

Disentangling the Forces of Selection in the Age-crime Relationship

Yunmei Lu, Pennsylvania State University

Jason R. Thomas, Pennsylvania State University

Abstract

Literature addressing the age-crime relationship focuses on the aggregate level age-specific crime data without considering the individuals' life course experience. This observed pattern could also be viewed from a cohort perspective acknowledging incarceration and mortality that remove cohort members from the population at risk. Since longitudinal data with incarceration and mortality information of multiple cohorts is not available, we propose a simulation approach to tease out the selection effects from the desistance effect in the decline of the age-crime curve. By simulating the criminal justice experience of multiple cohort members and taking into account their incarceration histories and mortality probabilities, the current study assesses the sensitivity of the age-crime curve to the censoring effects of incarceration and mortality. Moreover, we also explore the potential impact of criminal justice policy changes (e.g., shortening the sentencing length) on the age-crime curve by altering simulation parameters and comparing different scenarios.

Introduction

Age-crime curves observed in cross-sectional data from western countries share a very similar shape—crime involvement increases with age among the adolescent age groups, reaches the peak among the young adults and then diminishes gradually with age after the peak (Hirschi and Gottfredson, 1983; Farrington, 1986; Blumstein & Cohen, 1987). Hirschi and Gottfredson (1983) claimed that the age distribution of crime is invariant across social and cultural conditions, and that age effects on crime cannot be accounted for by any variables in criminology. Offenders will desist from crime as they age, which is a general or universal process regardless of an individual offender's characteristics. In contrast, Sampson and Laub (2003) argued that an individual's desistance from crime should be understood from the life course perspective, taking into account the age-graded experiences, such as marriage, and recognizing the differences between individual trajectories. They highlighted the roles of mortality and incarceration as two issues that are often overlooked by researchers when studying the decline of the age crime curve.

Based on Sampson and Laub (2003)'s argument, the post-peak decline of the age-crime curve in the aggregate level data is driven by three forces: crime desistance, the incapacitation effect of incarceration and the excess mortality risk of offenders. Since longitudinal data with information on criminal justice experiences and mortality records of multiple cohorts are not available, the current study proposes simulation techniques to tease out the potential selection forces of incarceration and mortality in the aggregate level age-crime curve. By simulating individual criminal justice and survival trajectories based on parameters estimated from prior literature, our study tests the sensitivity of the age-crime curve to changes in simulation parameters and assesses the magnitude of selection effects due to incarceration and mortality.

Literature Review

The decline in criminal involvement with age is one of the most widely accepted propositions in the field of criminology (Quetelet, 1831; Steffensmeier et al., 1989). However, an intense debate has arisen around the universality of the age-crime relationship since Hirschi and Gottfredson proposed their age-crime invariant thesis in 1983. After comparing the aggregate age distribution of arrests across countries, races, and gender, Hirschi and Gottfredson (1983) concluded that the age distribution of crime is the same across different social and cultural conditions. A lack of self-control can explain an individual's propensity of offending at all ages

(Gottfredson and Hirschi, 1990). Based on this invariant thesis, the post-peak decline of the age-crime curve among the older age groups is a result of the universal desistance among all individuals.

Scholars who oppose the age-crime invariant thesis criticize the methodology employed in Hirschi and Gottfredson's analysis, and some of them find new evidence to illustrate variations in the age-crime relationship (Greenberg, 1985; Farrington, 1986; Steffensmeier et al., 1989). One of the most serious methodological challenges is that the thesis infers the individual level age-crime relationship from patterns observed in aggregate cross-sectional data (Sampson and Laub, 2003). Life course criminologists (Farrington, 2002; Sampson and Laub, 2003) argue that the age-crime relationship at the individual level can only be tested with longitudinal data measuring within-person change with age.

Literature from developmental and life course criminology suggests that an individual's offense trajectory is affected by different factors at different ages. Moffitt's (1993) typology of life-course persistent and adolescence-limited offenders is a typical developmental approach that opposes Hirschi and Gottfredson's invariant thesis. Sampson and Laub's (1993) age-graded theory of informal social control also suggests that there are age-graded "turning points," such as marriage, employment and military service, that are important for understanding the individual's involvement in crime and its relationship with age. The fundamental proposition of the life course and criminal career studies in the past two decades is that the age-crime relationship varies between individuals as their life course experiences are different. A large volume of life course studies in recent years have investigated the relationship between different life course events and an individual's desistance pattern (Sampson, Laub and Wimer, 2006; King, Massoglia and MacMillan, 2007; Tripodi, Kim and Bender, 2009). Nevertheless, desistance is only one part of the story in the decline of the age-crime curve among older age groups. Two additional life course experience that can incapacitate potential offenders from reoffending, namely, incarceration and mortality, are often overlooked in prior life course studies.

Incarceration

High-rate and serious offenders are disproportionately more likely to be incarcerated (Blumstein et al. 1986), so ignoring the experience of incarceration will lead to a false understanding of the desistance pattern in the age-crime curve. A study by Piquero et al. (2001)

using data from the California Youth Authority found significant changes in the population's desistance patterns after taking into account the incarceration time. The proportion of subjects on a desistance trajectory by their late 20s decreased from 92% to 72% of the sample after adding exposure time to the model. Sampson and Laub (2003) address this issue by using the Glueck Data to show that the age-crime curve remains stable after taking into account the number of days that an individual has been incarcerated each year to age 32. However, the sample size of the Glueck data is relatively small ($N = 500$) and incarceration information is only available up to age 32 (subjects were interviewed in the year of 1965), which is before the dramatic expansion of correctional systems beginning in the 1970s.

The past three decades have seen almost an eightfold increase in the size of incarcerated population in the country (Massoglia, 2008). Spending time in prison has now become a common part of the life course for certain groups in population, most notably, African Americans who drop out of high school (Pettit and Western, 2004). Black men face a 20 percent cumulative risk of incarceration by their early thirties and more than 60% of black males who dropped out of high schools went to prison. Literature on the collateral consequences of mass incarceration has explored how incarceration affects family (Lopooand Western, 2005; Turney and Wildman, 2013), health (Massoglia, 2008), employment (Pager, 2003) and democracy (Pettit, 2012), but little attention has been directed to how incarceration affects the age distribution of crime. With such a large amount of people in prisons or jails, the numbers of potential offenders on the streets is expected to be censored and the age-crime curve should be affected to certain degree by the selection effect of incarceration. Therefore, more exploration of this selection process is needed to understand how the mass incarceration in the contemporary era affects the age-crime relationship.

Mortality

As suggested by Robins and O'Neal (1958), taking mortality into account is crucial for differentiating individuals who desisted from crime as compared with those who have no criminal record due to death. The fact that criminal and deviant behaviors are related to high mortality risks is well documented in the demographic and health literature (Rogers, Hummer & Nam, 1999; Repo-Tiihonen, Virkkunen & Tiihonen, 2001; Binswanger et al., 2007). For example, heavy drug users are found to be more likely to have health problems and subject to

higher risks of death. Some individuals convicted of aggravated assault are gang members involved in relatively high levels of physical violence, which may increase their risk of death. Rogers et al. (1999) find a strong effect of mental and addictive disorders on mortality within the noninstitutionalized population. Repo-Tiihonen et al. (2001) report that criminal offenders who have antisocial personality disorder (ASPD) show a five- to nine-fold increase in the mortality rate compared with the general population. They also highlight the possible impact of the high death rate among young ASPD groups on the crime rate of the older age groups. In addition, research on incarceration and health suggests that the experience of incarceration can increase ex-inmates mortality risks (Binswanger et al., 2007). Sampson and Laub (2003) follow the subjects in the Gluecks' study to age 70 and find that 50% of men are dead by age 70 compared to less than 30% in the non-delinquent control group. Based on their finding that high-rate offenders die earlier, Sampson and Laub suggest that the idea of life-course-persistent offenders might lose much of its appeal because this group is selectively removed from the population through early death. To sum up, individuals' involvements in criminal activity is associated with a relatively high risk of death and this group of people will be removed from the population more rapidly than the non-delinquent population. The traditional interpretation of the aggregate age-crime curve without considering the censoring effects mortality among high-risk offenders is problematic.

Research Gap

Prior literature suggests a potential influence of incarceration and mortality on an individual's propensity to offend, but these two selection forces have received little attention in the age-crime relationship discussion. As shown in figure 1, the age-crime curve generated from the aggregate level data fails to acknowledge the individual differences in life course experiences of incarceration and mortality, so the decline of the curve is a result of multiple forces rather than a simple indication of desistance. Longitudinal data with detailed information on involvement with the criminal justice system and mortality records will be useful to tease out the effects of incarceration and mortality, but most of the currently available longitudinal data don't keep track of incarceration and mortality records. Moreover, the relatively short follow-up period of the longitudinal data with little information about older age groups cannot capture the full picture of how the age-crime curve declines. Sampson and Laub's follow-up of the Gluecks' study

(Sampson and Laub, 2003; Laub and Sampson, 2009) is the only work that recognizes both effects of incarceration and mortality in the age crime relationship. However, the cohort's experience with the criminal justice system occurs before the mass incarceration era, which limits the study's ability to accurately estimate the magnitude of the incarceration and mortality effects in the more recent decades. Considering the limitations of the available data, we employ simulation methods to explore the potential influence of these two selection forces.

[Insert Figure 1]

Current Study

The objective of the study is to understand how incarceration and mortality affect individuals' criminal offending, which influences the age distribution of crime at the aggregate level. By simulating the criminal justice contact experiences and mortality experiences of each individual in the population from age 18 to 54 and altering the simulation parameters for comparison of simulation scenarios, the current study tests the following four questions: 1) how will the age-crime curve change if we lower the average probabilities of being incarcerated; 2) how will the age-crime curve change if we shorten average incarceration length individuals serve in prisons or jails; 3) how sensitive is the age-crime curve to the recidivism parameters used in the simulation, and how does this relationship compare to changes associated with the incarceration parameters; 4) how does the age-crime curve change if there is no excess mortality experienced by offenders. The tests of the first two questions help us assess the possible consequences of relaxing the current mass incarceration policies. The third question helps us understand the magnitude of incapacitation effects (incarceration) compared to rehabilitation effects (reducing recidivism) on the age-crime curve. The final question will shed light on the magnitude of mortality's influence on the age-crime relationship.

Methodology

Increasing numbers of criminology studies have adopted computational modeling techniques such as simulations to address academic as well as policy issues. Several groups of researchers applied simulation methods to investigate the spatial and temporal characteristics of crime (Birks, Townsley and Steward, 2012; Brantingham et al., 2005; Johnson, 2008), Van Baal

(2004) used simulation methods to predict the impact of different configuration of sanctions on offenders, Short, Bertozzi, and Brantingham (2010) used simulation to explore how different types of hot-spot crime patterns are formed. Different from the traditional statistical and equation-based studies that make inferences about underlying mechanisms from the association between aggregate observations (Birks, Townsley and Stewart, 2012), the simulation method takes a generative bottom-up approach and tests the sufficiency of a potential mechanisms on generating the macro-level pattern. Many social systems are complex and lack of analytical solutions to correctly estimate the aggregate level system patterns (Epstein, 1999), simulations can allow researchers to construct their own social systems capturing main components but reducing the complexities. The criminal justice process from arrests to incarceration is complex and the currently available data don't have sufficient information for researchers to estimate the relationship between criminal justice responses and the age distribution of crime, simulation offers an alternative ways to explore how the manipulations of one of these criminal justice or mortality components of the system might affect the others.

Figure 2 illustrates the simulation process of the current study. The cohort members included in the simulation are males from age 18 to 54. Considering the gender differences in the criminal justice process (Steffensmeier, Ulmer and Kramer, 1998; Spohn, Gruhl and Welch, 1987) and the mortality risks (Case and Paxson, 2005), the current simulation simplifies the process by including males only. But simulations for female population can be generated by changing simulation parameters. We restrict the simulation to individuals between age 18 and 54 to avoid bringing in the complex process in juvenile justice system. As the primary interest of the current study is the decline of the age-crime curve rather than the age-onset of crime involvement and the involvement of crime usually decline from age 18-20, restricting the analysis to age 18 and 54 can simplify the simulation but still capture the full picture of the decline of the curve.

[Insert Figure 2 here]

Initial Population Estimates

The first step of the simulation is to estimate the age distribution of in the population based on their incarceration experience. Taking into account of the potential selection effects of incarceration, we start with three distinct groups of people with their age distribution estimated from the US Census 2000 and Bureau of Justice Statistics on the inmates' characteristics and prevalence of imprisonment (Beck, Karberg and Harrison, 2001; Bonczar, 2003). Figure 3 illustrates the estimated age distribution of the three distinct groups with different incarceration experiences. The percentage of people who are currently incarcerated increases rapidly among early twenties, remains constant for age groups between 20 to 35, and then starts to decline from age 35. In contrast to the currently incarcerated population, the percentage of formerly incarcerated population is low among the younger age groups but increases since age 35. It reaches the peak at age 45 and declines slightly among the older age groups. The age distribution of the people who have never been incarcerated remain stable across all age groups with some fluctuations among groups at age 20 to 30 and the groups older than 50.

[Insert Figure 3 here]

The age distribution of the three groups will be used as the starting point of the simulation at time 0. Every individual from each group will go through the simulation process by exposing them to the risks of being arrested, charged, convicted, incarcerated and survived before they reach time 1. The individual's age, previous experience of incarceration and the transition probabilities from one event to another will guide his path in the simulation. For individuals in group 1 at time 0, who have never been incarcerated, we make random draws from a binomial distribution to simulate the experience of being arrested at that age. If an individual is arrested, he will go through the criminal justice events until any of the processes select him out of the criminal justice system. Those individuals selected out at any of the criminal justice stages without reaching the event of incarceration will be diverted to the mortality risks exposure. Individuals who survive and remain un-incarcerated will be added to the group 1 at time 1, and start their simulation again for the subsequent year. For individuals in group 2 where people are currently incarcerated, the simulation keeps track of people's sentencing length and their age of release. Individuals will be released and moved to group 3 once they reach their age of release, while individuals who remains incarcerated will be exposed to mortality risks and will continue to be in group 2 at time 1. Individuals in group 3 have a very similar simulation pattern as individuals in group 1, but the transition

parameters for re-arrests, re-incarceration, incarceration length and mortality are different as the group 3 simulation takes into account the incarceration effects on these parameters.

As the simulation moves one year ahead, new 18-year-old cohort members of the three groups will be added into the simulation. The simulation will stop as the first 18-year-old cohort members turn age 54. The age distribution of arrest curves generated from this simulation will be used as a reference curve for comparisons with simulated age-arrest curves generated based on different transitional parameters.

The transition parameters are the key to the simulation, most of them are based on the official statistics (UCR and Bureau of Justice Statistics) or prior literature. Table 1 lists the sources and the information of transition probabilities of different events. Unfortunately, not all the criminal justice procedures receive as much research attention as sentencing and incarceration. Age-specific probabilities for charging and conviction is not available, and how incarceration experiences affect an individual's chances of being charged and convicted compared to people who have never been incarcerated is unknown. As a result, we simplify these two process and assume that incarceration experiences and age do not have significant effects on chances of individuals who are arrested to be charged and individuals who are charged to be convicted.

[Insert Table 1 here]

Assumptions

To make the simulation possible, there are several assumptions we need to make based on the limited information about the criminal justice process and mortality experiences in the real world. First of all, the age distributions of the population in the three groups and the transitional probabilities of different events are assumed to be stationary over time. Secondly, if people released from prison or jail don't recidivate within five years, we assume they will never recidivate in the rests of their life. The conventional follow-up period of the current recidivism studies usually lasts from 3 years to 5 years, so recidivism after the first five years of release is very rare and our current assumption about recidivism should be justified. Third, although the criminal justice process from arrest to sentencing takes longer than 12 months in some cases, we assume that the subsequent criminal justice procedures after arrest will be completed within the same year. Fourth, the incarceration transition and sentencing length estimates are obtained from studies based on sample in Pennsylvania and the mortality risks for

incarcerated individuals are estimated based on an inmate sample in Washington, we assume that the pattern observed in these two states is representative to the patterns of other states. Finally, we allow individuals to be arrested for multiple times in the same years, but we assume that the maximum number of arrests in the same year is five, which helps simplify our simulation process.

Findings

(Findings and conclusions of the study will be available in the presentation of PAA 2015 Session 99, the full paper will be available upon request. Apologize for the inconvenience.)

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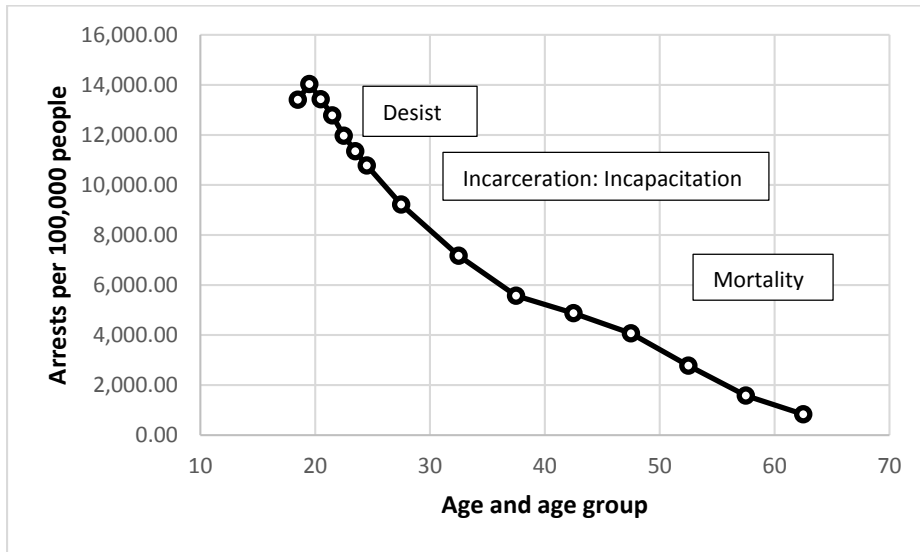
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Figure 1. Arrest rates by age for all offense, US Arrest Estimates age 18-54, 2000

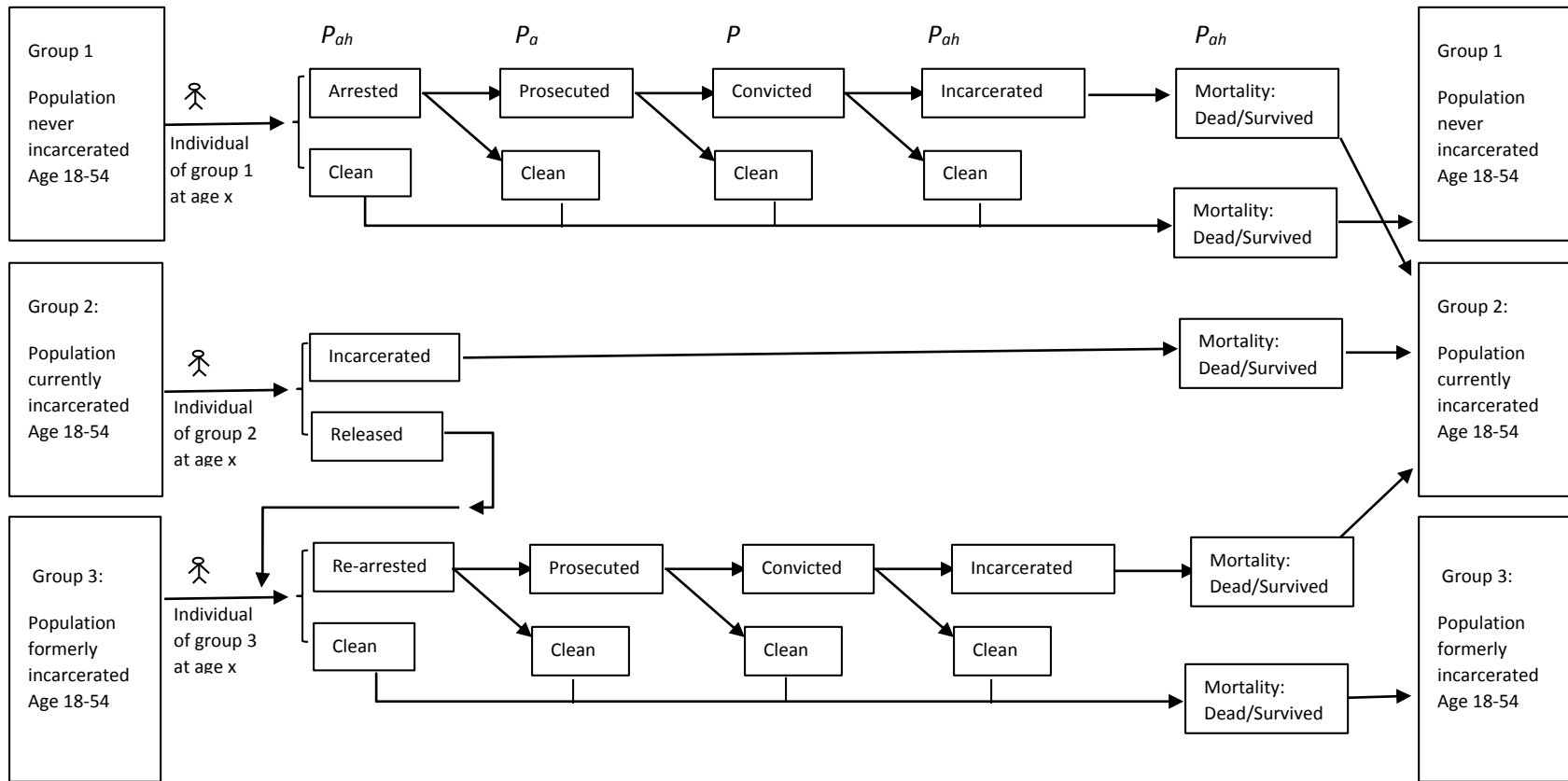


Source: Snyder, Howard N. and Mulako-Wangota, Joseph. Bureau of Justice Statistics. U.S. Arrest Estimates, Arrest rates by age for all offenders, 2000. Generated using the Arrest Data Analysis Tool at www.bjs.gov.

Figure 2. Simulation Process From Time 0 to Time 1

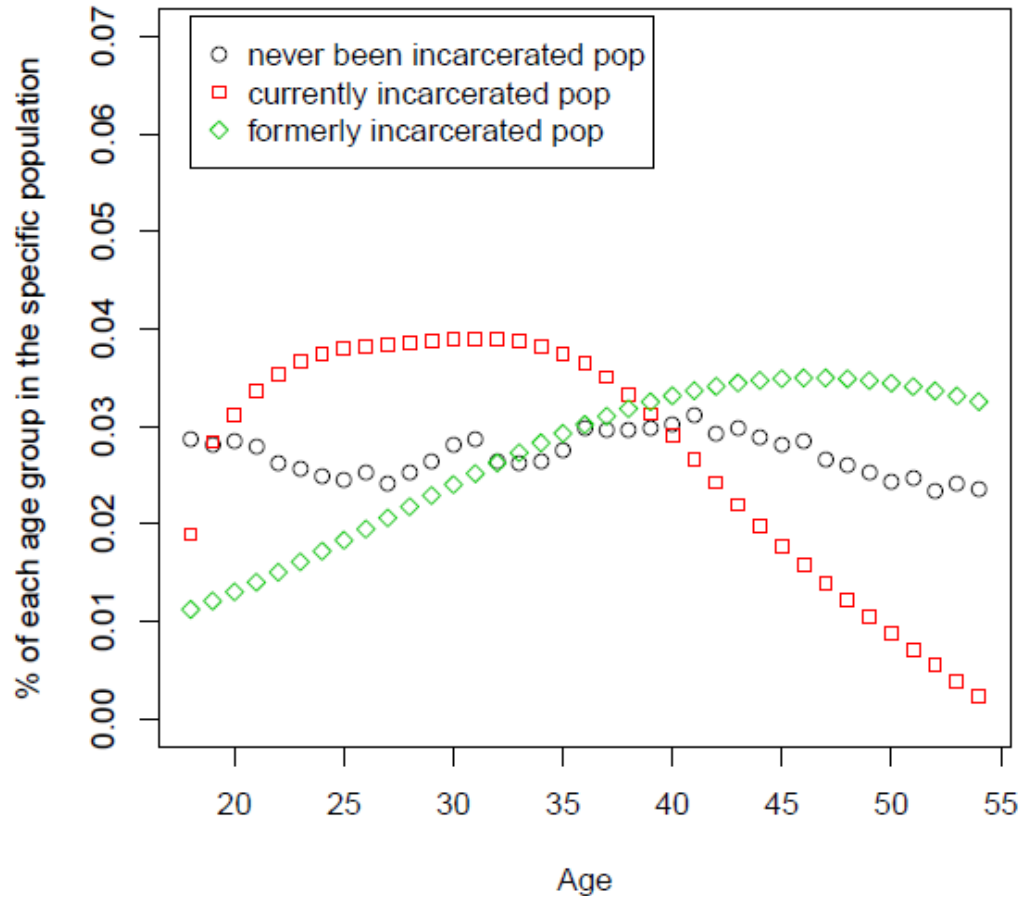
Time 0

Time 1



* P is an individual's transition probabilities between two experiences, subscript a indicates that the probability is age specific, and subscript h indicates the probability is criminal history specific (different probability for individual who have been incarcerated and who have never been incarcerated).

Figure 3. Age distribution of population subgroups, 2000



Sources:

US Census, 2000;

Bonczar, Thomas P. 2003. *Prevalence of Imprisonment in the U.S. Population, 1974–2001*.

Washington, DC: Bureau of Justice Statistics.

Beck, A. J., Karberg, J. C., & Harrison, P. M. (2001). *Prison and jail inmates at midyear 2001*.

Washington, DC: Bureau of Justice Statistics.

Table 1. Transition Probability Estimates and Sources

| Process | Transition Probability | Sources |
|------------------------------------|---|--|
| Clean→ Arrest | Age-specific; Different probabilities for people have been incarcerated and people have never been incarcerated. | Uniform Crime Report, 2010; National Longitudinal Surveys, 1979; Durose, M. R., Cooper, A. D., & Snyder, H. N. (2014). <i>Recidivism of Prisoners Released in 30 States in 2005: Patterns from 2005 to 2010. Bureau of Justice Statistics.</i> |
| Arrest→ Charge | Age-specific; But assume incarceration doesn't matter (No estimates were found). | Johnson, B. (2010), <i>The missing link: examining prosecutorial decision-making across federal district courts.</i> (NCJ 245351, Grant Report). Washington D.C.: the US Department of Justice. |
| Charge→ Conviction | Assume age and incarceration doesn't matter for this transition. (No estimates were found). | Executive Office for United States Attorneys (2010), <i>United States Attorneys' Annual Statistical Report, Fiscal Year 2010.</i> Washington D.C.: US Department of Justice. |
| Conviction→ Incarceration (In/out) | Age-specific; Taking into account criminal histories. | Steffensmeier, D., Ulmer, J., & Kramer, J. (1998). <i>The interaction of race, gender, and age in criminal sentencing: The punishment cost of being young, black, and male. Criminology, 36(4), 763-798.</i> |
| Incarceration length | Age-specific; Taking into account criminal histories. | Steffensmeier, D., Ulmer, J., & Kramer, J. (1998). <i>The interaction of race, gender, and age in criminal sentencing: The punishment cost of being young, black, and male. Criminology, 36(4), 763-798.</i> |
| Mortality | Age-specific Taking into account incarceration experience. | Binswanger, I. A., Stern, M. F., Deyo, R. A., Heagerty, P. J., Cheadle, A., Elmore, J. G., & Koepsell, T. D. (2007). <i>Release from prison — A high risk of death for former inmates. The New England Journal of Medicine, 356(2), 157-165</i> |

