Has the U.S. Prison Boom Changed the Age Distribution of the Prison Population?

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ABSTRACT

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This paper provides the first detailed exposition of changes in the age-incarceration distribution during the period of mass incarceration from 1974 to 2004. We start by providing an extensive 'proof' of the dataset, a repeated survey of inmates in state prisons in the United States. We then document that the prison population expanded during this period and the age distribution shifted dramatically to the right. 16% of the state prison population is 40 and older in 1974, but 33% of the state prison population is 40 and older in 2004. The median age shifts up over 7 years from 27 to 34. The natural next step is to explain the nature of this shift in the age distribution. Using an estimable function approach, we estimated an age-period-cohort model to determine to what extent the observed changes in the distribution could be explained by changes in how birth cohorts are treated by the criminal justice system. We found that cohort effects could explain the observed shifts in the prison population extremely well. Essentially, the younger cohorts from the 1970's and 1980's appear to have more people who experience incarceration than did the older cohorts from the same period. The most plausible explanation is that there are simply more people in these cohorts. And indeed, we do know that the distribution is aging. However, we found essentially the same result after controlling for the size of the population. More recent cohorts in the US have experienced higher incarceration rates, leading to a dramatic shift in the age distribution in the U.S. prison population.

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I. Introduction

There were 506 people in state and federal prisons in 2007 in the United States for every 100,000 people in the population, a 3.5 fold increase over 1980. At a time when the United States was engaged in two overseas wars, there were more people serving time in American prisons in 2007 than there were serving on active duty in the U.S. military (West and Sabol 2009; U.S. Department of Defense 2008). If the number of persons incarcerated in the United States were itself a state, it would be the 36th largest — somewhat smaller than fast-growing Nevada, but much larger than New Mexico, not to mention West Virginia, Nebraska, Idaho, Hawaii, and ten others. The sheer number of people in prison at any time is an important indicator of related demographic phenomena: the proportion of Americans who will spend at least some of their life in custody (Bonczar and Beck 1997; Pettit and Western 2004), the timing of this incarceration, its cumulative length across the life course and the extent of subsequent disenfranchisement from American civic life (Uggen and Manza 2002). Given that stays in U.S. prisons are disproportionately afforded to minority groups, African-Americans in particular, there is great interest in how incarceration is associated with a variety of demographic events (marriage, fertility, mortality, and child outcomes), including how differences in demographic rates between subpopulations may reflect differential rates of incarceration (e.g. Pettit and Sykes 2009).

These are two alternative demographic perspectives on the same phenomenon. One holds that there is essentially a single, evolving U.S. population, with incarceration representing a state or status, akin to, for example, marriage (or being in school, or having a child in the house). The other is that there are two populations: The general (non-incarcerated) population; and the prison (incarcerated) population. There is nothing contradictory about the two perspectives. They do lend themselves to different questions. The one-population, incarceration-as-a-status perspective lends itself to series of statements about conditional distributions (if not cause-and-effect): Who goes to prison? When? What does going to prison do to one's chances later in life, of getting married and stayed married, of finding work, and so on?

The two-population perspective is especially relevant when one wants to discuss the prison population *as such*. For example, there is a large literature devoted to the implications of prison aging for the management of prisons, for policies regarding release from prison, and the like (Auerhahn 2002; Morton 2001; Rikard and Rosenberg 2007). There is less of an understanding of the extent to which it is aging, and why — the subjects of our paper. Consider briefly the demography of the general population. It is not a closed population: Net inflows from beyond the borders are the primary engine for intrinsic growth, which is to say the propensity to increase independent of the age structure (Preston and Wang 2007). Absent international in-migration, fertility and mortality would cancel each other out. As for the age structure itself: The long-term trend has been toward an older and older population. Life expectancy has been continually increasing, and the association between lower mortality and an older population seems "natural" enough. Less obvious is the effect of fertility decline, but fertility declines were the initial engine for population aging, since fewer "entrants" at younger ages gives less weight to those ages in the calculation of a population's mean age. Migration, which currently has a large effect on growth, is distributed across the age distribution in such a manner as to have a comparatively minimal effect on, in particular, the mean age of the population.

What about the U.S. prison population? Its members are behind bars, a perspective that must dominate *their* lives; but in a demographic sense, it is anything but a *closed* population, at least in the formal sense that defines a closed population as one in which all entries occur at birth, as a function of fertility, and all exits are due to mortality. In the U.S. prison population, fertility is anecdotal and mortality is very low. In-migration (incarceration) and out-migration (release) dominate, and may occur at any adult age. Formal demography is the interaction between rates of fertility and rates of mortality in the growth of a population and the creation and maintenance of its age structure. Migration is an empirical nuisance. Small wonder that the demography of the "all migration" prison population is in general allusional and intuitive.

The allusional aspect simply conflates the two populations: The general U.S. population is aging, so its prison population, drawn from an aging population, should be aging as well. The logic, as we shall see, is only middling; but the general correspondence is not a bad one. The median age of the U.S. population has increased six years from 28 in 1974 to 36 in 2004.[1] The median age of a person in the U.S. state prison population increased seven years from age 27 in 1974 to age 34 in 2004.[2] Indeed, if rates of incarceration and release by age are always the same, then the age structure of the prison population *will* be a constant function of the age structure

[1] The median age of the U.S. population is computed by authors, using the population estimates from the U.S Census Bureau website (http://www.census.gov/popest/national/asrh/).
[2] The age of the prison population is not reported regularly by the Bureau of Justice Statistics. The median age reported here is computed by authors, using the Survey of Inmates in State Correctional Facilities.

of the general population, in particular its fertility and migration (since mortality in the U.S. is very low before old age).

But it is well known that rates of incarceration have *not* been constant: that there was at least a quarter-century of ever-greater proclivity to incarcerate, to deny parole, and to lengthen sentences. Let us start with the latter two, which fit well with a useful intuition: That more time in prison will lead, all else equal, to an older population. This is true, and the beginning of a useful analogy. For if we redefine mortality in the prison population as not death *per se* (even though prison deaths do indeed exist), but as exit from prison (including, occasionally, by death), then longer prison terms are analogous to longer life expectancy, or lower mortality (chance of exit); hence an aging population. The intuition is apt.

Is there a correspondence with fertility? At first blush, the answer would appear to be “no.” Fertility is a property of adults in one population that maps their distribution backwards toward entry into the same population at age zero. Entry into prison, on the other hand, is not related to the distribution of the prison population at other ages — there is no direct way in which prisoners reproduce themselves, even sociologically — and entry can occur at any age (and more than once per person). This said, crime *is* a young man’s game, which means that entries to prison *are* concentrated at the earliest adult years. And the relative constancy of the age-crime curve, with its sharp decline after early adulthood (Wilson and Hernstein 1985; Steffensmeier et al. 1989; Gottfredson and Hirschi 1990), makes initial incarcerations after young adulthood something of a constant within cohorts, at least conditional on incarceration in young adulthood, and therefore an arithmetic offset to the “mortality” as measured by length of stay. Or so we argue, by way of simplification as against the challenge of modeling no end of age-specific entries and exits over time. From an analytic perspective, this is a reminder that the aging of the prison population need not mirror the aging of the general population. Yes, the former is drawn from the latter. And, yes, sentences have been getting longer over time. But increases in the rate of incarceration, which are concentrated at young ages, are akin to increasing fertility; and even in a general population where cohorts are not growing larger, entering prison cohorts *can* be increasing in size, which will tend to make the prison population *younger* than it would otherwise be.

Does this perspective lead to a useful understanding of changes in the age distribution of the prison population? We start with a review of the literature linking age, incarceration, and the size of the prison population. We then explore survey data from the Bureau of Justice Statistics-funded Surveys of Inmates in State Correctional Facilities for 1974, 1979, 1986, 1991, 1997 and 2004. These data have the virtue of giving age-specific estimates of the corresponding prison population, which allows for the creation of the *cohorts* whose comparative size and distribution by age are integral for the conceptual demographic frame on prison aging as outlined above. These are, however, *sample* data, so we consider the extent to which they provide sufficiently fine-grained estimates of prison populations by age, as to support the formal analysis that follows.

This analysis, which follows O'Brien and Stockard (2009), is a decomposition of age-specific incarceration rates over time as a function of a characteristic pattern of incarceration by age and, variously, parameters for the extent of incarceration across cohorts and across surveys (periods). The distinction between so-called period and cohort effects is an essential one (Smith 2008, p. 291), and in this instance conjures two alternative views of how changes in the "incarceration environment" (*e.g.*, propensity to incarcerate, sentence length) should affect the age distribution of the prison population over time. Cohort effects are expected under all circumstances, since they index changes in the size of the population "eligible" for imprisonment. But what about period-specific changes in the environment — epidemics of drug use, change in sentencing laws, construction of new prisons? In theory, these could put (primarily upward) pressure on the number of persons incarcerated at all ages in a given year; or they could act differentially on different age groups at different times (if, for example, somewhat older prisoners who would "normally" be paroled are now likely to be maintained in prison), creating *interactions* between age and period that are *not* cohort effects (*e.g.*, Smith 2004, pp. 112-113). Although we do find some evidence of changes in the age parameters for incarceration over time, these changes have been comparatively small as against a backdrop in which cohort effects dominate. That is, the "spirit of the times" in the years in which successive American cohorts reach young adulthood defines a certain level of incarceration that persists across their life course, and is not simply a function of the cohort's size (Ryder 1965). We conclude with a preliminary exploration of the potential explanations for this cohort effect.

II. Literature Review

The age-arrest curve, presented in Figure 1 for all arrests, is perhaps the most iconic "fact" in the field of criminology. There is a widespread agreement that arrests for crime rise dramatically from age 10 to a peak around age 18 followed by a more gradual decline over the life course (Levitt 1999; Wilson and Hernstein 1985). Moreover, the arrest rates are fairly constant over time. The fact that the arrest rates per 100,000 are nearly identical from 1979 to 2004 might come as a surprise to those aware of the dramatic increase in incarceration during this same period.[3] The relative constancy of the age-arrest curve across time and place is a well-accepted fact in criminology (Gottfredson and Hirschi 1990), although there is some skepticism about the degree of constancy (Steffensmeier et al. 1989), and there should probably be more.

Why more skepticism? The original statement of the age-invariance hypothesis was at once sweeping — "… our thesis is that the age effect is invariant across social and cultural conditions" (Hirschi and Gottfredson 1983, p. 560) — and imprecise, since what exactly is meant by "the age effect"? The theoretical underpinning is clear enough. The age effect is about a process that occurs across the life course, for some combination of social and physiological reasons. For that reason, the "age effect" should be apparent within cohorts, since the pattern of events by age within cohorts is the population equivalent of the life cycle of an individual. There *is* an example in the founding article of criminality by age within a cohort — the famous age pattern of delinquency in a birth cohort from Wolfgang, Figlio, and Sellin (1972) – but the other examples are all age patterns in the cross-section (*i.e.*, for a given period), with no

[3] The arrest data come from the Uniform Crime Reporting Program. For earlier years, the age-specific arrests are only available at the Metropolitan Areas (ICPSR Study No. 2538: Uniform Crime Reporting Program Data [United States]: Arrests by Age, Sex, and Race for Police Agencies in Metropolitan Statistical Areas, 1960-1997). In order to make the data comparable over time, aggregated arrests by the metropolitan areas are applied to 1997 and 2004. The arrest numbers are reported by single year from age 15 to 24, and the rest are reported by mostly 5 year age block. The arrest rates are computed by dividing the total number of arrests by the age-specific group population, then multiplied by 100,000.

comment on the implications of blurring the two perspectives. This implies an even more austere hypothesis: That in any given place, crime never changes. For it is only where and when there are no cohort effects *and* no period effects that the age pattern of a variable will always look the same in cohort and period profile.[4]

Since we know that there are changes over time in the propensity to incarcerate; that incarceration, like criminal conduct, is concentrated among young adults; and that the distribution of sentence lengths creates a distribution of exits following peak entry; it stands to reason that there should be successive distortions in the period-specific distribution of prisoners by age, even in the absence of any changes in the "age effect" differentiating incarceration by age over the life course and/or within a cohort.

This said, the general structure of any age-arrest curve is sufficiently robust as to help us understand changes in aggregate crime. The aggregate arrest rate declined by 10% between 1979 and 2004 and the overall crimes reported to the police have declined almost 40%.[5] At least part of the reason for this crime drop has been the aging of the population. The median age of the population increased six years and the number of people in the most crime prone categories of age 15 to 19 and 20 to 24 declined 3% at the same time that the overall population increased by 30%. The group

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[4] Prior to the advent of effective chemotherapy, for example, the age pattern of tuberculosis within cohorts was essentially invariant (Mason and Smith 1985). So the decline in tuberculosis over time *across* cohorts made the age curve in any particular cross-section an over-estimate of the mortality rates for any extant cohort at older ages in the years to come (Frost 1939).

[5] The discrepancy between the decline in arrests and the decline in offenses comes from the fact that crime trends are based on crimes reported to the police rather than arrests. Arrests are reported by fewer agencies, and tend to vary less over time than offenses reported to police. For example, as fewer homicides means that more resources can be devoted to each homicide, potentially increasing the clearance rate. The arrest rates are also more influenced by the "war on drugs." The drop in the arrest rate for only non drug crimes is 30% from 1979 to 2004. Drug crimes are typically not reported to the police, so for this category arrests and offenses tend to be highly correlated. This contrasts with crimes like burglary where the vast majority of crimes reported to the police do not result in arrest.

of people at the peak period for crime accounts for a smaller part of the overall population, and we expect less overall crime.

Lawrence Cohen and Ken Land (1987) used these age trends to predict a decline in crime during the 1990's. And Jamie Fox (2000) calculated that 10% of the dramatic drop in homicides from 1990 to 1998 could be accounted for by changing demographic characteristics (age, race and sex). While these changes have at times been interpreted out of the context of the overall population distribution (Levitt 1999), the inherent logic of the age-crime curve mandates that changes in the age distribution in the population lead to changes in the aggregate crime rate, all else constant.

It therefore makes sense to suggest that such changes will also be reflected in the incarceration rate. In fact, at the same time that Cohen and Land (1987) were using age trends to predict a decline in crime, Alfred Blumstein predicted that the aging of the population in the 1990's would lead to a decline in prison populations in the ensuing decade (Blumstein 1988). The dramatic drop in crime in the 1990's makes Cohen and Land (1987) appear prescient, however the continued increase in the incarceration rates during the same period directly contradicts the prediction made by Blumstein (1988) on the basis of the same data.

Such a disconnect was anticipated by Frank Zimring and Gordon Hawkins (1991), who argued that there were too many policy factors between the commission of the crime and a final release from prison to sustain a strong link between age structure and incarceration rates. These include determinate sentences, mandatory sentences and prison capacity constraints. In contrast, Tom Marvell and Carl Moody (1997) argued empirically that there is a fairly strong relationship between the age distribution and size of the prison populations, with a 10% increase in the proportion of the population that is 25-34 associated with a 5.9% increase in the prison population. At the same time, the prison population did in fact keep growing as this age group declined in the 1990's. In the end, Marvell and Moody (1997) agree with Zimring and Hawkins that there are countervailing forces – namely sentencing policy - that explain the increasing prison population during the last 30 years. This does not mean that the age structure in the population does not have a direct causal link to the incarceration rate – but it does suggest that this link may be more complex and/or weaker than the link between the age distribution and the arrest rate.

A large sentencing literature in criminology focuses on identifying the "causes" or correlates of both incarceration (prison/jail[6] or not) and the length of the incarceration sentence.[7] Darrell Steffensmeier and his colleagues (1995) did the first serious exploration of the relationship between age and sentencing, showing that among those convicted, there was an upside-down U-shaped relationship between age and both sentence length and imprisonment decisions. Youth under 20 apparently receive lenient treatment while those in their 20's receive the harshest sentences, with a fairly steady decline in punitiveness starting in the thirties. So, while youth in the late teens are the most likely to get arrested, they appear to be at lower risk for incarceration given their arrest. At the same time, adults in their thirties and forties also appear to be at lower risk for incarceration, after controlling for both criminal history and the type of crime. This suggests that instead of peaking around ages 18-20, the age-incarceration

[6] Prison typically refers to incarceration sentences of more than a year, which are typically served in state or federal prisons. Jail refers to incarceration sentences of less than a year, which are typically served in a locally run jail.
[7] See Mitchell (2005) for a systematic review of this literature.

curves should peak sometime in the twenties.[8] However, this literature is uninformative about how the role of age may have changed in the last 30 years.[9]

Complicating matters somewhat is the fact that age in the prison population can be directly caused by the sentence itself. If sentences get longer, the prison population will also by definition get older. Although Blumstein and Beck (1999) did not look at the age distribution, they concluded that about 57% of the increased prison population is due to increased sentence length while the remainder is due to increased prison admissions and crime. If true, the age of the prison population will increase, simply because more people will be serving longer sentences — the functional equivalent of increases in life expectancy (decreases in mortality) in a general population with fixed rates of fertility. As these people age, the age distribution of those in prison will increase, even if the age of those sentenced to prison stays constant, under the further assumption that cohorts are of the same size.

But changes in the size of cohorts can also affect the period-specific age distribution even without a change in the length of prison stays, and so too can a change in the predilection to imprison, whether the population size is changing or not. These are features of the demography of the situation which may underpin more recent results that have given less weight to sentence length in the growth of the prison population. Steve Raphael and Michael Stoll (2009) find that only 35% of the increase in prison can be attributed to an increase in sentence length. Instead, they report the majority of the increase can be attributed to an increased propensity to incarcerate

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[8] The fact that incarceration rates will be a stock variable, rather than a flow variable, should also contribute to a shift in the peak age of incarceration, although with the median sentence length below 2 years, there is a limit to the impact that this change can have on the distribution.

[9] We are unaware of any research that systematically compares age coefficients measured from the 1980's with similar models now.

people who are convicted. John Pfaff (2009) goes even further based on prison admissions data to conclude that no more than 10% of the increase in prison population can be attributed to an increased probability of incarceration. In this work, the shift in the median age of prisoners comes entirely from incarcerating older offenders who previously would have received probation.

This position is supported by a recent paper on drug offenders by Harold Pollack and his colleagues Peter Reuter and Eric Sevigny, in the only other paper we could identify which has used the Survey of Inmates to study the changing age pattern of U.S. prisoners (Pollack et al. forthcoming). They report that the median age of a new arrived prison inmate (within the last year) who reports to abusing cocaine in the month prior to their arrest increased seven years from age 27 to age 34 in the time from 1986 to 2004. In contrast, the median age for new arrivals who do not report drug abuse prior to arrest increases by 3 years. While the difference in incarceration rates for older drug users in and by itself will not account for the six year increase in the median age of prisoners, Pollack et al. (forthcoming) provide some support for the idea that any model will need to account for changes in the age of the people who are sent to prison.

However, before we can move too far forward in predicting the causes of any changes in the age distribution of those who are in prison, we need to document, as carefully as possible, the magnitude and nature of the change in the age distribution. We will do this by estimating a standard age, period, and cohort demographic model. We start with a detailed description of the data.

III. Data

Incarceration Data

The data on inmates housed in state and federal prisons come from the “Survey of Inmates in State and Federal Correctional Facilities” datasets for 1974, 1979, 1986, 1991, 1997 and 2004. These individual files, housed in the ICPSR archives, make up a data series designed by the Bureau of Justice Statistics and conducted by the U.S. Census Bureau that gathers information on the characteristics of state and federal inmates. The data include age at the time of the survey, in single years, and are weighted to be representative of the overall United States state and federal prison population. The federal prison inmates were only interviewed in 1991, 1997 and 2004. In order to make comparisons over a longer time period, we choose to focus on the state correctional facilities, which held 87% of the total U.S. prisoners in 2004.

A stratified two-stage selection was employed in the sample design. In the first stage, the state prison universe was defined and a representative prison sample is selected by taking into account prison population, facility type, and security level (ICPSR Study No. 2598). In the second stage of the sample selection, a random sample was selected based on the list provided by the facility which included all inmates using a bed the previous night. The sample sizes are of the same order of magnitude across samples, with 9,008 in 1974, 11,369 in 1979, 14,560 in 1986, 13,931, in 1991, 14,282 in 1997 and 14,459 in 2004. The survey provides information on inmates’ current offense and sentence, criminal history, family background and personal characteristics. The general content of the survey remained the same over the years with the addition of new questions in the more recent survey instruments.

We were anxious to be able examine single years of data for several inter-related reasons. First, since samples are taken at irregular intervals, it is difficult to define cohorts when data are grouped. Second, although the adult life span represented in these data is long, the crime experience is concentrated in young adulthood, and the intensity of that experience varies markedly by age in ways that are not well apprehended by *gross* characterizations. For example, the number of people arrested drops 11% from age 22 to age 24 in 2009, according to the FBI.[10] Third, it is less essential to make distinctions among rates, probabilities, proportions, and prison-years "lived" in an interval when the intervals are comparatively short (*i.e*., a year) and "exposure to risk" can reasonably considered to be homogeneous within a given duration. However, the emphasis on single years of age, as opposed to five-year age groups, puts more demands on the survey.

In particular, although these are large surveys, it was not immediately obvious that samples of this size can support the standard age-period-cohort analysis typically conducted by demographers on population level data aggregates So we have spent some time considering the formal estimation of age-specific population counts from these data sources.

For ease of exposition, let $x(a,t)$ be the number of prisoners age a in year t, $t = 1974, 1979, 1986, 1991, 1997, 2004$ *and* a is a single *year* of age. For comparison across years, we will leave out teenagers below age 17 (who generally do not get

[10] Crime in the United States, 2009. http://www2.fbi.gov/ucr/cius2009/index.html, Table 38.

sentenced to state prison) and truncate older inmates at age 72.[11] We estimate $n(a,t)$ as $\hat{n}(a,t) = \mathcal{F}(s[a,t])$, *i.e.*, we do not have a complete count of prisoners, but rather an estimate $\hat{n}(a,t)$ that is, for each sample t, a Horvitz-Thompson estimator $\mathcal{F}(\blacksquare)$of the age- ($a$) specific population total based on an observed age-specific sample count, $s[a,t]$.

Fortunately, even the samples per age year are large samples. As Figure 2 shows, the density of age-specific counts $s[a,:]$ is quite high across ages, with $s[a,t] > 50$ in general for $a \leq 50$(and for $a < 60$ for $t = 1997, 2004$); and the overall sample size $s[t] = \sum_a s[a,t]$ is of the same order of magnitude across surveys . The shift in the curves over time toward older ages hints that the prison population may be aging,, but for a given t and two ages a and a', $\hat{n}(a,t)/\hat{n}(a',t) \neq s[a,t]/s[a',t]$, (since weights can vary across ages within a survey, $\mathcal{F}(s[a,t]) \neq \mathcal{F}(s[a',t])$). Moreover, this inequality pales relative to that *between* surveys t and t', $\hat{n}(a,:)/\hat{n}(a,t') \neq s[a,t]/s[a,t']$, since weights have increased greatly over time.

The relevance of examining the underlying $s[a,t]$, before proceeding to analyses of the estimated totals, $\hat{n}(a,:)$ (and functions of those totals, such as proportions incarcerated), is that their size is a key element in the sampling variability that will attach to the subsequent totals and proportions. Since this is, in the first instance, a

[11] This makes little or no difference in the age distribution of inmates because there are few outside these boundaries. But it does make comparisons across years "cleaner" and *is* relevant when examining the mean age of the general population, since there are of course many persons <17 and >72.

demographic analysis, not a statistical one, we need some "order of magnitude" reassurances, especially since we can only get survey-design-corrected standard errors for the 2004 survey.

The fact that the age-specific counts tend to be in excess of 50 is evocative of a sense in sampling theory that "large samples" are those (depending on the distribution of the underlying variable) that are greater than 30; certainly greater than 100. But this is a false analogy, because a given age-specific count $s[a,t]$ is *not* the denominator of a mean or a proportion. Rather, it is a *numerator* of an estimator of the year- or survey-specific (t) multinomial age distribution, $\hat{p}(a,t) = \hat{N}(a,t)/\hat{N}(t) = \hat{N}(a,t)/\sum_a \hat{N}(a,t) = \mathcal{F}(s[a,t])/\mathcal{F}(s[t])$. Since the number of age groups is quite large, one can, for the purposes of intuition, think of $\hat{p}(a,t)$ for any particular *a*, as a binomial variable with $s[a,t]$ "successes" in $s[t]$ "trials," *e.g.*, for $a = 50$ and $t = 1974$, $s[a,t] = 47$, $s[t] = 9008$, and $\hat{p}(a,t)$ — at least without any weighting — is $.0052$, or about one half of one percent, and a 95% "exact" confidence interval of $.0038$ to $.0069$, or four-tenths of a percent to seven-tenths of a percent. Of course, this is only *exact* under simple random sampling, and this is a complex sample with design effects that we can see for 2004, but not otherwise.

In addition, *s[a,t]* is the basis for an estimated *total*, $\hat{N}(a,t) = \mathcal{F}(s[a,t])$. Here what will become most relevant are the relative sizes of the sampling weights, for the various functions $\mathcal{F}(s[a,t]), \mathcal{F}(s[a',t'])$, since a comparatively low count $s[a',t] \ll s[a,t]$

for $a' > a$ need only indicate that there is a lower proportion of inmates at these ages ($\hat{z}[a', t] \ll \hat{z}[a, t]$), not that the *precision* of the estimated total is much less at older ages.

Inflation factors are the weights that scale up the observed sample counts $s[a, t]$ to estimates of population totals, $\hat{n}(a, t)$. Weights can vary across individuals of the same age, since they are sampled within different strata (types of prisons) and sampling units (prisons themselves), so for any given age we have a distribution of weights. Figure 3 provides the mean inflation factors (weights) by age. A close examination of Figure 3 shows that the size of the surveys has not changed to anything like the degree that the prison population has grown, so the average weight has grown four- or five-fold between 1974 and 2004. Figure 3 also shows that average weights do not vary too much by age, at least relative to differences within ages across surveys. This is not entirely surprising, because age is not a feature of the sampling design. It is also apparently not too closely correlated with sampling units. The exception is the 1997 study, where inflation factors decline with age. In 2004, by contrast, after age 40 they appear to increase somewhat. Finally, Figure 3 shows that there is more variability in these mean weights at the youngest but especially the older ages, which makes sense since here the $s[a, t]$ *are* the denominators of estimates of sample-specific means. The variability will increase with the root-mean decline in the size of these observed counts.

Since the inflation factor is rising over time across surveys, it stands to reason that the variability (standard deviation) for age-specific weights will be increasing as well. Figure 4 plots not the standard deviation in weights by age, but the *coefficient of relative variation (CRV)*, the ratio of the standard deviation to the mean. What stands out in this figure is the difference between the 1974 survey and all of the others: The

1974 design was almost certainly a near-*pps* (probability proportional to size) design, since there is very little variability in the inflation factor. Otherwise, even as the mean inflation factor went up dramatically (from ~ 25 in 1979 to > 80 in 2004) the CRV stays relatively similar, with standard deviations running at $40 - 60\%$ of the ever-increasing means. To the extent that the surveys of 1986 and 1997 are to the higher end of the range, and those of 1979, 1991, and 2004 — the one year for which we can estimate design effects — we might hypothesize that design effects will be somewhat larger in the former two than the latter three. Otherwise, the CRVs do not change much by age, which makes sense since age groups were not a feature of the sampling design; and the increase in the variability of these CRVs at $a > 50$ reflects the declining size of $s[a > 50, t]$.

What then are the standard errors for $R(a, 2004)$, the survey for which we have enough information on the sampling design to calculate them more-or-less correctly? Figure 5 gives the estimates for 2004, with a 95% confidence interval.   Figure 5 supports our choice to look at single years of age rather than five-year age groups. There is clearly some age-to-age “bounce” that could be chalked up to sampling error; but there are also some “twists and turns,” especially at the youngest ages and, interestingly, in the 40s, that might be blurred otherwise.   However, focusing on one-year age groups (primarily because of the irregularly spaced survey dates), does have a cost in terms of power. Collapsing age-groups into five year groups will inflate the sample size by approximately 5 times the average group size, but only increase the standard error by the square root of 5.

To gain some of the benefits of grouping without losing the single age years, we smooth the data from year to year rather than thinking of any particular single year of age as a sample independent of the counts of near-neighbors. As shown in Figure 6, the surveys through 1991 probably admit to a simple parametric form, and the advantage of a parametric form is that it makes it easier to formalize the reduction in sampling error attendant to the imposition of a “model” (the parametric form). But this is an exercise in descriptive demography as a prelude to some analytic criminology; plus, whatever this parametric form might be, it evidently could not be sustained for 1997 and 2004. As a result, we chose lowess smoothing ([very] local regressions), as per Velleman (1980) on robust nonlinear data smoothing, and opted for a **4253H,twice** algorithm.[12]

The theory of the robust median smoothers is that one wants to borrow information where there is *support* (in the statistical and econometric sense), but not to smooth *too* much, where “too much” means getting rid of outliers at all costs. Thus in the preceding figure, we have not only the smoothed data, but the underlying age-specific estimates. Points near the line are absorbed into it, literally and visually, and all that are left are the outliers. We are not concerned with the effects of smoothing at older ages, since there the population is sparse there and sampling error does not much affect our notion of how many inmates there are.

Of course, this is also puts more of an emphasis on 1997 and 2004, the two surveys for prison populations of over a million. Still, the “jumpiness” in the data by age is not simply a function of numbers (scale). The age distribution in 2004 is simply

[12] We experimented sufficiently with other algorithms to know that the results are not dependent on the choice of smoother.

“lumpier” and less regular, and even the smoothed distribution looks the least like the others. This *might* be sampling variability, but it is hard to explain that given that the standard errors for 1997 are likely *larger* than the corresponding standard errors in 2004.

One of the keys to the *demography* of aging is the notion of a cohort, and this shows up in the *criminology* of the situation as well. One need not have an Easterlin-like well-elaborated behavior *cum* macro-economic and macro-demographic theory to imagine that there are cohort effects in the aging of prison populations (Steffensmeier et al. 1992). If a lot of 22 year-olds enter prison in 1997; and some of them have long sentences; and the tendency is not to let people out too early, then, *ceteris paribus*, 29 year-olds are comparatively numerous in 2004. However, it is not obviously true in these data that single ages for which there are peaks in one sample are also peaked in the next sample (age plus the time interval between surveys). As a result, we are believe that these unsustained single-year peaks (and troughs) are more likely noise, and in what follows, we will treat the median-smoothed estimates as the “real” counts.

IV. Results

Is There a Cohort Effect?

Figure 6 with the actual estimated *numbers* of prisoners conveys simultaneously the growth in the size of the prison population and the aging of the prison population. Most of the growth in the prison population is through 1997. The 1997 and 2004 estimated counts differ markedly by age but are of roughly the same magnitude.

The simplest measure of aging is probably the mean, $\mu_t = \sum_a a \cdot \tilde{p}(a,t)$, with the tilde ($\tilde{}$) indicating the age-specific proportions are based on median-smoothed estimates of the estimated inmate counts $\tilde{n}(a,t)$. As shown in Table 1, the average age actually *declined* between 1974 and 1979, even as the overall numbers of inmates grew, but since 1979 the mean has increased from survey to survey by 1.5 to 1.8 years. Since the intervals between surveys are only five to seven years, these are large changes. The distributions are right-skewed, so the median lags the mean, but not by much. The mode, which is the age at which incarceration is most pronounced, lags both the mean and the median. Again, this is typical of right-skewed distributions. The most recent two surveys stick out: 1997, because mean, median, and mode are basically the same; and 2004, because the age distribution is bi-modal.

Other features of the age distribution of the prison populations have *not* mimicked the changes in mean age. The standard deviation was lower in 1986 than in 1974, in spite of the rise in average age. In 1997, the mean age was a full four years higher than in 1974, but the age distribution was less diverse (as measured by the standard deviation) than it had been when the prison population was younger. Real "diversity" — differentiation with respect to age — is most evident in 2004. The standard deviation is the largest; the distribution is bi-modal and the proportion of "older folks" — arbitrarily defined here as ages 40 and older—is the greatest (33%). The "older" population, in percentage terms, was essentially the same in 1986 and 1991 as it was in 1974, in spite of a rise in the mean age.

The extent of the mean increase over fairly short time intervals is consistent with a big effect of "lingering" (getting in and staying in). But, of course, new people are coming in, and while they theoretically could come in at *any* age, they are more likely to enter at younger ages than at older ages. This tends to pull the mean down, since births are what make a general population younger. These processes can be difficult to see in successive cross-sections. If we focus, for example, on the age curves in 1979, 1986, and 1991, we see plenty of indication of the general increase in incarceration at all ages: Each successive year is in some sense an inflated version of the one prior. There are just more people in prison at all ages. At the same time, the peaks of the distributions are moving to the right, toward older ages, at a rate not too much less than the rate defined by the time between surveys. These are potentially "cohort effects." Between 1997 and 2004, the cohort pattern is also stark: Fairly simple functions map the numbers of inmates at all ages from, say, 35 onward in 1997 onto the corresponding numbers seven years older in 2004. What is needed is a straightforward approach to systematically examine the pattern of change over time and confirm that indeed these later birth cohorts are indeed either behaving differently, or being treated differently by the criminal justice system.

These kinds of analyses have been conducted in criminology to explain shifts in the age pattern of homicide arrest rates (O'Brien et al. 1999). Characteristics of the cohort in question, such as relative cohort size and non-marital births, are used to try and account for changes in the number and/rate of people arrested in each age group. In the context of incarceration, however, changes in the "behavior" of any given cohort is as likely to be the result of changes in the behavior of the system as it is changes in the behavior of the individuals. As we have already shown in Figure 1, arrests rates have not changed dramatically during this time period. Although there was a period of youth homicides from the late 1980's to the mid 1990's (Blumstein 1995), previous research has shown quite clearly that changes in crime rates cannot account for changes in the prison population Raphael and Stoll (2009). Therefore, it will be more likely that changes in policy that are not cohort specific could be driving the changes that we observe in Figure 6. It is not as obvious how to use non-cohort specific hypotheses to explain the observed changes. However, it will be useful to get a sense of the magnitude of the cohort effect that we observe. In other words, instead of focusing immediately on the explanation of the cohort effects, we seek first to verify that cohorts are important.

There are three basic components in our simple demographic model. We use dummy variables for each of our six samples to capture proportional shifts in the level of the age distribution from sample to sample. Although these period affects cannot capture shifts in the age distribution, they should be able to capture the expansion in the prison population over time. We use dummy variables for each age to capture the basic shape of the age distribution of incarceration from 1974 to 2004. To the extent to which the age-distribution is constant, these dummy variables should do an excellent job of explaining the age distribution observed in the data. Finally, we use dummy variables for birth cohort, which is the survey year minus the age. This produces Equation 1 as our general model. The y_{ij} are the non-parametrically smoothed incarceration counts by single year of age and survey year. Predictor variables are indicators ("dummies") for age, survey year, and birth cohort so that α_i is the effect of the ith age, π_j is the effect of the jth period, and x_k is the effect of the kth cohort. The ε_{ij} represent random error.

$$y_{ij} = \mu + \alpha_i + \pi_j + x_k + \varepsilon_{ij} \quad (1)$$

This model has a well-known statistical problem – the main independent variables are perfectly collinear. If a researcher knows age and period, then she also knows cohort. In general, a linear combination of the any two variables will produce the third variable. As a result, we cannot estimate the coefficients in Equation 1 simultaneously. This is known in demography as the Age-Period-Cohort conundrum (Searle 1971, Fienberg and Mason 1979; Yang, Fu, and Land 2004).

However, the predicted values of the dependent variable are estimable even when specific coefficients corresponding to effects are not; and the fit of the three-effect model can be compared with effects of models using only two effects (Mason et al. 1973). O'Brien and Stockard refer to this as the "estimable function approach" for estimating the effects of age, period, and cohort (O'Brien and Stockard's 2009). Although we cannot estimate the specific age, period and cohort coefficients, the estimated values of the age-period specific incarceration statistics are best linear unbiased estimates of these numbers (Scheffe 1959; Searle 1971; O'Brien and Stockard 2009).

Because we can get best linear unbiased estimates of predictions from Equation 1, and we can also generate predictions from a model with only age and period, we can determine whether the predictions are improved by adding cohort to the model. This will allow us to formally test our insight that the shift in the age distribution observed in Figure 6 is in fact a cohort effect. We can also test how well this basic model fits the overall change observed in Figure 6. This estimable function approach is unusual, but has been used profitably by others, most notably O'Brien and Stockard (2009), to make progress in identifying the basic character of the changing demographic patterns observed in the data. Alternatively, the point here is that progress can be made in describing the problem without estimable coefficients from the age-cohort-period models specified in Equation 1.

Figure 7 provides the smoothed incarceration counts by age curve, as well as the age-period curve, the age-cohort curve (both of which have estimable coefficients) and the age-period-cohort model. The comparison of the age-period and age-cohort models is very instructive. The period model does explain some of the growth in the incarceration over time. The predicted numbers of incarcerated people at the peak age of 25 increases from 20,040 in 1974 to close to 24,600 in 1986, 29,200 in 1991, 35,500 in 1997, and 38,400 in 2004. In other words, a simple age period model captures the doubling in the number of people incarcerated at age 25. However, this description is rather inaccurate. The 1974 estimate actually over predicts the number of incarcerated people by 100%, and the 2004 underestimates the number of people incarcerated at age 25 by over 6,000 (16%).

In contrast, the age-cohort model tracks the actual age distribution remarkably closely, both in levels and in terms of the shifting of the distribution to the right. In other words, a model that simply allows some birth cohorts to have different rates of incarceration than other birth cohorts, together with the age distribution, can explain the changes in levels and the changes in the age distribution to the right. Adding period to the age-cohort model has almost no explanatory power – 1997 is the only year where the age period cohort model is closer to reality than the age cohort model by itself.

The model estimates from the age-cohort models are presented in Table 2. Because we are using smoothed data, we will not report the significance tests, but look to the explained variance to give us a sense of the relative power of these different explanations. The age variables account for about 16% of the overall variation. This captures the extent to which there is a constant age structure to this data. While this is a sizeable, it is noteworthy that during the same time period, O'Brien and Stockard (2009) found that age effects accounted for 83% of the variation in the homicide arrest rates. As captured by Figure 6, incarceration patterns over time are much less stable than arrest patterns (Figure 1).

This change can be best described as cohort change. The cohort variables account for 83% of the overall variation in the (smoothed) data. With 86 different cohorts, these variables have a lot of flexibility with which to capture change in the pattern. But, the cohort variables are capturing differences in the levels of incarceration that are constant over time. If there is a blip in the 1980's due to crack cocaine, we would expect that the cohort effect would not capture this change. Indeed, O'Brien and Stockard (2009) had to interact cohort and period to capture the increase in age specific homicide rates that describe the "crack epidemic" (Blumstein 1995). However, in the incarceration data, age and cohort together account for 98% of the variation in the model. Somewhat to our surprise, given the huge increase in incarceration rates over time, both the increase in incarceration AND the shift to the right can be described as a cohort level phenomenon. People who came of age in the 1980's and beyond have a systematically different experience in the state prison system than those who came of age later.

Given the relative unimportance of the period effects,[13] we can move back to the age cohort model, for which the coefficients are estimable. Figure 8 provides the coefficients for a select set of cohorts in the model, starting with those born in 1921 (who were 53 in the first year of the survey), and moving up to the 1980 cohort, who were 24 in 2004, and observed in at least two surveys.[14] Figure 8 also provides the size of the cohorts in 1991, and can be "read backwards" as the fertility history of the United States. For example, the largest cohorts correspond to the peak years of the "baby boom", from the mid 1950s through the early 1960s. Since our model is one for the age-specific *stocks* of inmates (their count or number, not a rate of incarceration relative to the general population), it is not surprising that a good part of the cohort effect that defines the growth and structure of the prison population is a reflection of changes in the size of the general population. Cohort effects track the baby boom. To a point: Because even with the onset of the "baby bust," beginning in the second half of the 1960s, cohort effects continued upwards for many years (albeit at a slower rate). This is not a surprise: The 1980s and 1990s were a period of increasing punishment and incarceration. The social and political factors underlying this change in attitude and public policy were sufficiently strong as to "grow" the prison population even as the general population was receding in the number of young adults.

What is striking in our results is that these changes can be captured so well by a model that focuses on cohorts. This does not mean that there is no underlying change, be it in social values, public policy, or the "criminal environment" (*e.g.*, drug epidemics

[13] In the age-period model, the period coefficients can explain 26% of the total variation.

[14] Younger cohorts are estimated, but their coefficients are estimated only once because they are only present at the latest survey.

and their *sequelae*). What it suggests, however, is that these changes essentially mark a cohort at its entry to young adulthood, where criminality, detection, and incarceration are always most prevalent. Some of the “marking” is easy to understand: Sentence length yields a subsequent age distribution, with many of those who are locked-up at age 22 still remaining in prison at age 32. But there is also much subsequent entry and exit, and re-entry and re-exit, and none of that is modeled here, except in broad brush. However, one can surmise that the well-known effects of a criminal record may be persisting over the life course, so that even if a given 22 year-old is no longer in prison when his cohort is aged 27, he is more likely to be back in prison at age 32; and hence, *ceteris paribus*, incarceration in that cohort remains high. We earlier commented on the failure of the criminology literature to associate “age effects” with patterns that occur (and are interpretable) *within* cohorts (as opposed to in the cross-section). These results speak to the usefulness of being more precise in this regard.

So some of the cohort effect is change in the size of the “prison-eligible” population; but a lot of it is *not*, especially most recently. This can be seen in Table 3, which reproduces period- (survey-) specific measures of the age distribution of the prison population, but now standardized to control for changes in the age distribution of the general population. Through 1986, population change indeed accounts for changes in the age distribution of the prison population, as the standardized distributions for the first three survey years are essentially equivalent. Later, the distributions change, since rates of incarceration — also specific to cohort — are on the dramatic increase. To see this, consider Figure 9, in which we present fitted data from comparable models that estimate the contribution of age, period, and cohort effects to the age-specific *rates* (not counts) of incarceration. The main takeaway from Figure 9 is the essential similarity of these results with Figure 7. Period does not explain the changing distribution very well, and cohort does.

V. Discussion/Conclusion

This paper provides the first detailed exposition of changes in the age-incarceration distribution during the period of mass incarceration from 1974 to 2004. We start by providing an extensive 'proof' of the dataset, a repeated survey of inmates in state prisons in the United States. This proof demonstrated that this survey could support a standard demographic analysis of the data.

We then documented that the prison population dramatically expanded during this period and the age distribution shifted dramatically to the right. 16% of the state prison population is 40 and older in 1974, but 33% of the state prison population is 40 and older in 2004. The median age shifts up over 7 years from 27 to 34. It is hard to overstate the size and the importance of this shift demographically. For example, according to the National Health and Social Life Survey from 1992, 43% of men experience the birth of their first child between the ages of 25 and 34. All else constant, the shift in the age distribution of the prison population means that many more children would experience life with a father in prison even if the size of the prison population stayed constant.

The natural next step is to explain the nature of this shift in the age distribution. Using an estimable function approach, we estimated an age-period-cohort model to determine to what extent the observed changes in the distribution could be explained by changes in how birth cohorts are treated by the criminal justice system. We found that cohort effects could explain the observed shifts in the prison population extremely well. Although the cohort model was flexible, there was nothing inherent in the model that would "force" the model to fit. Essentially, the younger cohorts from the 1970's and 1980's appear to have more people who experience incarceration than did the older cohorts from the same period.

The most plausible explanation is that there are simply more people in these cohorts. And indeed, we do know that the distribution is aging. However, we found essentially the same result after controlling for the size of the population. More recent cohorts in the US have experienced higher incarceration rates, leading to a dramatic shift in the age distribution in the U.S. prison population.

This is, as we have pointed out, a "broad brush": One that builds on the characteristic age pattern of criminality, and connects it to changes in the size of cohorts entering young adulthood, but also to the well-known growth in penalization and incarceration that occurred in the last two decades of the twentieth century. It is focused on stocks and ignores the *flows*, the age-specific entries and exits that constitute (and reconstitute) the prison population at any point in time. This may seem like a flaw of the analysis — a lot of behaviorism and micro-process is missing — but we would prefer to view it as a strength, in the sense that the broad age contours of the prison population can be captured very simply, all the comings and goings aside, by a model that emphasizes incarceration numbers in early adulthood. The implications for prediction of the prison population's future are strong: Absent period-specific events such as the recent Supreme Court ruling on California state prisons (and the “who” and “how” of release is still undetermined), a model that ties early life-course prevalence to a fairly constant age profile is one that allows us to “see” fairly far into the future (*e.g.*, Wang and Preston 2009)

A real regret, however, is our incapacity to give demographic decompositions of the various effects as a function of changes in the composition of the population with respect to various individual-level traits (from subgroup membership to previous incarceration histories). This blending of the macro (age, period, and cohort effects) with micro measures on individuals has been done usefully and convincingly by Yang and Land (2008), who estimate age, period, and cohort effects for verbal acuity in the United States, but then adjust them (hence *explain* them) in terms of the changes in the educational distribution of the population. The nature of our data are problematic in this regard. The surveys tell us a great deal about the prison population in any year. But the use of those data to predict incarceration is impossible, since, by definition, they are all incarcerated. Whether we might someday be able to match these samples to samples from the general population is a task that lies ahead!

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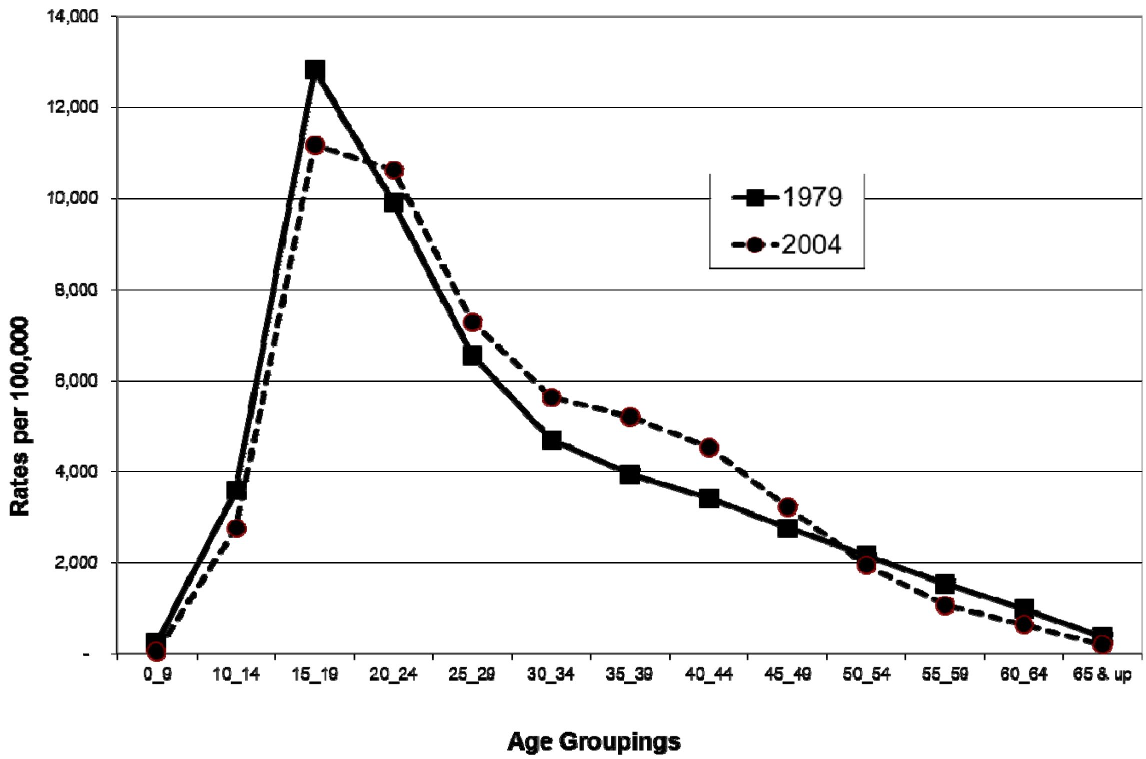
Figure 1



U.S. National Arrest Rates in 1979 and 2004[15]

[15] Data comes from the U.S. Department of Justice, Federal Bureau of Investigation, Uniform Crime Reports combined with data from the U.S. Census Bureau.

Figure 2

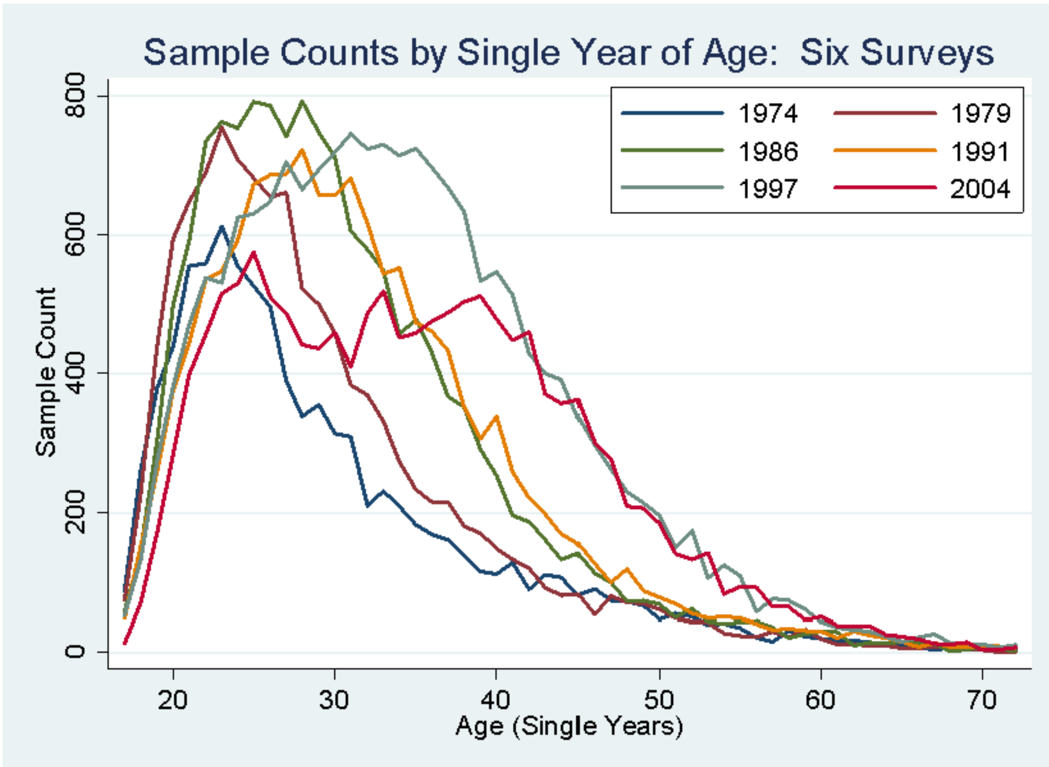

Sample Counts by Single Year of Age: Six Surveys
1974
1979
1986
1991
1997
2004
Sample Count
0
200
400
600
800
20
30
40
50
60
70
Age (Single Years)

Figure 3

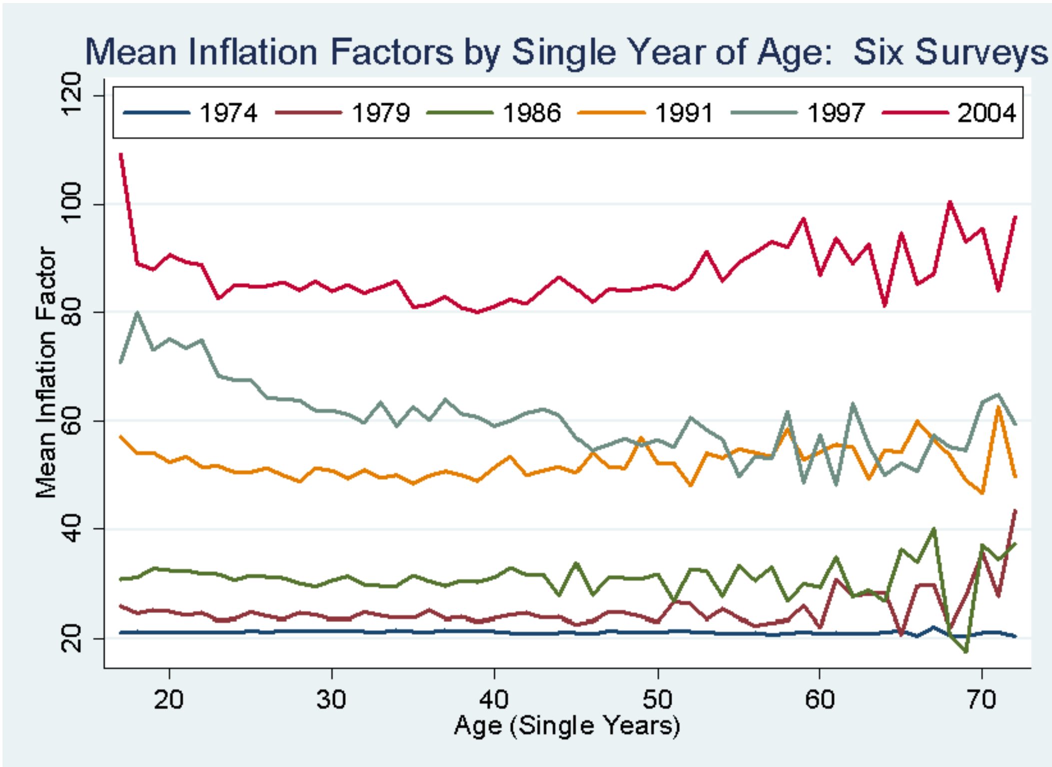

Mean Inflation Factors by Single Year of Age: Six Surveys
1974
1979
1986
1991
1997
2004
Mean Inflation Factor
20
40
60
80
100
120
20
30
40
50
60
70
Age (Single Years)

Figure 4

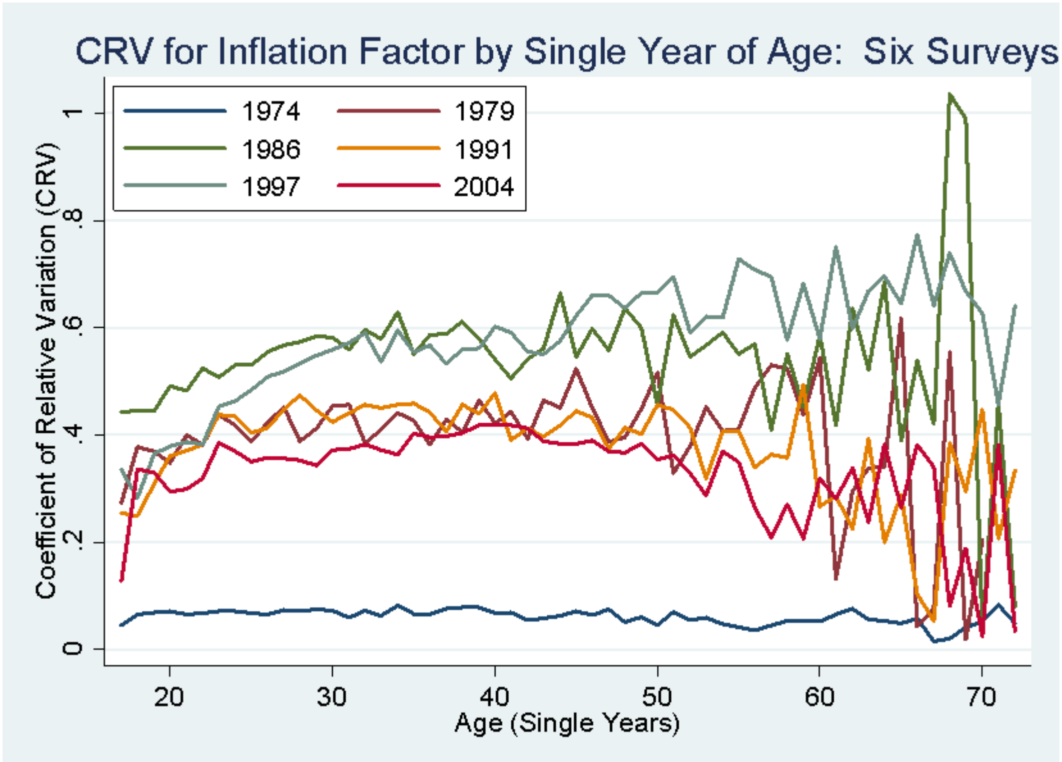
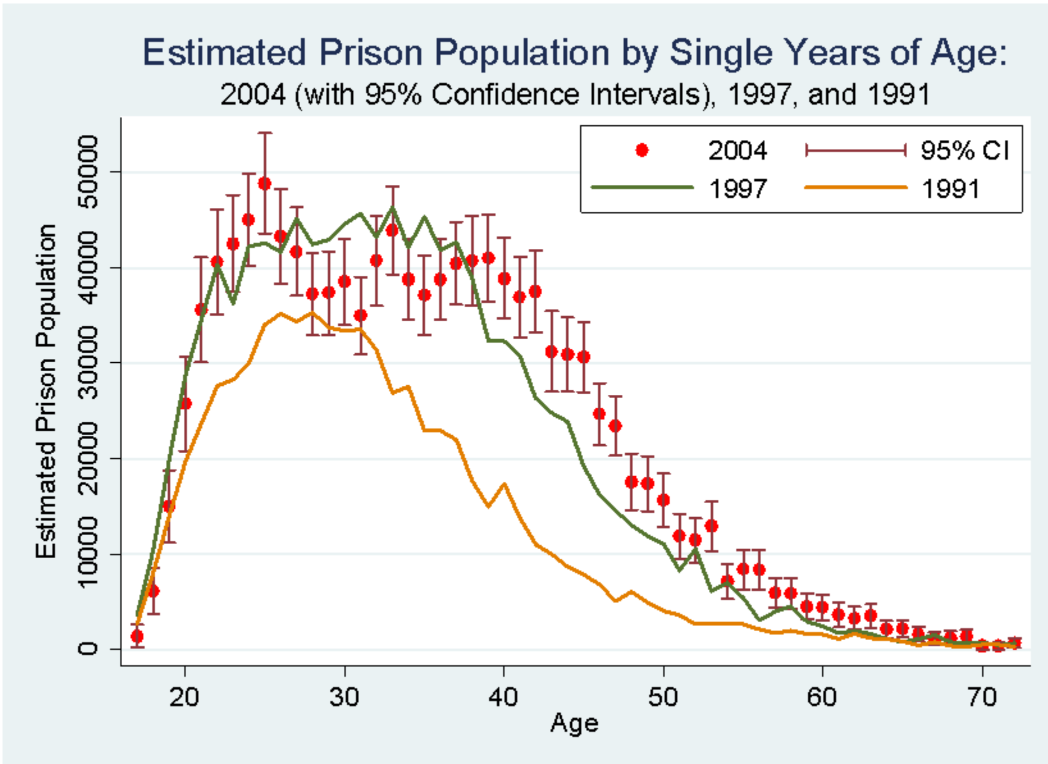

CRV for Inflation Factor by Single Year of Age: Six Surveys
1974
1979
1986
1991
1997
2004
Coefficient of Relative Variation (CRV)
0
.2
.4
.6
.8
1
20
30
40
50
60
70
Age (Single Years)

Figure 5



Estimated Prison Population by Single Years of Age:
2004 (with 95% Confidence Intervals), 1997, and 1991
2004
95% CI
1997
1991
Estimated Prison Population
0
10000
20000
30000
40000
50000
20
30
40
50
60
70
Age

Figure 6

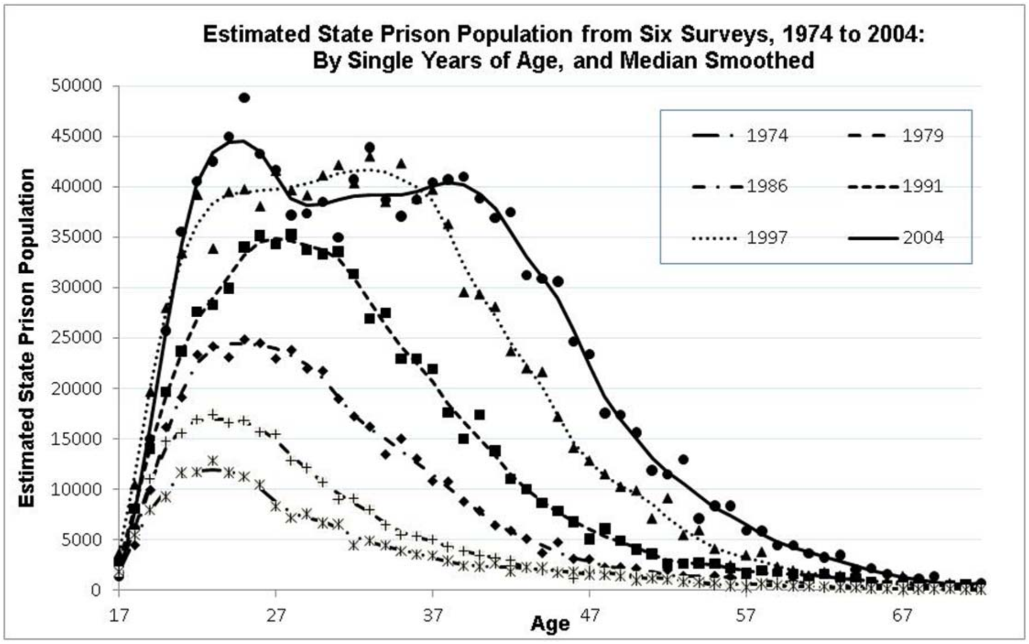

Estimated State Prison Population from Six Surveys, 1974 to 2004:
By Single Years of Age, and Median Smoothed
Estimated State Prison Population
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
17
27
37
47
57
67
Age
1974
1979
1986
1991
1997
2004

Figure 7
Age Distribution of Inmates Age 17 to 72 Years Old, Predicted by Age and Cohort, Age and Period, and Age, Period and Cohort

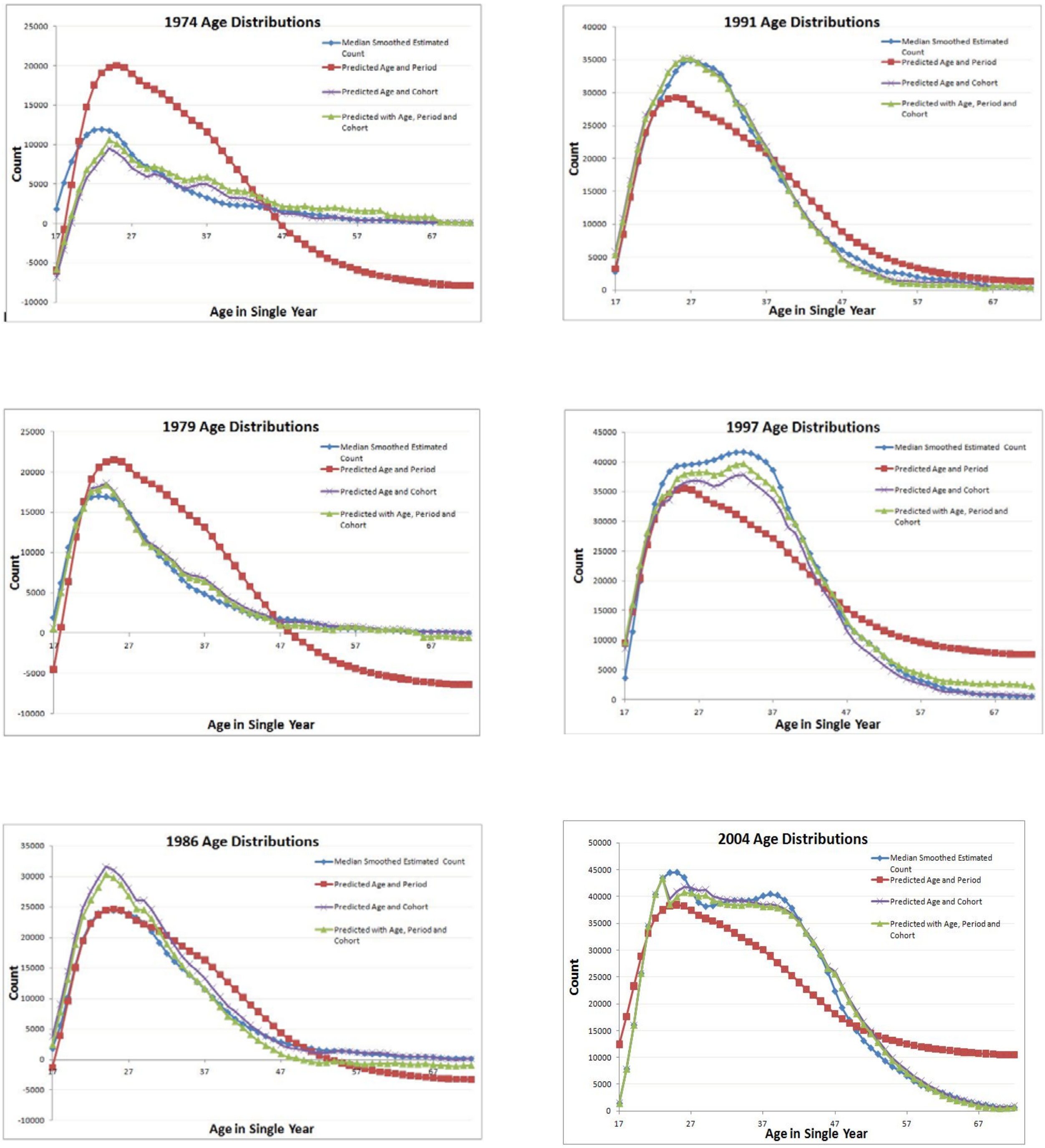
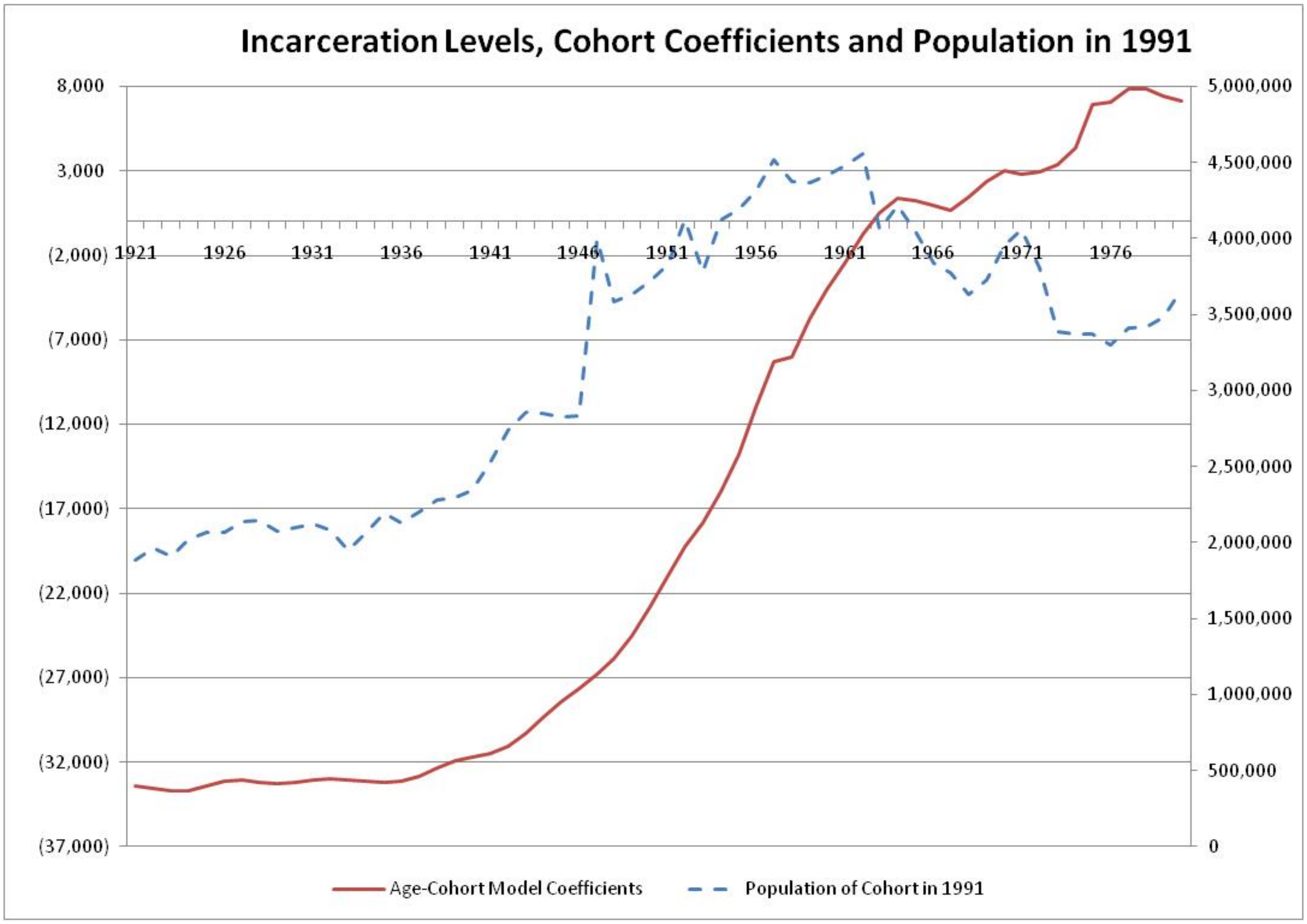


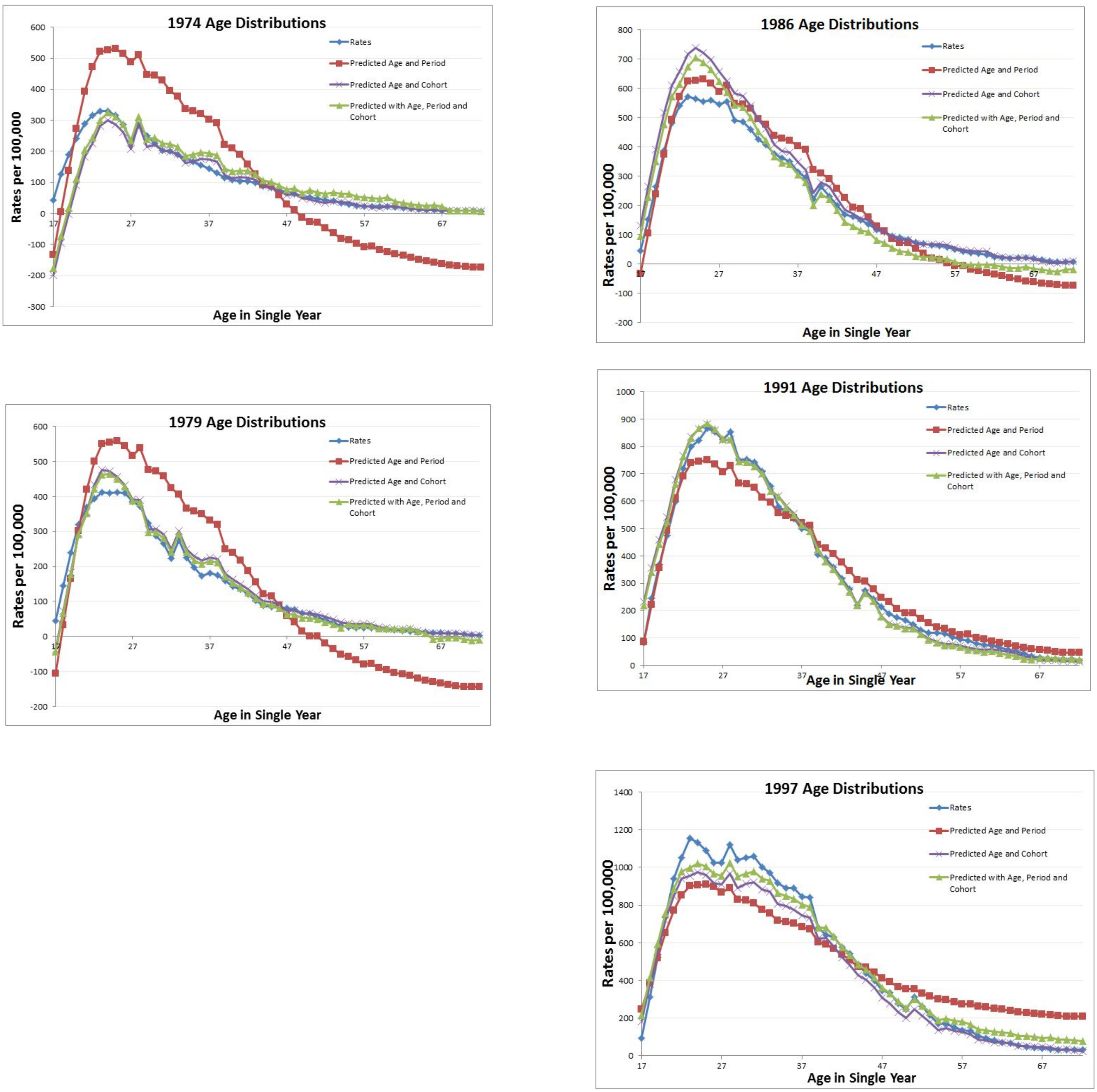
Figure 8

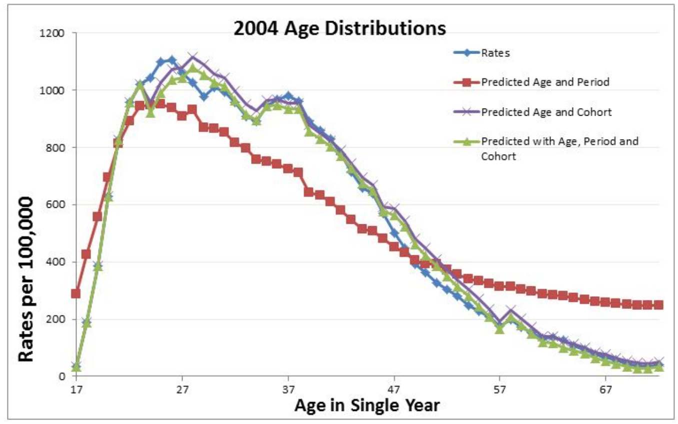


Incarceration Levels, Cohort Coefficients and Population in 1991
8,000
3,000
(2,000)
(7,000)
(12,000)
(17,000)
(22,000)
(27,000)
(32,000)
(37,000)
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1921
1926
1931
1936
1941
1946
1951
1956
1961
1966
1971
1976
Age-Cohort Model Coefficients
Population of Cohort in 1991

Figure 9

Age Distribution for Incarceration Rates of Inmates Age 17 to 72 Years Old, Predicted by Age and Cohort, Age and Period, and Age, Period and Cohort





2004 Age Distributions
Rates
Predicted Age and Period
Predicted Age and Cohort
Predicted with Age, Period and Cohort
Rates per 100,000
Age in Single Year
1200
1000
800
600
400
200
0
17
27
37
47
57
67

Table 1

Characteristics of the Age-Incarceration Curve, Non Standardardized.

Year	Distributional Characteristics							Numbers of inmates (000s)	
	Location (Central Tendency)			Spread / Shape			% 40 and older		
	Mean	Median	Mode	SD	Skew	Kurtosis		Ages 17-72	Ages 40 and older
1974	29.7	27	23	9.95	1.32	4.59	16%	191	30
1979	29.1	27	23	8.98	1.42	5.26	12%	275	34
1986	30.6	29	24	8.88	1.25	4.95	14%	451	63
1991	31.9	30	27	9.33	1.10	4.48	18%	710	127
1997	33.7	33	33	9.72	0.70	3.38	25%	1149	290
2004	35.2	34	25	10.43	0.55	2.84	33%	1221	408

The Western age convention is that one is age 30 from the time of the 30th birthday up to the day of the 31st birthday. Thus from the standpoint of "years lived," reported ages are underestimates by a factor of roughly ½ a year. In taking averages of age, it often makes sense to scale them up by a factor of 0.5; but this is not done here since the figures are graphing ages as though 30 year-olds have lived thirty years exactly, and so on. Also, the age distribution is weighted by the smoothed estimates of age-specific totals.

Table 2 Sums of Squares Associated with Age and Cohort Model

Source	df	Type I SS	Mean Square
Cohort	85	49,401,550,690	581,194,714
Age	55	9,909,645,510	180,175,373
Model	140	59,311,196,200	423,651,401
Error	195	1,391,997,659	7,138,450
Total	335	60,703,193,859	--

Table 3

Characteristics of the Age-Incarceration Curve, Standardized for Population Size (Rates)

Year	Distributional Characteristics					
	Location (Central Tendency)			Spread / Shape		
	Mean	Median	Mode	SD	Skew	Kurtosis
1974	31.9	29	23	10.82	1.11	0.94
1979	31.2	29	23	10.08	1.14	1.13
1986	32.2	30	23	10.22	1.06	0.94
1991	33.2	31	25	10.74	1.02	0.74
1997	33.8	32	23	10.65	0.86	0.43
2004	35.2	34	26	10.91	0.76	0.17