary, based on the immediate opportunities available to them. The original term described decision-making behavior within the context of various and simultaneous income-generating opportunities, where youth choose activities to maximize expected income. In contrast, I suggest that individuals are disadvantaged in the labor market to such a degree that they are often relegated to foraging behavior among scarce employment opportunities as a survival strategy. A second distinction is that the term was originally used to describe the employment behavior of youth, and this orientation was contrasted with the permanent careers of adults. However, I suggest that foraging is a strategy that applies to very marginalized workers more generally.

work in very temporary positions constitutes a person's primary labor market relationship.

In addition to extreme irregularity, work as foraging spans a range of different job types, which cut across occupations and industries, licit and illicit realms, and formal and informal markets.[2] When work is primarily about short-term income and not a means to a long-term career, individuals are omnivorous across job types. This strategy of casting a wide net across different job types is found in research on jobseekers that face barriers to employment, such as racial discrimination (Pager and Pedulla 2015). And diversity in job types is also seen in work on the urban poor (Edin, Lein, and Nelson 2002; Edin and Nelson 2001). However, the distinction here is that individuals switch across these opportunities on a near daily basis. They do not work in one job, such as construction, for a few months and then switch to fast food; rather, changes in job types occurs as frequently as the day-to-day irregularly of work itself.

What are the implications of work as foraging? In the near term, foraging contrasts sharply with the vision of employment that characterizes social integration (Western et al. 2015) and protects against negative outcomes (Sampson and Laub 1995; Sampson and Wilson 1995). These day-to-day strategies are precarious, stressful, and economically insufficient, impacting not only the ability to make ends meet but also mental and physical health (Kalleberg 2011). In contrast to regular employment, work as

[2] In this paper, I am unable to examine illicit work, since focus groups during the project's planning stage suggested that participants would be hesitant to provide this information; however, foraging behavior likely extends to these activities.

foraging likely exacerbates day-to-day instability and strain. Most criminological theories suggest that these experiences are criminogenic—that they aggravate circumstances that lead to crime. In the labor market stratification and crime theory, for example, very poor quality employment creates conditions ripe for violence and theft (Crutchfield 1989, 2014). These ideas are echoed by an employment reentry counselor in Chicago, who described the "day-labor mindset" of temporary work as potentially criminogenic, where "weak attachment to the workplace; irregularity of routines; an insecure, hand-to-mouth existence; a low-trust environment, characterized by exploitative, if not predatory, behavior…was dangerously similar to the mode of existence that had led to incarceration in the first place" (Peck and Theodore 2008:270). It is likely, then, that foraging is not simply benignly non-protective for outcomes, such as social integration, but may actually exacerbate the likelihood of poor outcomes, such as strain and crime.

In the long term, foraging portends a bleak future. Very unstable day-to-day work is a survival strategy to fulfill immediate needs, and the instability inherent in foraging is much like other forms of coping used by the poor (e.g., disposable ties in Desmond 2012). Foraging jobs do not promote skill building that can be leveraged into a career. They cannot be easily referenced on a job application or resume. Even in the best of cases, such as employment by a formal temporary agency, the sporadic nature of work would not provide enough hours or earnings to qualify for unemployment

benefits. In the long term, individuals that are shut out of regular work may feel unable to fulfill traditional social roles, such as breadwinner (Edin et al. 2002), which has implications for identity construction and maintenance (Snow and Anderson 1987). The haphazard nature of foraging is similar to narratives of work among some youth (Apel and Sweeten 2010; Fagan and Freeman 1999); however, foraging among adults in their mid 30s and 40s has particularly dire implications for long term inequality and social integration.

**Work at reentry**

This article focuses on the job search and work experiences of men after release from prison. In many ways, reentry is a very specific time period that heightens the likelihood of foraging. Formal employment rates in the first year after release are low, ranging anywhere from 40 to 64 percent (Pettit and Lyons 2009; Sabol 2007; Tyler and Kling 2007), and these numbers do not capture duration and stability. A reentry study that interviewed individuals at three and eight months after release found that only 10 percent were employed in the formal sector at both interviews (Visher and Kachnowski 2007). And qualitative studies describe the struggles that individuals encounter at reentry to find and maintain long-term work, as well as the presence of temporary jobs (Harding et al. 2014; Western et al. 2015).

Reentering individuals face barriers to employment that are not only challenging for poor, low-skilled jobseekers generally (e.g., spatial segregation, changing industries, few resources for job search, little schooling) but that are also specific to criminal justice involvement. They are excluded from certain professions (Stafford 2006) and experience severe stigma related to their criminal record and incarceration (Holzer, Raphael, and Stoll 2006; Pager 2007; Pager, Western, and Bonikowski 2009; Stoll and Bushway 2008). The reentry period is also a time of uncertainty, instability, and hardships, even apart from employment, in which people often must reconnect with family and friends, locate stable housing, and address health and addiction issues.

In other ways, however, the focus on prison and reentry is not an unusual experience among the contemporary poor, and particularly, among minority men (Western 2006). With the expansion of U.S. incarceration rates over the past several decades, reentry has become a common life experience among already disadvantaged groups. At yearend 2015, over 1.5 million individuals were incarcerated in prison, and in that same year, over 640,000 people were released from prison and returned to their communities (Carson and Anderson 2016). The annual number of people who leave prison does not capture the cumulative risk of ever experiencing prison and reentry, as well as their concentration among men, racial/ethnic minorities, and those with low educational attainment. By ages 30 to 34, an estimated 68 percent of black/African-American men with less than a high school

degree will have been to prison (Pettit 2012). These rates are closely connected to geographic place, where areas of concentrated disadvantage have high rates of incarceration and reentry (Sampson and Loeffler 2010). For poor minority men, and particularly those who live in highly disadvantaged areas, the experiences of incarceration and reentry are common.

**Heterogeneity in search and work**

Although I suggest that foraging is broadly applicable to those at the bottom of the labor market, there are good reasons to expect that search and work experiences are heterogeneous. In the formal labor market, a wide range of contextual factors affect employment—e.g., the strength and characteristics of markets, geographic patterning of opportunities, and local transportation systems (Peck and Theodore 2007; Sabol 2007). At the individual level, certain characteristics—e.g., demographics, previous employment, criminal justice history, and post-incarceration situations—all might account for differential ability to find and maintain work. For example, the stigma of a criminal record presents a significant barrier for jobseekers at reentry; however, for black and Hispanic men, in particular, the intersection of race/ethnicity and criminal justice contact elicit strong employer aversion (Pager 2007; Pager et al. 2009). Another potentially important factor is age. Older individuals often fare poorly in the labor market post-release (Nelson, Deess, and Allen 1999; Visher et al. 2010; Western et al. 2015), due to more entrenched problems with substance use, mental health issues, and difficulty

handling the physical requirements of manual labor positions. At the same time, however, older individuals may be more likely to persist with job search because of increased commitment to finding work and an internal change away from criminal activity (Maruna and Toch 2005; Uggen et al. 2005).

How might these factors affect job search and work among marginalized jobseekers? On the one hand, individuals with high barriers to formal labor market work (e.g., those with poor post-release circumstances, racial/ethnic minorities, and older jobseekers) may quickly cease searching for work and rely on foraging as a survival tactic. In this framework, frustration and discouragement mediates search persistence over time, where jobseekers disadvantaged in the labor market repeatedly encounter rejection and eventually stop looking for work (Krueger and Mueller 2011; Young 2012). Indeed, discouragement has been proposed as a primary explanation for job search exit and joblessness at reentry (Pager 2007). In addition to job search exit, individuals that encounter high barriers to formal work may be more likely to increase their job search breadth across a range of occupational and job types (Pager and Pedulla 2015), in order to increase their odds of obtaining any type of work. These individuals might cast a broader net—either in the formal labor market or among day-to-day temporary jobs (consistent with the foraging concept)—compared to more competitive applicants.

On the other hand, however, jobseekers recently released from prison may be excluded from the labor market to such a degree that these factors

make little difference to search and work (see Raphael and Weiman 2007; Sabol 2007). Although a small qualitative study found that some post-release factors (such as lack of social support, substance use, and mental health issues) are related to sporadic employment (Harding et al. 2014), the salience of these factors in larger samples has been mixed (Visher and Kachnowski 2007), indicating that typical labor market disadvantages may not clearly correspond to employment outcomes for marginalized workers.

## DATA, MEASURES, AND METHODS

To study daily search and work, I use data from the Newark Smartphone Reentry Project (NSRP), which sampled participants from a complete census of eligible men on parole released from prison to Newark, New Jersey between April 2012 and April 2013. Men were eligible to participate if they were recently released from prison, neither gang-identified nor convicted of a sex offense, searching for work, and conversationally proficient in English.[3] Limiting the sample to those that planned to search for work excluded few individuals, such as those with severe mental or physical health constraints and those that planned to enroll in school full time. Most individuals, even if they intended to go to school or apply for disability benefits, also anticipated searching for work. To identify participants, parole officers contacted those potentially eligible to meet with the researcher about the project. Of the 152 individuals contacted, 135 people agreed to

[3] The sample did not include individuals identified as active gang members or convicted of a sex offense, who are supervised by a separate division within the Newark parole office. The research team did not include a Spanish-language speaker, which limited participation from non-English speakers.

participate in the study (or 89 percent). A comparison of participants with those who were not contacted and who declined participation suggests that these groups are similar (see Appendix Table A1). In this study, I restrict the analysis sample to 133 individuals, which excludes two individuals (1.5 percent) that did not complete smartphone surveys.

The setting of Newark, New Jersey is an important context for the study of work as foraging. Newark is a disadvantaged urban center compared to the rest of the state, as well as the country. In 2012, at the start of participant recruitment, the Newark unemployment rate was 13.8 percent, as compared to 9.4 percent for the state and 8.1 percent across the United States. Although Newark's labor market may be particularly challenging to find work, the city's high rate of unemployment, history of deindustrialization, and predominately minority residential population are similar to other locales with high rates of crime and imprisonment.

NSRP individuals participated in an initial, semi-structured interview, received a smartphone with a data collection application, and received smartphone surveys for three months. At the end of the study, participants completed a final interview and were allowed to keep the phones. Throughout the study, participants received a service plan, as well as weekly gift cards for completing at least 75 percent of the smartphone surveys. Seventy percent of participants completed all parts of the study. Among those that exited the study early, average participation was still quite long (over 9 weeks) and many participants continued to send information by the

12th week of the study even if they did not complete the final interview. A comparison of demographics, criminal justice histories, and post-release job search and work experiences among those that did and did not complete the project found no significant differences between groups (see Appendix Table A2). Overall, the retention rate was comparably high for most reentry studies,[4] since individuals are a particularly difficult group to follow and reentry is a very unstable context.

Daily search and work experiences were collected in real-time from smartphone surveys. Surveys were sent to participants twice a day. The first survey ("experience sampling survey") was sent at a random time between 9am and 6pm, and asked about specific activities occurring at that moment. The second survey ("daily survey") was sent at 7pm daily and asked about activities for that day (see Appendix B for abbreviated survey questions). Although the use of frequent surveys raises questions about survey fatigue,[5] real-time data offer several advantages to study work as foraging. First, smartphone surveys capture different types of self-reported work, including off-the-books and entrepreneurial jobs. This is a unique aspect among employment research, and particularly reentry studies, which often use

[4] A month-long study of reentering individuals in New York City had a 56 percent completion rate (Nelson et al. 1999), and a multi-city study followed up with 60 percent of the sample at only two time points after release (Visher et al. 2010; but see Western et al. 2015 and Harding et al. 2014 for exceptions).

[5] Frequent surveys over time could result in survey fatigue, where respondents choose answers based on their expectations about the number of additional follow up questions. I made several modifications to the survey questions to help prevent survey fatigue from influencing answer choices. First, the experience sampling survey and the daily survey were both very brief (one minute and between three to four minutes, respectively) to reduce participant burden. Second, there were follow up questions to both "yes" and "no" answer choices about search and work to reduce the perception that one answer was more advantageous time-wise (see Appendix B).

administrative records. When studies do ask about employment, questions typically either exclude temporary and informal jobs or use broad measures (e.g., “currently employed” or “ever employed”), which are unable to capture fluctuations over time. Second, real-time collection of information helps prevent bias associated with retrospective reports. Retrospective reports are often influenced by people’s current feelings and conditions, and intermittent experiences, such as irregular search and work, are especially difficult to remember accurately (Stone et al. 2007; Torelli and Trivellato 1993). Third, information is collected repeatedly for the same person over time, permitting a systematic accounting of longitudinal experiences. This data format—i.e., copious amount of data per person for relatively small samples, or “intensive longitudinal data”—is often a feature of smartphone studies (Walls and Schafer 2005). These data are neither “quantitative” nor “qualitative;” instead, they exist in a middle ground, offering new tools and vantage points. In the case of employment at reentry, this in-depth study of daily search and work complements reentry survey studies that consider large numbers of people at few time points (Visher et al. 2008; Visher et al. 2010).

There are two characteristics, in particular, of the data collection approach that must be considered in the analysis and interpretation of findings. First, it is possible that smartphones and frequent surveys influence search and work patterns. I return to this issue and its implications in the discussion section; however, a comparison of recidivism outcomes for

the NSRP sample, those not contacted about the study, and those that declined to participate suggests that the study design did not have a measurable impact on future arrest or incarceration (see Appendix Table A1). Second, the intensive longitudinal format is associated with higher rates of missing data on any given day. In the NSRP, information is collected for 8,176 days (of a total possible of 11,970 days), which is based on 6,713 daily and 6,527 experience-sampling surveys.[6] Seventeen percent of days are missing information due to right censoring, or when a person leaves the study. The other missing days (accounting for 15 percent of total days) are intermittently dispersed among observed days. Days with missing information are directly modeled as separate states in most analyses, and I describe this approach in more detail below.

**Measures**

Job search and work. These measures come from the smartphone surveys. If a person both searched and worked on the same day, they are coded as working. A person who did neither of these activities is coded as neither searching nor working (abbreviated as "nsw"). The measures of search and work are coded as daily experiences as opposed to events such as starting or ending a job. It is often not clear when a job ends because many individuals work on an as-needed basis. Similarly, it is not always clear when a job begins, and participants often reported job offers even though the work did not ultimately materialize. Even among jobs that have

[6] Two participants lost their phones partway through the study and information on their daily activities was collected via interviews every two weeks for the remainder of the project.

clear start and end dates, the number of days worked by week or by month can vary substantially. Individuals may also work several jobs at once, where each contributes only a few hours of employment per week. All of these considerations emphasize the inadequacy of broad measures of "employed" or "unemployed" to study work irregularity among marginalized jobseekers.

Types of work. Work is grouped into eight categories: construction, delivery/driver, maintenance, restaurant, retail/sales, warehouse, other, and unknown.[7] Participants who reported working on the daily survey were asked a follow-up question about the type of work that they did. They were provided with the above seven choices and an "other" category with an open text box, which asked them to specify the type of job. These open-text box answers were reviewed and in some cases, recoded as one of the main six categories above.

Demographics and reentry characteristics. Information on a variety of demographic and post-release characteristics is used in some analyses. Participants were asked questions about their age, race, education level, relationship status, and number of children at the initial interview.[8] They

[7] Information on type of work was not collected for some days and is coded as "unknown." Due to the design of the smartphone questions, participants who reported working on the experience sampling survey were not asked the follow-up question about type of work. If they did not complete a daily survey later that day, type of work was unknown (12 percent of working days). In some cases, information was recovered in the final interviews (for approximately 60 percent of missing days). For less than 5 percent of the total working days, type of work remains unknown, either because the person did not complete a final interview (approximately 2 percent) or because the person could not remember the type of work (approximately 3 percent).

[8] Two cases, which were missing information for children and recent stay, were replaced with sample means.

were also asked about their health in the past 12 months (on a scale from 1 to 5, where 1 is excellent and 5 is poor), whether they have ever been diagnosed by a mental health professional as having a mental health condition, and whether they were living in a shelter at reentry. A scale of perceived social support (modified from the Fragile Families and Child Wellbeing survey) was also asked in the initial interview and is the sum of the following five questions: *if you needed assistance during the next three months, could you count on someone to: loan you $200? Loan you $1000? Provide you with a place to live? Help you get around if you needed a ride? Help you when you're sick?* ($\alpha$ = .67).

Pre-incarceration characteristics. Information on previous formal labor market experience was collected in the initial interview. Criminal justice history was obtained through administrative records, which were provided by the New Jersey Parole Board. The records include information on arrests, convictions, and incarcerations in the state of New Jersey.

**Methods**

To study daily patterns of job search and work, I employ a sequence analysis (SA) approach. SA is not a particular analytic method, such as linear regression or event history analysis; rather, it is a more general approach to study the ordering of events or states over time (Abbott 1995; Cornwell 2015). As opposed to event history analysis, SA methods are not primarily concerned with reasons for changes between states (Aisenbrey and Fasang 2010), such as whether a change in X is related to a change in Y. Rather,

they are descriptive approaches that consider an entire pattern of events over time. As Stovel and Bolan write, “The identification of patterns of social processes over time, which is a unique strength of sequence analysis, is an important precondition that often receives little attention, before turning to the question of which mechanisms produce them” (quoted in Aisenbrey and Fasang 2010:423). In this article, I use SA to study how days searching and working unfold over time and how search and work relate to each other.[9] The analyses were conducted in TraMineR in R (Gabadinho et al. 2011).

In the first section, I describe search and work patterns for the sample overall. I graph the proportion of states—i.e., working, searching, and nsw—that are inhabited by individuals at each day over the project period. This “state distribution plot” provides a descriptive overview of daily search and work trajectories by illustrating how events (and their ordering) are related over time. In the general population, for example, we would expect to find large amounts of time initially spent searching, which decrease over time as more and more people find employment. Instead, as the findings will show, among marginalized jobseekers, changes in search patterns do not align with increases in work and the prevalence of work does not increase over time. Although the trajectories themselves contain missing information, the state distribution plots exclude missing states; in later analyses, I directly model missing data as separate states.

[9] The use of SA methods to study a trajectory of working days (i.e., daily states that we typically think of as outcomes) is less common than the use of SA to study processes leading to or proceeding from an outcome.

In addition to the state distribution plot, I document job types and transition rates for the sample overall. Transition rates assess day-to-day stability by describing the proportion of days that are followed by a same state or a different state, such as the proportion of working days that are followed by another, second day of work. A person who works consistently Monday through Friday has a transition rate of 80 percent given an initial state of working, since the following four of five days are also spent working. Transition rates lower than this benchmark suggest greater day-to-day volatility. In the case of work as foraging, transition rates provide estimates of instability and irregularity, in which high rates of change between different states indicate a lack of day-to-day routine. For example, even if individuals work only a week or two over the study period, the nature of this employment and its implications are different depending on its distribution over time—e.g., do people work in short concentrated "bursts" or are working days dispersed irregularly, scattered across time? This distinction is important, since the latter scenario is experienced as greater day-to-day volatility. In addition to assessing instability across days, transition rates also reflect relationships between different states. For example, we might expect to see a close relationship—or high rates of transition—between search and work, at least among the general population, where search pays off with subsequent work.

Descriptive information for the entire sample describes average search and work patterns; however, it conceals heterogeneity among individuals. It

is likely that certain individuals—e.g., those with fewer labor market barriers or those who are older and more committed to finding formal labor market work— have markedly different search and work patterns. In the second part of the analyses, I take advantage of the detailed search and work measures to define different groups of patterns using cluster analyses. These sequence comparison methods, which model missing days as a distinct state,[10] are described in Appendix C. As opposed to grouping individuals based on *a priori* hypotheses, cluster analyses define groups based on people's observed sequences; in this case, groups are based on an optimal matching with empirical costs (OMEC) assignment and Ward's linkage criteria (Ward Jr. 1963), which produces a cophenetic coefficient of 0.79 (which is within the range of acceptable concordance) (Romesburg 1984). I examine differences in job types, work stability, and participant characteristics across these different groups.

In the third section, I illustrate people's day-to-day patterns of search, work, and job types by focusing on daily sequences for specific individuals in each of the patterns identified in the second section. This analysis complements the aggregated findings of the prior sections by presenting

[10] With missing days as a distinct state of "missingness," there are four possible states: searching, working, neither searching nor working, and missing. Other common approaches for handling missing data for sequence comparisons are deletion, in which missing states are deleted from the sequence, and imputation, in which missing states are imputed based on other information from the sequence (often from information from states adjacent to the missing state) (Cornwell 2015; Halpin 2013). An advantage of modeling missing days as separate states is that it preserves timing of observed states and does not make assumptions about missingness based on adjacent states; this is particularly important for analyzing irregular patterns. The limitation of this approach is that it considers missing observations as the same state (i.e., "missing"), even though the missing day was, in fact, one of three states (even if unobserved).

individual trajectories of frequency, regularity, and type of work obtained at reentry. As opposed to patterns documented in the preceding sections, which reflect both patterns within individual trajectories and across individuals, focusing on individual patterns illustrates how characteristics related to work and type of job are distributed over time for individuals. I find that foraging—or extreme instability in working days across different types of jobs—characterizes experiences across heterogeneous search and work patterns.

**RESULTS**

I first present the distribution of states across all participants over time (Figure 1). As the figure shows, people initially spend about 40 percent of their days searching for employment, about ten percent of days working, and the remaining time neither searching nor working. As time passes, slightly more people spend their days working but search quickly decreases, as more and more time is spent neither searching nor working. After six weeks, about 20 percent of time is spent working and the majority of time is spent neither searching nor working. These patterns of search and work are notable for several reasons. First, they show that people spend some time searching for work, at least initially. Although this may seem unsurprising, it is not necessarily the case that people would spend time on job search, particularly if they expect to be unsuccessful in the formal labor market (Apel and Sweeten 2010; Nelson et al. 1999; Visher and Kachnowski 2007). Second, the plot shows that time spent on job search decreases fairly quickly

over time. Spending only a month or two on job search is a short amount of time, even for those without high barriers to employment. Third, the plot illustrates how decreases in search do not coincide with comparable increases in work, which would be a typical understanding of the relationship between job search and work over time. Rather, the proportion of working days remains low, which suggests that people leave the labor market without much consequence to the amount of work that they find.

FIGURE 1 ABOUT HERE

Table 1 presents descriptive statistics about search and work patterns for the sample overall (see column 1). As the table shows, nearly all people searched for work and worked at least one day (92 and 73 percent, respectively). However, work was very irregular, as only about half of people (48 percent) ever worked at least two consecutive days in a row, and only one-quarter of the sample ever worked at least four consecutive days.

Irregularity of search and work is also assessed with transition rates, or the percent of states that lead to the same state or a different one the following day. There are several findings to highlight. First, the highest rates of transition occur between days spent neither searching nor working (75 percent), suggesting that people generally remain out of job search, as opposed to moving back and forth between search and nsw. Second, the transition rate between working days is low (58 percent) compared to the rate associated with a Monday through Friday schedule (80 percent). This indicates that the probability of working a second day is substantially lower

(about three-quarters) compared to people with regular work schedules. Third, there is no clear connection between days searching and days working. Indeed, search days are not more likely to result in work as compared to nsw days (6 percent compared to 8 percent, respectively). Taking together these descriptives and the state distribution plot, work is very irregular, without much change over time and without a clear connection to job search activities.

TABLE 1 ABOUT HERE

Looking to types of jobs worked by the sample overall, there is diversity that spans across the low wage market (see Figure 2). Warehouse jobs were the most common, accounting for more than one-quarter of total working days (27 percent). Construction (15 percent), retail (13 percent) and maintenance (12 percent) were also common. Delivery and driver jobs accounted for 9 percent of working days. Restaurant jobs, including fast food, were relatively rare (6 percent) even though they are often discussed among low wage workers (Crutchfield and Pitchford 1997; Kalleberg 2011). Importantly, the second most common type of job category, following warehouse work, was “other” (15 percent). This catchall category is comprised of office work (22 percent), waste management (20 percent), and caregiver positions, including daycare, childcare, and eldercare (20 percent). Other types of jobs included moving (8 percent), telemarketing (6 percent), and car mechanic (6 percent), as well as a range of miscellaneous jobs such

as snow shoveling, Hurricane Sandy cleanup, yard cleaning, security, carnival concession stand, and ride operator.

FIGURE 2 ABOUT HERE

**Heterogeneity in search and work**

The above section describes patterns for the sample overall; however, certain individuals (e.g., those more advantaged in the labor market) are likely to have different search and work trajectories. In this section, I present five typologies of patterns, which are based on sequence comparison methods. As Figure 3 displays, the most common typology, which characterizes 47 percent of the sample (n=62), is “early exit” from search. These individuals search initially but quickly lessen their efforts and conduct few search activities after the first month. Notably, individuals in this group do work, but at a very low level, throughout the three months. The second group is “early exit with low response” (n=19, or 14 percent). Because missing data are directly modeled as a separate state, this second group exhibits a trajectory similar to the early exit pattern but has higher amounts of missing data on any given day. This second group also reports sporadic work throughout the three months. The patterns of the third “recurring work” group (n=12, or 9 percent) are very different from the former two groups, with high rates of work over time. These individuals find work relatively quickly and work more regularly over the study period. The fourth “ persistent search” group (n=11, or 8 percent) is also quite different. These individuals sustain comparably high levels of job search throughout the

entire period with relatively few work experiences. Finally, the fifth pattern can be considered a "low response" pattern (n=29, or 22 percent) where higher levels of missing data characterize patterns and are truncated early due to sample attrition.[11]

FIGURE 3 ABOUT HERE

Table 1 (columns 2-6) assesses work irregularity— one of the main components of foraging—across groups. Similar to the sample overall, there are high rates of any search and work across most groups; however, differences quickly become apparent when looking at finer-grained search and work measures of duration and transition. In particular, the recurring work pattern has more consistent employment over time compared to the other groups. All of the recurring work individuals have at least five consecutive days of work and a comparably high working-to-working transition rate (73 percent). This rate is still lower than that of a steady Monday to Friday schedule (80 percent), which indicates that the recurring work group still experiences more day-to-day work irregularity compared to those with regular jobs. Individuals in the persistent search pattern also depart from the full sample in notable ways. They have lower rates of any work, fewer consecutive days working, and a lower working-to-working transition rate compared to the early exit and recurring work groups. The

[11] Recidivism is one possible explanation for higher amounts of missing data for the "early exit with low response" and the "low response" groups. To assess this, I compared dates of study participation with dates of arrest. None of the participants in the early exit with low response group experienced an arrest during the study period. Three participants in the low response group were arrested within the study period and based on the arrest dates, arrest likely contributed to their study non-completion.

persistent search group, then, has high rates of labor market participation in terms of searching but much lower and more irregular days working compared to the other groups. Overall, these characteristics indicate that work is irregular and sporadic for all groups, although to very different degrees.

Consistent with foraging, job types span across the low wage market for all groups, with a few notable differences (see Figure 4). First, warehouse jobs are common for all pattern typologies except for persistent searchers. Indeed, no individuals in the persistent search group worked any days in a warehouse job. Rather, persistent searchers, when they do obtain work, often find construction and "other" jobs. Warehouse work has a reputation for being physically demanding and low paid, factors that contribute to either self-selection out of these jobs or employer discrimination against older workers (or both). Second, retail jobs are most common among the recurring work group. Although retail jobs are not typically considered options for low-skilled minority men, these jobs may be the most promising types of employment, in terms of providing more consistent work opportunities. Overall, although there are some differences across groups, types of jobs are diverse and heterogeneous.

FIGURE 4 ABOUT HERE

Given the literature on job search and employment, we might expect that the reasons for different search and work patterns reflect labor market advantage, in which groups that remain in the labor market (i.e., the

recurring work and persistent search groups) are better positioned to obtain employment. However, this does not appear to be the case (see columns 2-6, Table 2). The recurring work group is not more advantaged in either the labor market or in the reentry context; for example, they have lower levels of educational attainment (half have not finished high school) and lower rates of previous formal labor market experience compared to other groups. They also have higher rates of shelter residence (17 percent) and prior felony convictions (92 percent). The persistent search group is also not obviously more advantaged compared to the other groups. Individuals who persistently search for work are about 10 years older, on average, compared to other participants. They also have lower rates of car access (9 percent compared to 31 percent among the early exit group) and high rates of shelter residence (18 percent). Although all of the persistent searchers have held at least one formal labor market job in the past, this experience may be a function of their older age. Interestingly, the early exit group has the lowest rates of shelter residence at reentry, compared to the other groups, which could indicate that they experience the least pressure to quickly find work after prison.

TABLE 2 ABOUT HERE

Taken together, the findings in this section point to substantial heterogeneity in job search and work patterns at reentry. Although the majority ceases job search relatively quickly and maintains a state of very sporadic work, some individuals do find more consistent work and other

individuals persistently search for work without much success. It is notable that the individuals who search and work more consistently are not more advantaged in the labor market, based on a variety of observed characteristics, compared to the early exit group. It is also important that even across these groups—and in spite of very different patterns—work remains irregular over time and spans across job types. In other words, foraging is evident across all groups, although to varying degrees.

**Individual patterns of job search and work**

This final section describes daily patterns of job search and work for individuals, selected from the early exit, recurring work, and persistent search groups. These cases illustrate how the aggregated analyses above—e.g., the state distribution plots, the transition rates, and the search and work typologies—correspond to individual day-to-day experiences and trajectories.

Figure 5 displays daily experiences of search, work, and nsw for individuals in (a) the early exit pattern, (b) the recurring work pattern, and (c) the persistent search pattern. As panel (a) shows, the individual in the early exit pattern worked a variety of different jobs over the three months with little evidence of progress in finding consistent work. Initially, in the first week, this individual searched for work two days and worked one day as a delivery/driver. Three days later, he worked again as a delivery/driver. The following day, he worked at a warehouse job. About a week later, he worked

for a printing company for four days (not consecutively). After another two weeks, he worked for the printing company for a fifth day, and soon after, worked as a delivery/driver for two days (again, not consecutively). Near the end of his second month, he worked one day at a warehouse job and then shoveled snow for two days.

FIGURE 5 ABOUT HERE

Panel (b) displays daily patterns for an individual in the recurring work pattern. This individual worked a series of different jobs throughout the first month, ranging from construction to sanitation to maintenance to carnival worker. By the beginning of the second month, he started work at a maintenance job. Although he continued working this job throughout the rest of the study period, there is no discernible pattern in terms of the number of consecutive days that he worked and those that he did not work, suggesting a frequent but irregular work schedule.

Panel (c) describes daily patterns for an individual in the persistent search pattern. As the figure shows, this individual worked several different types of jobs within the first month, ranging from deck assembly (one day) to landscaping (three consecutive days) to painting (two consecutive days). In the second month, he worked one day for waste management and another day as a mover. Close to the end of the third month, he worked one day in a landscaping job. Throughout this entire period, he frequently searched for work (on average, 45 percent of days).

The day-to-day patterns, combined with the aggregate analyses of the previous sections, illustrate several key findings. First, most people work multiple types of very short-term jobs. Excluding those that report only one or two days of work over the study period (21 percent), 58 percent of the remaining individuals report working several different types of jobs. This pattern of obtaining jobs that span across job types and skill sets is distinct from working multiple jobs within the same industry or occupation. Although many individuals worked several temporary jobs within the same type of work, the majority switched from one type of work to another, shifting across a spectrum of very temporary jobs. Second, the patterns of job search, work, and nsw over time are generally haphazard and irregular. There is no clear trajectory based on what we might typically expect in the job search literature among more advantaged jobseekers—e.g., a distinct period of job search followed by work. Rather, sequences show day-to-day movement across the states of working, searching, and nsw. Working days do not clearly follow searching days; rather, a working day is just as likely (if not more) to follow a non-searching/non-working day as a searching day for most people. Although the recurring work and persistent search groups show more stability in day-to-day labor market participation, all of the groups exhibit irregular work patterns across a range of job types.

## DISCUSSION

When faced with few job prospects and numerous barriers to regular work, marginalized jobseekers find sporadic opportunities that span a range of job types in order to make ends meet. This day-to-day experience of work is akin to foraging, where individuals take up diverse opportunities, such as shoveling snow, working in a warehouse, or operating rides at a seasonal carnival, as they arise. This study focused on a group of jobseekers that confront particularly high obstacles to employment—racial/ethnic minority men recently released from prison in a disadvantaged labor market—although prior qualitative research also documents short-term work among poor men and women more generally (Edin and Lein 1997; Edin et al. 2002; Edin and Nelson 2001; Edin and Shaefer 2015; Fader 2013; Venkatesh 2006). This article extends this scholarship by documenting the extent, consistency, and nature of irregular work over time in a systematic way. This is not only a methodological contribution of using real-time information from smartphones; rather, the approach uncovers a previously unrecognized prevalence and depth of work instability that requires a different conceptualization of work. The findings, which I summarize below, have implications for theory and policy that contrast with typical understandings of labor force participation.

First, most individuals spent time searching for work; however, those activities were short-lived and many stopped formally looking for work after the first month, instead relying on foraging work to make ends meet. Individuals who exhibited this pattern were not measurably disadvantaged in

the labor market compared to other groups, suggesting that they did not face more severe obstacles to finding work. Instead, this pattern of experiences—e.g., high rates of initial search that quickly cease—may reflect changes in post-release optimism, where individuals are generally hopeful about their chances for finding work after release (Visher and O'Connell 2012) but reorient expectations and behaviors after encountering frustrations and disappointments. Future research that investigates the reasons for this pattern—short-lived job search activities and foraging work—is important for both scholarly and policy purposes. From a policy perspective, exit from job search after several weeks (as opposed to months) suggests that the critical window of time to support job search is very short. For comparison, studies of UI-recipients find that job search persists over many months (and often, over years for the long-term unemployed) (e.g., Krueger and Mueller 2011). The findings documented here suggest that policy interventions need to target the very immediate period after initiating search to better support search persistence among the hard-to-employ.

Second, reductions in search did not coincide with comparable increases in employment. Rather, individuals ceased looking for work and instead found foraging work that was not clearly connected to formal search activities. This pattern of findings—and specifically, early exit from job search while foraging—suggests that most individuals did not obtain work through typical job search channels, such as submitting job applications for regular jobs or seeking help from employment resource centers. Instead,

although speculative, individuals may have relied on their social contacts and networks for foraging jobs, even if they were less likely to depend on friends and family for connections to regular jobs (Smith 2007).

Third, although early exit from the labor market was the dominant pattern of search and work, there were distinctly different experiences. A minority of people found work more regularly (although this work was still less consistent than regular jobs). These individuals were not obviously more advantaged in the labor market compared to the other groups based on demographic, post-release, and pre-release characteristics. One interpretation of this finding is that those in the recurring work pattern were more willing to take on poorer quality work. Indeed, a comparison of open-ended answers at the initial interview about perceived strengths and weaknesses aligns with this possibility. When asked, "What do you think are your main strengths for finding work?," none of the recurring work individuals volunteered that they would be a competitive applicant (while 21 percent of the early exit individuals stated something to this effect). Moreover, when asked to assess in real-time how satisfied they were with their hours, pay, and work overall, people in the recurring work group gave the lowest ratings across all three categories, compared to people in the other four groups.[12] Taken together, it appears that individuals who found

[12] If work was reported on the daily survey, individuals were asked three follow-up questions about their satisfaction with hours, pay, and work overall (see Appendix B). On a 100-point sliding scale, where larger values indicate greater satisfaction, the mean responses for individuals in the recurring work group were 55, 52, and 69, respectively (compared to 74, 65, and 72 for the early exit group and 64, 73, and 84 for the persistent search group).

more consistent work were not more advantaged in the labor market—either in terms of their characteristics or based on their self-perceptions—and correspondingly, the work they found was poor in terms of their hours, wages, and perceived quality.

Another important, albeit small, group of individuals persistently searched for work. These persistent searchers, who were comparably older, appeared more committed to job search, perhaps because they were able to maintain optimism about their labor market chances (Visher and O'Connell 2012), they had experienced an internal change toward conventional labor market activities (Maruna and Toch 2005) or they perceived greater long-term costs of exiting job search compared to their younger counterparts (Uggen et al. 2005). However, this group was rarely able to translate search persistence into work—regular jobs and even, foraging work. Apart from their age (which may have disadvantaged them in low-skill jobs that require manual labor), other post-release circumstances (e.g., not having access to transportation) may have hindered their ability to obtain jobs. Prior scholarship has found that older individuals are the most likely to benefit from temporary jobs through transitional jobs programs (Uggen 2000). Taken all together, these findings provide a strong argument for targeting employment resources (e.g., transitional jobs, transportation subsidies) to older individuals who are committed to searching for work but unable to find labor market success on their own.

The findings from this paper must be considered within the specific study context. The NSRP was located in a particularly disadvantaged urban center, where the disappearance of regular work may be felt more acutely among marginalized workers. The project also followed a group of low-skilled minority men after release from prison. Although incarceration has become a normative experience among some groups, jobseekers with criminal records face very high and multifaceted barriers to employment. Moreover, at the time of the study (2012-2013), New Jersey did not yet have a "Ban the Box" policy. Ban the Box, or the requirement that employers delay inquiring about criminal records until after the initial employment stage (usually after the job application stage), would presumably reduce barriers for jobseekers early in the application process (although see Apel 2017 for a recent discussion). Given these circumstances, regular employment is a very high bar to reach. I suggest that foraging may be particularly prevalent among groups with acute barriers to labor market participation and in disadvantaged labor market contexts; future research that investigates these differences is needed.

There are also several considerations related to the study methods. First, the NSRP distributed smartphones and frequent surveys, in order to collect daily information on search and work. Smartphones are new data collection tools, and there are unresolved questions about how phones and surveys may change self-reported measures, either due to behavioral changes or social desirability bias. In both of these cases, the approach

would most likely increase days searching or working. Although I am unable to definitively assess these concerns with these data, there are reasons to suspect that this potential "treatment" did not measurably impact patterns. First, a comparison of recidivism outcomes for the participants, those that were not contacted about the study, and those that declined participation suggests that the study did not measurably improve outcomes, at least regarding recidivism (see Appendix Table A1). Second, the findings suggest that job search and work were sporadic and irregular; in other words, were the measures of job search and/or work positively affected by the project methods, then the findings represent a more optimistic account of search and work. If jobseekers actually cease their search efforts earlier and work fewer days than documented here, work would look even more unstable and sporadic.

A second consideration is that some respondents had higher levels of missing data on any particular day, resulting in search and work patterns characterized by lower responses. Although it is possible that information is missing at random, where participants simply did not hear the survey prompts, larger amounts of missing data may also be related to employment or criminal activity. If the former, the number of individuals in the recurring work pattern would be larger than that reported here. If the latter, individuals may be finding more income opportunities than documented here, but through illicit activities. Although the NSRP did not collect information on illicit work, underground activities are likely important

complements to foraging. I suggest that illicit work is one resource among a diverse, but constrained, set of foraging opportunities, and future research would help differentiate among these income sources.

Third, the project covered the first three months after release from prison. Although the immediate months after release are considered a critical window for reentry integration efforts (Redcross et al. 2012), search and work trajectories would likely look different considering a longer time frame. This is particularly the case if individuals postpone their search because they need time to get readjusted to non-institutional life or if they need to obtain proper identification to pursue formal labor market opportunities. Although these may be considerations for some, I suggest that these were not issues for most individuals.[13]

Several of the above issues relate to the newness of collecting real-time information from smartphones. These issues deserve thoughtful and deliberate consideration, concurrent to recognizing the strengths of smartphones for studying social experience in certain contexts. The intensive longitudinal data format falls somewhere between in-depth qualitative methods and large survey approaches; these aspects position

[13] When asked about their perceived advantages and disadvantages for job search, only 11 participants (or 8 percent) stated that not having a driver's license or other identification would be a disadvantage. In addition, 17 participants (or 13 percent) stated that they needed time to reintegrate to life on the outside before starting to search. However, despite these statements, smartphone answers suggest that the most common trajectory was not postponing search but instead, actively searching for the first few weeks and then curtailing activities. Although it is uncertain whether a longer timeframe would reveal an uptake in search at a later date, it is likely that a longer time frame would show different trajectories among the persistent search individuals. It is difficult to imagine, for instance, that individuals in the persistent search pattern would be able to maintain the frequency of job search activities observed here over an extended time period.

them well to develop, interrogate, and organize the types of theoretical frameworks and explanations that are typically uncovered by ethnographies and interviews. For research on irregular and changeable experiences, such as employment among those at the margins of the labor market, smartphone methods are particularly well suited to provide insight on questions that are difficult to study using surveys, retrospective accounts, and administrative data. They are also particularly advantageous to study micro social processes over time, which are often difficult to systematically document using the available social science toolkit. Moreover, because of their convenience and ubiquity, these methods could help better access groups that are often hard-to-reach and excluded from more traditional survey approaches (Pettit 2012; Sugie *Forthcoming*).

The analysis of real-time data documents the degree of irregularity, instability, and variability among marginalized jobseekers navigating a labor market in which work has disappeared. The foraging nature of work looks very different from prior accounts of high quality employment, which offered financial benefits, stability, and personal fulfillment (Laub and Sampson 2003). Indeed, the characteristics of foraging are directly at odds with the reasons we value work and employment. Instead of providing resources and benefits, foraging for work may actually exacerbate poor outcomes. Indeed, most if not all criminology theories would point to foraging as criminogenic, in that it contributes to irregular schedules, it likely exacerbates strain, and it likely prevents investment in societal bonds. The instability and irregularity

inherent in foraging may also worsen mental health and hinder involvement in parenting, family, and other domains critical to social integration (Crutchfield 2014; Edin et al. 2002; Kalleberg 2011; Zatz and Boris 2014). Although we typically view work as an aspect of social integration (Western et al. 2015), foraging may be the exception; rather, persistent job search—e.g., the daily structure of conducting a job search and commitment to labor force participation—may actually be more akin to the benefits of work among marginalized jobseekers.

## APPENDIX A – Sample

TABLE A1 ABOUT HERE

TABLE A2 ABOUT HERE

## APPENDIX B – Smartphone Survey Questions

The questions listed below relate to the search and work questions, as well as proximate follow-up questions, used in the analyses.

### Experience Sampling Survey

- What are you doing right now? (check all that apply, scroll down for more choices)
  - Working
  - Searching for work
    - How are you searching right now?
  - [Any choices other than work or search, e.g., Household chores, Waiting, Walking/on a bus/going somewhere, Hanging out/Watching TV, etc.]
    - Do you currently have a health issue that prevents you from searching?

### Daily Survey

- Did you work for pay today?
  - Yes
    - How satisfied are you with your hours?
    - How satisfied are you with your pay?
    - How satisfied are you with your work overall?
    - Is this a new job?
  - No
    - What were the reasons you didn't work for pay today?
- Did you search for work today?
  - Yes
    - What time did you start searching?
    - About how many minutes did you spend searching?
    - How did you look for work?
    - Where did you search for work?
  - No
    - What were the reasons you didn't search for work today?

- Do you have a health issue that prevents you from searching?

## APPENDIX C - Sequence Comparisons

The method to differentiate search and work patterns into groups depends on several factors. First, sequences are assessed in terms of how dissimilar they are from one another. Dissimilarity depends on the assignment of costs for actions—typically insertions, deletions, and substitutions of states—that change sequences to be more or less distant from each other (see Blanchard, Buhlmann, and Gauthier 2014; Cornwell 2015). Cost assignment based on optimal matching methods (OM) are most often associated with sequence analysis (Abbott and Forrest 1986; Elzinga 2007), and give the same cost assignment for insertions, deletions, and substitutions of states. Although there are many other cost schemes, other common metrics are OM with empirical costs (OMEC) and longest common subsequence (LCS). In OMEC, substitution costs are determined by calculating observed transition rates from one state to another. By defining costs based on observed transition rates, where rare transition rates are more costly than frequent transitions, the cost structure is empirically-derived as opposed to arbitrary. In LCS, similarity is based on subsequences, or patterns of states within a sequence, rather than the presence and timing of individual states (as in OM and OMEC). See Table C1 for an illustration of two NSRP sequences and their costs using OMEC.

TABLE C1 ABOUT HERE

Once distances between individual sequences are assessed, distances among groups of sequences are estimated. To do this, I use a hierarchical cluster approach and test two linkage variations. First, I estimate groups using Ward's linkage (Ward Jr., 1963), which aims to minimize variation within clusters and is the most commonly used linkage method in sequence analysis (Cornwell 2015). Second, I use a weighted average linkage, which calculates distances between groups as the average of the closest and furthest members of the clusters and weights the average by the size of the clusters. The combination of cost structures (e.g., OM, OMEC, and LCS) and linkage criteria (e.g., Ward and weighted average) produce different groupings. To choose the appropriate combination, I calculate cophenetic correlations, which evaluate how well the dissimilarity matrices produced by the cost structures correspond to the linkage-based clusters (see Table C2). According to the cophenetic correlation coefficients, OMEC with the Ward linkage produces the highest validity ($c = 0.79$), and is within the range of satisfactory concordance (Romesburg 1984).

TABLE C2 ABOUT HERE

A final consideration is the number of clusters. Clusters are useful if they aggregate complex data to conceptually meaningful groupings. Although there is no set rule to determine the number of clusters, there are several approaches that provide guidance. These include a dendrogram of clusters (where clusters are represented by vertical lines, see Figure C1), the "elbow" approach (or an assessment of where the dissimilarity threshold

begins to flatten), and a variety of cluster quality statistics (such as the Calinski-Harabasz Index) (for a discussion of these different approaches, see Cornwell 2015). These methods can lead to different conclusions. For example, in the NSRP data, the elbow approach suggests 2 to 3 clusters, the Calinski-Harabasz Index suggests 2 clusters, and Hubert's C suggests 5 clusters. Although 2 to 3 clusters may represent the largest jumps in the dissimilarity threshold, smaller levels of aggregation reveal conceptually distinct patterns. Cornwell (2015) advises that the choice of clusters should ultimately depend on whether the cluster solution represents meaningful and differentiated groupings. To that end, I considered the state distribution plots of the agglomeration tree (see Figure C2). Five clusters separate out the "persistent searching" pattern from the "early exit" pattern, which is a conceptually salient distinction. Six clusters further disaggregate the "early exit" pattern into two groups—one that appears to have fewer days of work and search as compared to the other group. Although moving from 5 to 6 clusters reveals this interesting distinction, these differences are subtle compared to the differences in patterns when moving from 4 to 5 clusters. Consequently, I report results based on 5 clusters, where cost structure is determined by OMEC and the distance criteria is defined by Ward's linkage.

FIGURE C1 ABOUT HERE

FIGURE C2 ABOUT HERE

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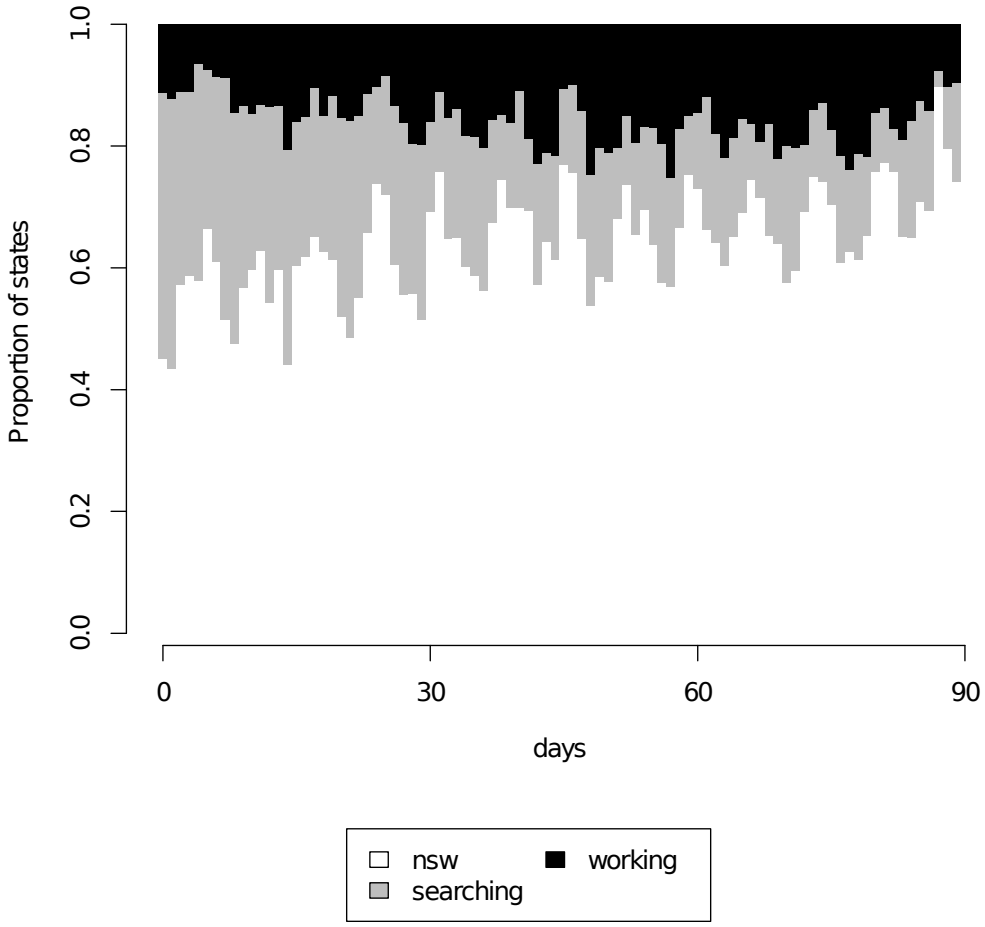
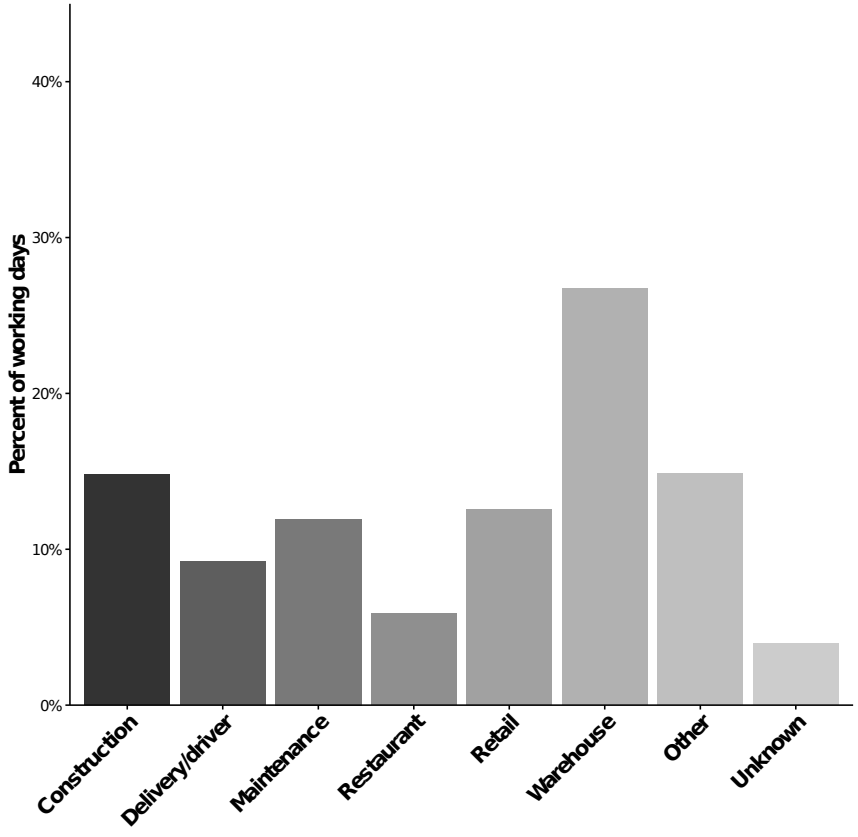
**FIGURE 1: Distribution of daily states, n=133**



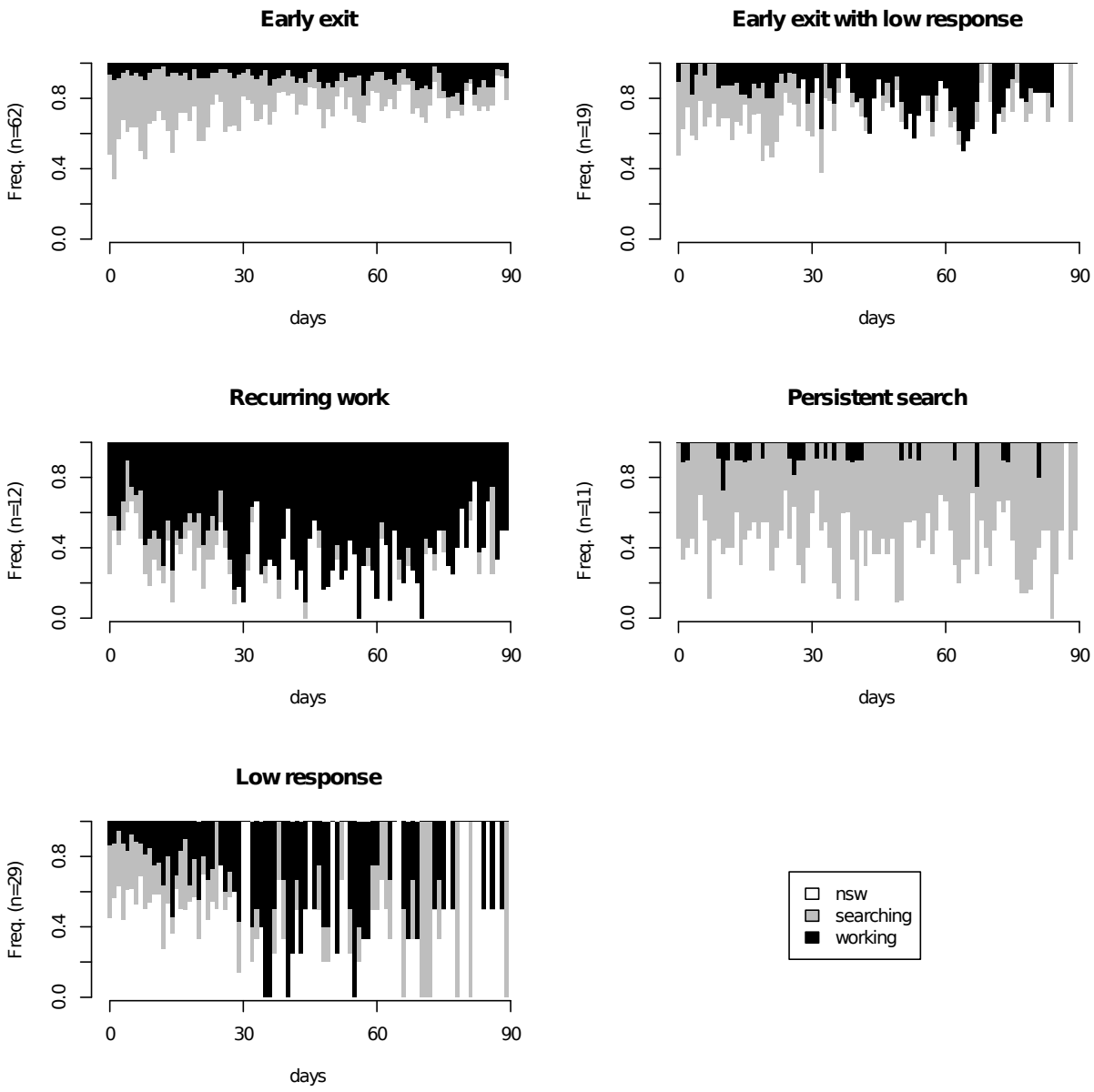

*Note: Individuals that report that they neither searched for work nor worked are coded as "nsw."*

**FIGURE 2: Types of jobs among total working days**




*Notes: The number of total working days is 1,290, which corresponds to 97 individuals (of 133 total individuals).*

**FIGURE 3: State distributions by search and work patterns, n=133**




*Note: Individuals that report that they neither searched for work nor worked are coded as "nsw."*

**FIGURE 4: Types of jobs by search and work patterns**

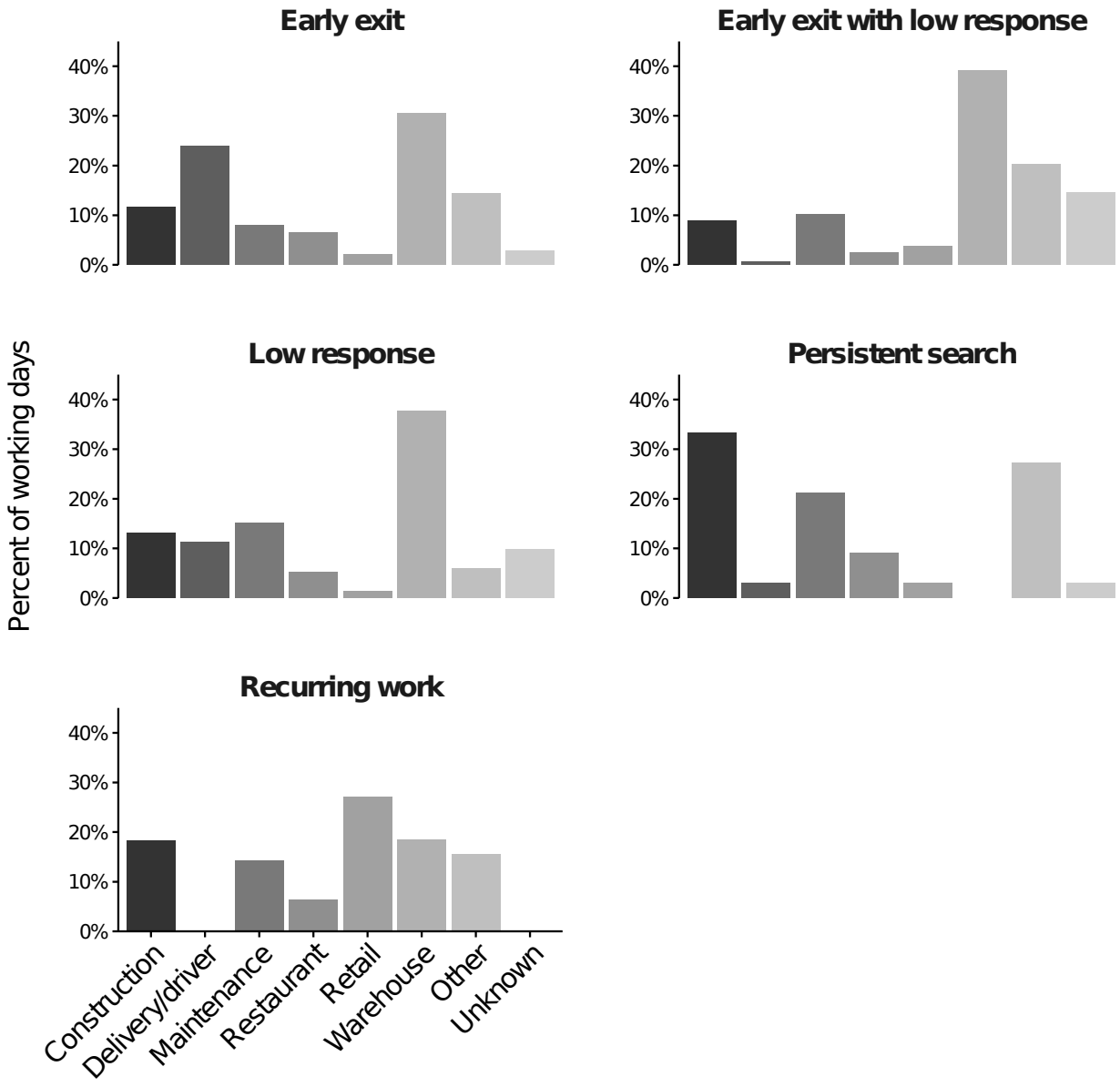
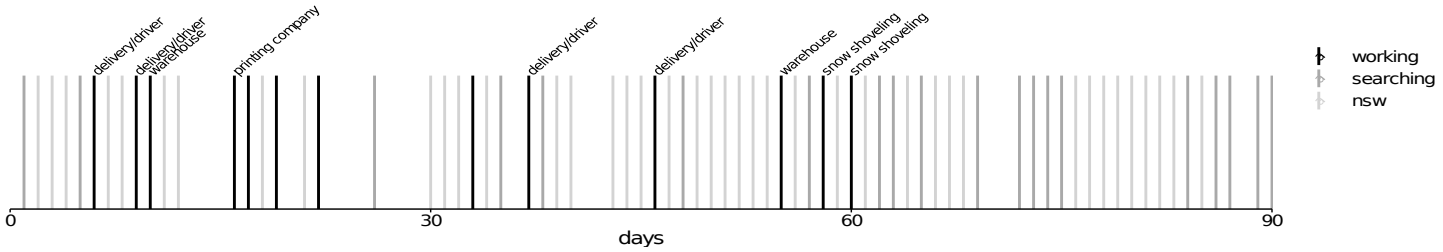
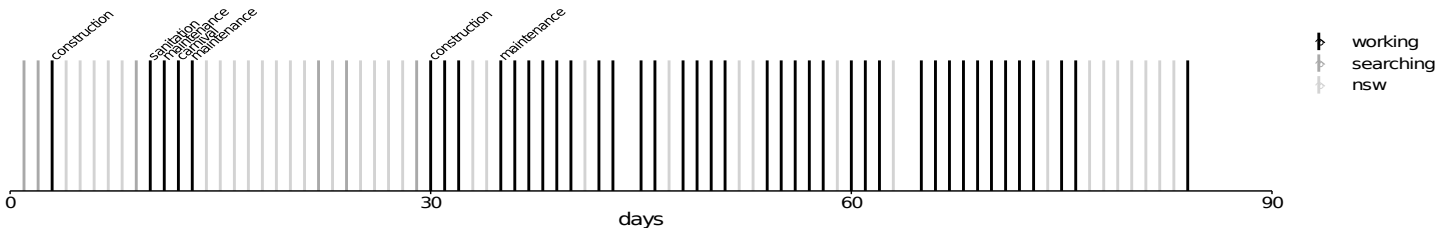


**FIGURE 5: Daily patterns of job search and work by pattern**

**(a) Individual in the early exit pattern**



## (b) Individual in the recurring work pattern



## (c) Individual in the persistent search pattern

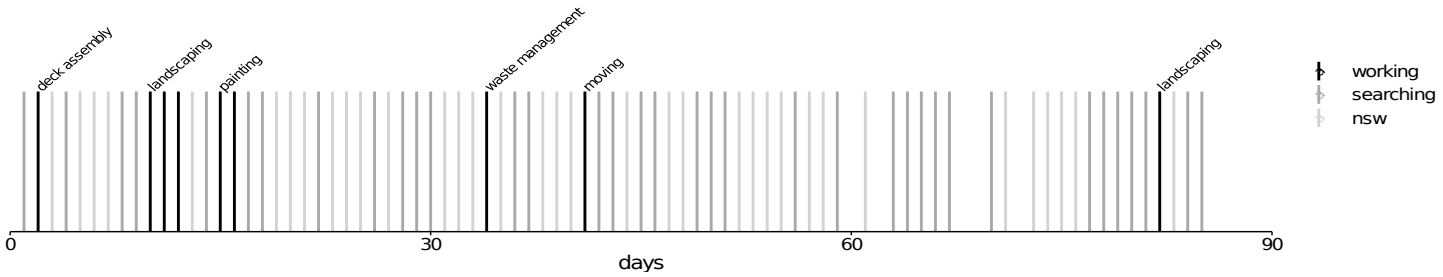


**TABLE 1: Search and work patterns for full sample and by pattern typology, n=133**

| | | Job search and work patterns | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Full sample | Early exit | Early exit with low response | Recurring work | Persistent search | Low response |
| Any search | 92.48 | 98.39 | 94.74 | 83.33 | 100.00 | 79.31 |
| Any work | 72.93 | 74.19 | 78.95 | 100.00 | 63.64 | 58.62 |
| Consecutive days working (at least): | | | | | | |
| Two | 48.12 | 46.77 | 42.11 | 100.00 | 18.18 | 37.93 |
| Three | 33.83 | 25.81 | 36.84 | 100.00 | 18.18 | 27.59 |
| Four | 24.81 | 17.74 | 26.32 | 100.00 | 0.00 | 17.24 |
| Five or more | 18.80 | 14.52 | 10.53 | 100.00 | 0.00 | 6.90 |
| Transition rates (initial to subsequent): | | | | | | |
| Neither searching nor working -->Neither searching nor working | 75.41 | 79.86 | 77.26 | 48.89 | 54.77 | 66.11 |
| Neither searching nor working -->Searching | 16.20 | 14.47 | 12.45 | 10.82 | 41.85 | 20.56 |
| Neither searching nor working -->Working | 8.39 | 5.67 | 10.29 | 40.30 | 3.38 | 13.33 |
| Searching -->Neither searching nor working | 47.95 | 53.85 | 61.07 | 28.99 | 34.71 | 45.00 |
| Searching -->Searching | 46.44 | 42.68 | 30.53 | 33.33 | 61.65 | 47.50 |
| Searching -->Working | 5.61 | 3.46 | 8.40 | 37.68 | 3.64 | 7.50 |
| Working -->Neither searching nor working | 36.34 | 48.21 | 52.10 | 24.79 | 36.36 | 25.27 |
| Working -->Searching | 5.77 | 6.15 | 5.88 | 2.31 | 45.45 | 7.69 |
| Working -->Working | 57.89 | 45.64 | 42.02 | 72.90 | 18.18 | 67.03 |
| N (number of people) | 133 | 62 | 19 | 12 | 11 | 29 |

Notes: patterns are based on 8,176 days

## TABLE 2: Descriptive characteristics for full sample and by pattern typology, n=133

| | | | Job search and work patterns | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | | (6) | | |
| | Full sample | | Early exit | | Early exit with low response | | Recurring work | | Persistent search | | | Low response | | |
| | Mean/% | SD | Mean/% | SD | Mean/% | SD | Mean/% | SD | Mean/% | SD | | Mean/% | SD | |
| *Post-incarceration characteristics* | | | | | | | | | | | | | | |
| Age | 35.87 | (10.02) | 35.69 | (10.08) | 31.42 | (6.44) | 33.83 | (10.29) | 45.45 | (9.75) | ** | 36.38 | (9.92) | |
| Black | 90.98% | | 91.94% | | 94.74% | | 83.33% | | 90.91% | | | 89.66% | | |
| Education | | | | | | | | | | | | | | |
| Less than HS | 29.32% | | 27.42% | | 15.79% | | 50.00% | | 36.36% | | | 31.03% | | |
| HS graduate/GED | 45.11% | | 45.16% | | 63.16% | | 33.33% | | 18.18% | | | 48.28% | | |
| Some college | 23.31% | | 22.58% | | 21.05% | | 16.67% | | 45.45% | | | 20.69% | | |
| College | 2.26% | | 4.84% | | 0.00% | | 0.00% | | 0.00% | | | 0.00% | | |
| Relationship status | | | | | | | | | | | | | | |
| Single | 47.37% | | 48.39% | | 42.11% | | 33.33% | | 54.55% | | | 51.72% | | |
| Married | 5.26% | | 6.45% | | 0.00% | | 0.00% | | 9.09% | | | 6.90% | | |
| Partner | 47.37% | | 45.16% | | 57.89% | | 66.67% | | 36.36% | | | 41.38% | | |
| Total children | 1.55 | (1.46) | 1.61 | (1.46) | 1.16 | (1.12) | 1.25 | (0.75) | 2.45 | (2.02) | | 1.47 | (1.55) | |
| Social support scale | 4.02 | (1.18) | 3.95 | (1.18) | 4.00 | (1.41) | 4.17 | (1.27) | 3.82 | (1.54) | | 4.21 | (0.82) | |
| Self-reported health | 2.23 | (1.15) | 2.18 | (1.14) | 2.53 | (1.35) | 2.00 | (1.21) | 2.45 | (0.69) | | 2.17 | (1.20) | |
| Mental health diagnosis | 9.02% | | 8.06% | | 5.26% | | 8.33% | | 9.09% | | | 13.79% | | |
| Living in a shelter at reentry | 15.04% | | 9.68% | | 21.05% | | 16.67% | | 18.18% | | | 20.69% | | |
| Car access | 33.08% | | 30.65% | | 42.11% | | 33.33% | | 9.09% | | | 41.38% | | |
| Length of recent incarceration | 4.21 | (3.70) | 4.11 | (3.10) | 3.94 | (4.10) | 3.67 | (3.73) | 4.52 | (4.18) | | 4.70 | (4.53) | |
| *Pre-incarceration characteristics* | | | | | | | | | | | | | | |
| Any formal labor market job | 78.95% | | 80.65% | | 73.68% | | 58.33% | | 100.00% | | | 79.31% | | |
| Age at first incarceration | 24.18 | (6.60) | 24.70 | (6.62) | 21.24 | (4.53) | * 22.33 | (4.70) | 28.48 | (9.44) | | 24.12 | (6.41) | |
| Number of previous convictions | 6.00 | (4.13) | 5.48 | (3.58) | 5.42 | (3.20) | 7.17 | (6.37) | 7.73 | (4.52) | | 6.34 | (4.47) | |
| Number of previous incarcerations | 0.98 | (1.19) | 0.82 | (1.06) | 0.63 | (0.76) | 0.83 | (0.83) | 1.64 | (1.75) | * | 1.38 | (1.40) | * |
| Any felony conviction | 77.44% | | 74.19% | | 84.21% | | 91.67% | | 81.82% | | | 72.41% | | |
| N | 133 | | 62 | | 19 | | 12 | | 11 | | | 29 | | |

Notes: *p<0.05, **p<0.01, ***p<0.001; significance tests used individuals grouped in the early exit pattern as the reference group; type of tests are two independent samples t test for continuous and dichotomous variables, and Fisher's exact test for categorical variables (e.g., education and relationship status); patterns are based on 8,176 days.

**FIGURE C1: Dendrogram of clusters, n=133**

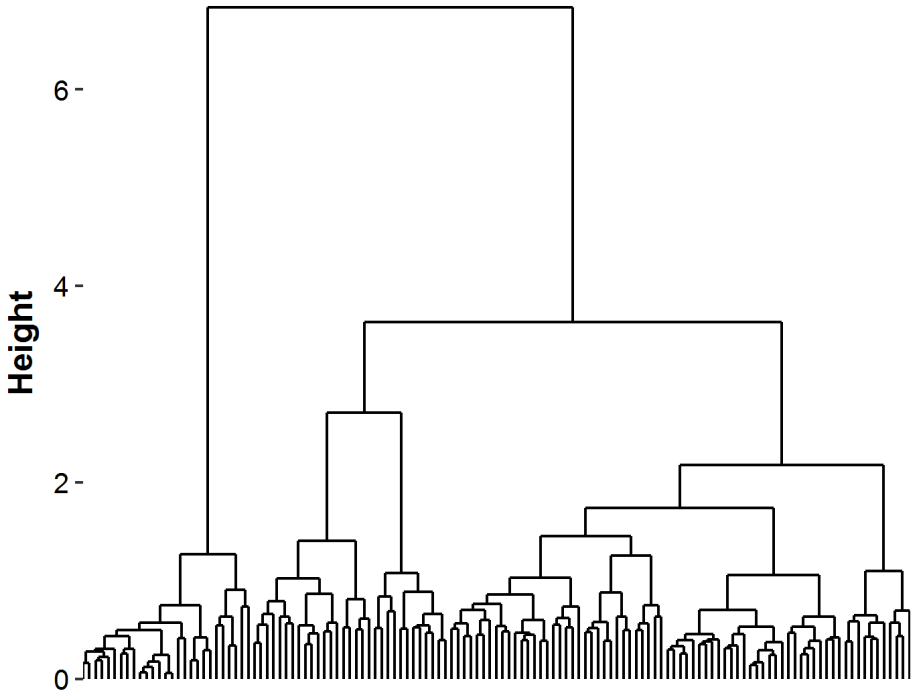


**FIGURE C2: State distribution plots of agglomeration tree, n=133**

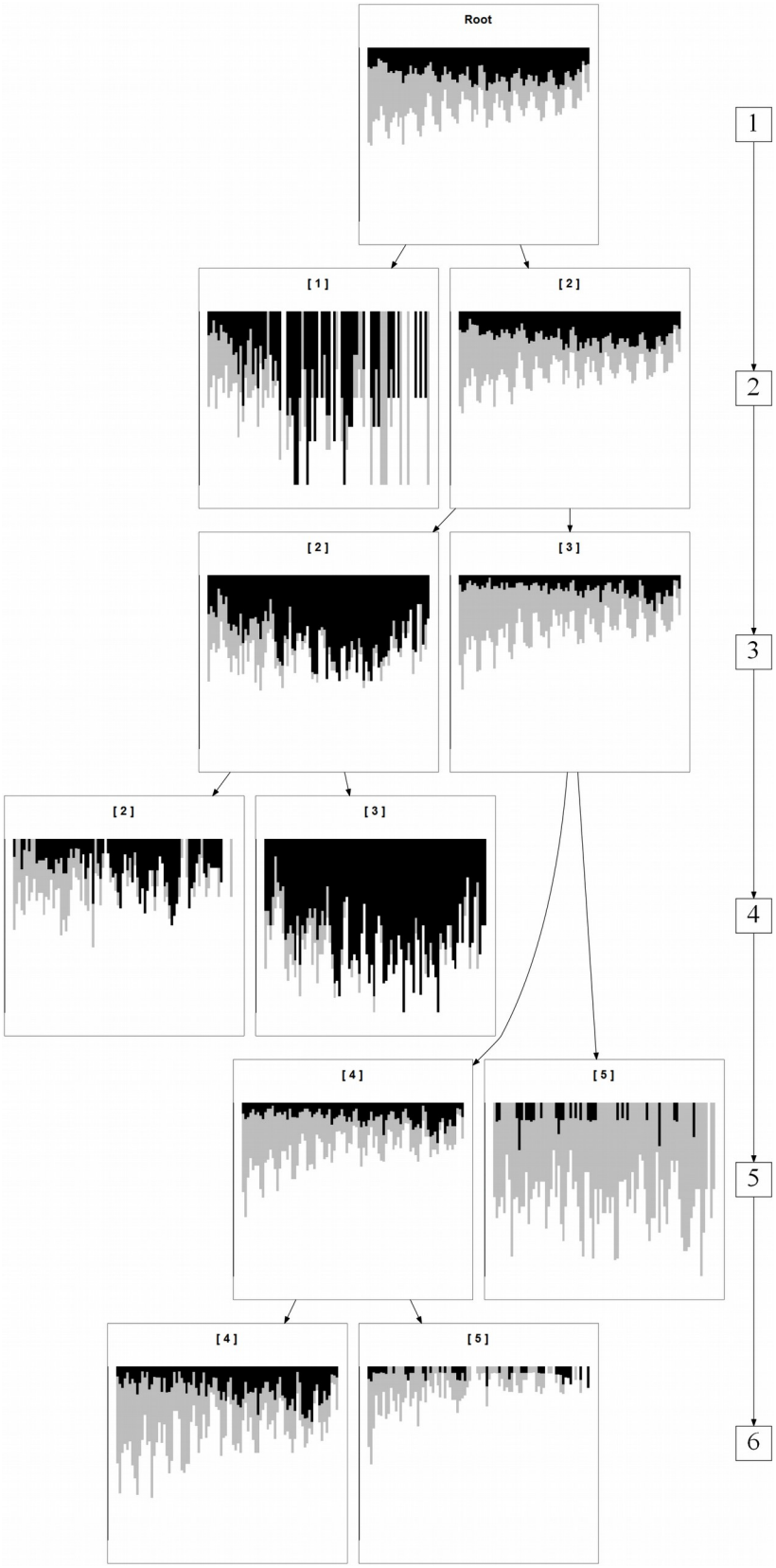


**TABLE A1: Descriptive statistics of NSRP participants, those not contacted, and those that declined participation**

| | Participants N=133 | | Not contacted N=64 | | Declined partici N=17 |
|---|---|---|---|---|---|
| | Mean/% | SD | Mean/% | SD | Mean/% |
| Age | 35.87 | (10.02) | 36.99 | (10.00) | 35.22 |
| Black | 90.98% | | 84.38% | | 94.12% |
| Number of previous convictions | 6.00 | (4.13) | 6.16 | (4.39) | 6.65 |
| Number of previous incarcerations | 0.98 | (1.19) | 1.13 | (1.35) | 1.00 |
| Any felony conviction | 77.44% | | 67.19% | | 70.59% |
| | | | | | |
| Recidivated | 32.33% | | 26.56% | | 29.41% |
| Average days until recidivism | 188.07 | (93.51) | 199.82 | (144.33) | 215.20 |

Notes: there are no significant differences among groups

**TABLE A2: Descriptive statistics of NSRP completers and non-completers**

| | Completed | | Did not complete | |
|---|---|---|---|---|
| | Mean/% | SD | Mean/% | SD |
| *Post-incarceration experiences - first week* | | | | |
| Job search (number of days) | 2.15 | (1.64) | 1.84 | (1.67) |
| Work (number of days) | 0.64 | (1.25) | 0.42 | (1.00) |
| *Post-incarceration characteristics* | | | | |
| Age | 36.39 | (10.45) | 34.58 | (8.86) |
| Black | 92.63% | | 86.84% | |
| Education | | | | |
| Less than HS | 27.37% | | 34.21% | |
| HS graduate/GED | 43.16% | | 50.00% | |
| Some college | 26.32% | | 15.79% | |
| College | 3.16% | | 0.00% | |
| Relationship status | | | | |
| Single | 48.42% | | 44.74% | |
| Married | 6.32% | | 2.63% | |
| Partner | 45.26% | | 52.63% | |
| Total children | 1.55 | (1.48) | 1.57 | (1.42) |
| Social support scale | 4.03 | (1.19) | 4.00 | (1.16) |
| Self-reported health | 2.28 | (1.15) | 2.11 | (1.18) |
| Mental health diagnosis | 7.37% | | 13.16% | |
| Living in a shelter at reentry | 14.74% | | 15.79% | |
| Length of recent incarceration | 4.35 | (3.54) | 3.84 | (4.09) |
| *Pre-incarceration characteristics* | | | | |
| Any formal labor market job | 80.00% | | 76.32% | |
| Age at first incarceration | 24.23 | (6.96) | 24.06 | (5.71) |
| Number of previous convictions | 5.97 | (4.28) | 6.08 | (3.79) |
| Number of previous incarcerations | 0.94 | (1.16) | 1.11 | (1.27) |
| Any felony conviction | 76.84% | | 78.95% | |
| N | 95 | | 38 | |

Notes: there are no significant differences between groups

**TABLE C1: Sequence alignment for two participants (first 15 days)**

| | Days | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Person 1 | S | | NSW | S | S | NSW | NSW | NSW | * | S | S | | NSW | NSW | NSW |
| Person 2 | S | W | NSW | | S | NSW | NSW | NSW | | S | S | W | W | W | NSW |
| | | | | | | | | | | | | | | | |
| Operation | | I | | D | | | | | D | | | I | S | S | |
| Cost | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1.61 | 1.61 | 0 |

Notes: Sequences are composed of states for searching ("S"), working ("W"), neither searching nor working("NSW"), and missing("*") . Operations are insertions ("I"), deletions ("D"), and substitutions("S"). Total distance for this subsequence is 7.22.

**TABLE C2: Cophenetic correlation coefficients, by linkage type**

| | Linkage Type | |
|---|---|---|
| | Ward | Weighted average |
| Optimal matching with constant costs | 0.72 | 0.72 |
| Optimal matching with empirical costs | 0.79 | 0.74 |
| Longest common subsequence | 0.72 | 0.78 |
| | | |
| N (people) | 133 | 133 |
| N (person-days) | 8176 | 8176 |