Assessing the Contribution of the Deinstitutionalization of the Mentally Ill to Growth in the U.S. Incarceration Rate

Steven Raphael
Goldman School of Public Policy
University of California, Berkeley
stevenraphael@berkeley.edu

Michael A. Stoll
School of Public Affairs
University of California, Los Angeles
mstoll@ucla.edu

Abstract

In this paper, we analyze U.S. census data covering the period from 1950 to 2000 to assess the degree to which the mentally ill who would have been in mental hospitals in years past have been trans-institutionalized into prisons and jails. We document the fact that many of those who were institutionalized in the 1950s and 1960s, and were subsequently deinstitutionalized, did not experience large increases in incarceration. In particular, the deinstitutionalization of women (who comprised nearly half the mental hospital population) as well as the elderly (who were nearly 30 percent of the mental hospital inpatient population at its peak) did not lead to substantial increases in incarceration for these groups. Conversely, those most likely to be incarcerated as of the 2000 census experienced pronounced increases in overall institutionalization between 1950 and 2000 (with particularly large increases for black males). We then estimate the rate at which individuals who would have been institutionalized in years past have been trans-institutionalized into prisons and jails. We construct a panel data set that varies by state, gender, race, and age and estimate the impact of changes in regional mental hospital inpatient rates on changes in regional incarceration rates controlling for a variety of fixed effects defined by the dimensions of the panel. We find no evidence of trans-institutionalization for any demographic groups for the period between 1950 and 1980. However, for the twenty-year period from 1980 to 2000, we find significant trans-institutionalization rates for all men and women, with a relatively large trans-institutionalization rate for men in comparison to women, and the largest trans-institutionalization rate observed for white men. Regarding the numerical contribution of deinstitutionalization to prison growth, our estimates suggest that between 4 and 7 percent of incarceration growth between 1980 and 2000 can be attributed to deinstitutionalization. While this is a relatively small contribution to prison growth overall, the results do suggest that a sizable portion of the mentally ill behind bars would not have been incarcerated in years past.

1. Introduction

The prevalence of mental health problems is extremely high among U.S. prison and jail inmates (James and Glaze 2006). Over half of state prison inmates, slightly less than half of federal prison inmates, and over 60 percent of jail inmates report having mental health problems or symptoms indicative of mental illness. The relative prevalence of severe mental illness is particular high (nearly five times that of the general adult population). Applying these prevalence rates to the 2008 incarcerated population yields the estimate that roughly 316,000 severely mentally ill people are inmates in the nation's prison and jails (approximately 115,000 jail inmates and 201,000 state and federal prison inmates). By contrast, there are currently fewer than 60,000 inpatient residents in state and county mental hospitals. Thus, the population of incarcerated severely mentally ill is over five times the inpatient mental hospital population.

That the incarcerated mentally ill population exceeds the inpatient population of mental hospitals is a relatively new development. In fact, as of mid century, the number of mental hospital inpatients per 100,000 U.S. residents greatly exceeded the *overall* prison incarceration rate. This fact is illustrated in Figure 1. The figure presents state and county mental hospital inpatients per 100,000,[1] state and federal prisoners per 100,000, and the sum of these two series for the years between 1930 and 2000. During the 1950s, the mental hospital inpatient rate was approximately three times the prison incarceration rate. The trend towards deinstitutionalization of the mentally ill begins in earnest during the 1960s. Thereafter the inpatient rate declines precipitously, falling below the incarceration rate in the mid 1970s and continuing to decline thereafter. The positive difference between the prison incarceration rate and the mental hospital inpatient rate widens quickly during the 1980s and 1990s as the country experiences a near five-

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1 Data on inmates in state and county mental hospitals was drawn from Palermo, Smith, and Liska (1991) through 1970 and from Raphael (2000) for later years.

fold increase in incarceration rates. By the end of the 20th century, the overall institutionalization rate (prisons and mental hospitals combined) is not appreciably different from what it was during the peak years for the mental hospital population.

The deinstitutionalization of the mentally ill juxtaposed against the increase in incarceration rates and the current high incidence of severe mental illness behind bars begs the question of whether the mentally ill have been trans-institutionalized from mental hospitals to prisons and jails. To the extent that the untreated mentally ill are more likely to commit crime, and that deinstitutionalization was not offset by sufficient expansion of out-patient mental health services, the closing of U.S. mental hospitals may have contributed to the drastic increase in U.S. incarceration rates over the past several decades, with prisons and jails becoming de facto mental institutions.

In this paper, we analyze U.S. census data covering the period from 1950 to 2000 to assess the degree to which the mentally ill who would have been in mental hospitals in years past have been trans-institutionalized into prisons and jails. We begin with a detailed descriptive analysis of the population of state, county, and private mental hospitals as of mid century (essentially the population deinstitutionalized over the subsequent 50 years). We document the fact that many of those who were institutionalized in the 1950s and 1960s, and were subsequently deinstitutionalized, did not experience large increases in incarceration. In particular, the deinstitutionalization of women (who comprised nearly half the mental hospital population) as well as the elderly (who were nearly 30 percent of the mental hospital inpatient population at its peak) did not lead to substantial increases in incarceration for these groups. Conversely, those most likely to be incarcerated as of the 2000 census experienced pronounced increases in overall institutionalization between 1950 and 2000 (with particularly large increases

for black males). Thus, the impression created by the aggregate trends in Figure 1 is somewhat misleading as the composition of the mental hospital population differs considerably from the demographic composition of prison and jail inmates.

We then estimate the rate at which individuals who would have been institutionalized in years past have been trans-institutionalized into prisons and jails. The 1950 through 1980 census data permits separate identification of mental hospital inpatients and the incarcerated (prisons and jails combined). We construct a panel data set that varies by state, gender, race, and age and estimate the impact of changes in regional mental hospital inpatient rates on changes in regional incarceration rates controlling for a variety of fixed effects defined by the dimensions of the panel. For this early period, we find no evidence of trans-institutionalization for any of the demographic groups analyzed.

Beginning with the 1990 census, one can no longer separately identify mental hospital inpatients from prison and jail inmates among the institutionalized. However, as the population of mental hospital patients is negligible relative to the prison and jail populations in 2000 (60,000 for the former compared to over 1.9 million for the latter), one can assume that all institutionalized adults between 18 and 64 in 2000 are incarcerated. Hence, the 1980 mental hospital inpatient rate proxies deinstitutionalization over the subsequent time period while the difference between the measurable 1980 incarceration rate and the 2000 institutionalization rate serves as a measure of the change in incarceration.

For the twenty year period from 1980 to 2000, we construct a data set measuring the change in incarceration as well as the change in mental hospital inpatient rates (using the imputations just described) by state, race, gender, and age. We find significant trans-institutionalization rates for all men and women, with a relatively large trans-institutionalization

rate for men in comparison to women, and the largest trans-institutionalization rate observed for white men.

We discuss two possible threats to the internal validity of our results for this latter period. First, budgetary pressures created by increasing incarceration rates may reduce resources allocated to mental health services within states and reduce state mental hospital populations as a result. Since we analyze trans-institutionalization for multiple demographic groups within a state, we are able to control for this possibility through the inclusion of state fixed effects interacted with race and gender in our incarceration-change models.

The second threat concerns the possibility that sentence enhancements and the increase in the scope of crimes punishable by incarceration may divert mentally ill individuals from state mental health systems into prisons and jails through an exogenous increase in the competing risk of incarceration. We test for this possibility using variation in incarceration growth around structural breaks in state incarceration time series and find evidence that causality is likely running in both directions. While this certainly muddies the interpretation of the partial correlations that we measure, both causal stories imply that more mentally ill serve time in prisons and jails rather than mental hospitals as a results of these policy shifts (whether driven by deinstitutionalization or sentencing). Given the internal day-to-day life in American prisons, this development most likely occurs to the detriment of those mentally ill individuals who are incarcerated as a result.

Regarding the numerical contribution of deinstitutionalization to prison growth, our estimates suggest that 4 to 7 percent of incarceration growth between 1980 and 2000 can be attributed to deinstitutionalization. While this is a relatively small contribution to prison growth overall, the results do suggest that a sizable portion of the mentally ill behind bars would not

have been incarcerated in years past.

2. Deinstitutionalization and the Criminal Justice System

Policies, Innovations, and Legal Decisions Driving Deinstitutionalization

The term deinstitutionalization refers to the set of policies and treatment innovation driving the more than half-million person decrease in the population of state and county mental hospitals between 1955 and the present. While some policy choices were explicitly and deliberately aimed at reducing the use of mental hospitals, the cumulative decline also reflects pharmacological innovations as well as changes in the delivery of health care and the inherent budgetary incentives created for states (Johnson 1990). Initial declines during the late 1950s are often attributed to the introduction of medications, particularly phenothiazine. Such medications are designed to control psychotic symptoms and may permit more effective outpatient treatment for the least severe cases of mental illness. A further impetus towards reduction came with the 1966 introduction of the Medicaid and Medicare programs. Under these programs, the federal government committed to a fifty percent match for treatment costs in nursing homes creating an incentive for states to transfer all eligible residents of mental hospitals (primarily the elderly mentally ill and those suffering from dementia) to nursing homes and other facilities. The reaction to this incentive by states accounts for much of the decline in the inpatient census during the 1960s and 1970s (Mechanic and Rochefort 1990).

The one policy change that embraced deinstitutionalization as an explicit goal occurred under the Kennedy administration. The 1963 Community Mental Health Service Act established Community Mental Health Centers (CMHCs) designed to provide outpatient, emergency, and partial hospitalization services for the mentally ill (Mechanic and Rochefort 1990). The

legislation embodied the shift in professional opinion among service providers toward outpatient care and residence in the community and away from traditional treatment in state mental hospitals.[2] A further force reducing inpatient population counts was the 1975 U.S. Supreme Court decision in *O'Connor v. Donaldson*. A key element of this decision was the finding that mental illness alone was not sufficient grounds for involuntarily commitment. In subsequent years, most states changed their involuntary commitment statutes to require that an individual be a danger to him or herself and/or to others, with varying evidentiary requirements. Most informed observers believe that involuntary commitment has become considerably more difficult as a result (Ross et. al. 1996; Treatment Advocacy Center, 200?, Worth 2001)

To the extent that outpatient mental health services are inadequate, deinstitutionalization exposes severely and chronically mentally ill individuals to a number of competing risks. The risk that has received the most attention from academics and the press concerns the relationship between untreated mental illness and homelessness (Jencks 1994, Torrey 1997). A competing risk that has received less attention concerns the probability of incarceration. The magnitude of the incarceration risk faced by the untreated mentally ill will depend on the degree to which the mentally ill are likely to commit crimes. Moreover, whether the mentally ill are incarcerated in jail (where individuals serving sentences of less than a year and those awaiting arraignment and trial are held) or prison (where those serving time for felonies with sentences of a year or more are held) will depend on the severity of offenses committed by this group.

Torrey (1997) notes that the mentally ill are often arrested for minor crimes such as shoplifting, engaging in publicly lewd behavior, or failure to pay for a restaurant meal, offenses

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[2]Many have questioned the effectiveness of this legislation, however, since the number of CMHCs falls far short of projected needs (Foly & Sharfstein 1983). Moreover, the CMHCs have been criticized as shunning individuals with the most severe and chronic mental health problems (Johnson 1990, Jencks 1994).

likely to result in a jail spell. Torrey also cites several instances of local authorities putting the mentally ill in local jails to provide a place for them to stay while awaiting more suitable psychiatric services.[3]

A prison sentence, on the other hand, requires being convicted of a serious felony. Several studies address the issue of whether the mentally ill commit violent acts at a higher rate than that observed for the general public.[4] An early review of this research documents the consistent finding that discharged mental patients are arrested and convicted for violent crimes at a rate that exceeds that of the general adult population (Godwin-Rabkin 1979). The more recent literature reviews provided by Monahan (1992) and Frank and McGuire (2009) arrive at similar conclusions, noting the robustness of the relationship between mental illness and violence to alternative methodological approaches and model specifications.[5]

How prevalent is mental illness among prison and jail inmates?

Analysis of recent inmate surveys does indeed reveal an over-representation of the seriously mentally ill among prison and jail inmates. Moreover, there is little indication that the incarcerated mentally ill are overly concentrated among jail inmate suggesting that the criminal justice interactions of the untreated mentally ill extend beyond being jailed for safekeeping. Table 1 presents estimates of lifetime prevalence of various mental illnesses from the 2004

[3]Torrey cites a 1992 survey of jails finding that 29 percent sometimes "...incarcerate persons who have no charges against them but are merely waiting for psychiatric evaluation, the availability of a psychiatric hospital bed, or transportation to a psychiatric hospital." (Torrey 1997, p. 37).

[4]Prior to the mid 1950s, most research found few differences, though the methodological soundness of this early research is questionable In a review of this early work, Godwin Rabkin (1979) questions the data sources of this early research. In addition, the author notes that early research used non-representative samples.

[5]Steadman et. al. (1998), assess the violent behavior of a sample of individuals discharged from acute psychiatric facilities. The authors find no difference in violent behavior between the mentally ill that do not abuse alcohol or drugs and members of the general population with no symptoms of substance abuse. For substance abusers, however, the mentally ill are relatively more violent, suggesting some interaction between mental illness and substance abuse. Frank and McGuire (2009) cite several studies that similarly find an interaction effect between mental illness and substance abuse on self-reported violent behavior.

Survey of Inmates in State and Federal Corrections Facilities (SISFCF) and the 2002 Survey of Inmates in Local Jails (SILJ). These estimates are based on questions inquiring whether inmates have ever received a diagnosis of a specific mental illness from a health care professional. Certainly, these figures under-estimate actual lifetime prevalence as there are likely to be many mentally ill inmates who have never been diagnosed.[6] For comparison, the table also presents two sets of prevalence estimates for the general adult population; estimates by Kessler et. al. (1994) from the original National Comorbidity Survey, and estimates by Kessler et. al. (2005) from the National Comorbidity Survey Replication. While we could not find comparable estimates for each condition included in the inmate surveys, these studies do provide lifetime prevalence estimates for the most severe mental illnesses (manic depression, schizophrenia, or another psychotic disorder).

Lifetime prevalence among state prison inmates and local jail inmates are nearly identical with roughly one-quarter of each indicating at least one diagnosis. The prevalence of severe mental illness (manic depression/bipolar, or a psychotic disorder) among state prisoners and local jail inmates is very high (nearly 15 percent of each population, or 3.1 to 6.5 times the rate observed for the general adult population). The rates of mental illness among federal prison inmates are somewhat lower. However, as federal prison inmates account for only 13 percent of the prison population, the overall prevalence of mental illness among prison inmates is much closer to the figures for state prisoners.

Tables 2, 3, and 4 present tabulations of average demographic as well as criminal history characteristics for state prisoners, federal prisoners, and jail inmates (respectively) by mental

6 These surveys also include a series of questions meant to gauge the presence of symptoms indicative of mania or a psychotic disorder. Prevalence estimates among inmates based on these questions are considerably higher (see James and Glaze 2006). Here we tabulate the data using ever-been-diagnosed to identify the most seriously mentally ill inmates.

health status. Each table provides tabulations for all inmates, for inmates with no diagnosed mental illness, for inmates with any diagnosis, and for inmates diagnosed with bipolar disorder/manic depression or psychotic disorder (who we refer to as the severely mentally ill). There are several notable patterns in Table 2. First, while males and racial and ethnic minorities are heavily over-represented among state prison inmates relative to the overall U.S. adult population, this is less the case among mentally ill inmates, especially among the severely mentally ill. For example, while 93 percent of state prison inmates are male, approximately 85 percent of severely mentally ill inmates are male. Similarly, while whites account for 49 percent of all inmates, the comparable figure for the mentally ill is 63 percent.

These patterns are consistent with the body of research documenting differences in the prevalence of mental illness across demographic and socioeconomic groups. In their review of fifty years of research on the topic, Frank and Glied (2006) find relatively comparable lifetime prevalence rates of severe mental illness for men and women and for different racial groups. While low socioeconomic status adults are over-represented among the mentally ill (whether measured by own income and education or parental characteristics), it is difficult to rule-out a reverse causal effect of mental illness on socioeconomic status.[7] Regardless, as mental illness does not discriminate by race and gender, it is noteworthy that the demographics of the incarcerated mentally ill are closer to the demographics of the general adult population than are those for the incarcerated overall.

A second notable pattern among state inmates is that the mentally ill are only slightly more likely to serving time for a violent crime (50.6 percent of all mentally ill compared to 47.1 percent of inmates without a diagnosis). The severely mentally ill are considerably more likely

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7 While one might contend that socioeconomic status based on parental characteristics takes care of this problem, there is strong intergenerational correlation between the mental health of parents and their offspring (Gottesman 1991).

to be serving time for a property crime (6 percentage points more likely), and are somewhat less likely to be doing time for a drug offense.

Finally, mentally ill prison inmates are more likely to indicate that they suffered a spell of homelessness in the year preceding the arrest leading to their current incarceration.[8] While 17.3 percent of inmates with severe mental illness experienced homelessness prior to their current arrest, the comparable figure for inmates with no diagnosed mental illness is 6.5 percent.

We observe similar demographic patterns for federal prison inmates, with lower proportions male, higher proportion white, and lower proportions Latino and black among the severely mentally ill. We also observe a strong relationship between mental illness and the likelihood of being homeless prior to arrest. Mentally ill federal inmates are considerably more likely to be held for violent crime than are inmates with no diagnosis (28 percent for the severely mentally ill compared with 14 percent for inmates with no diagnosis) and considerably less likely to be serving time for a drug crime. One pattern that is unique to the federal system concerns the proportion serving time for a weapons violation. Inmates with severe mental illness are eight percentage points more likely to be help for a weapons violation than are inmates with diagnosed metal illness. Under federal law, individuals who have been "adjudicated mentally defective" or "committed to a mental health institution" are prohibited from purchasing firearms (Daly 2008). This differential treatment of the mentally ill under federal law may explain this disparity.

The comparisons for jail inmates largely conform to the patterns observed for state and federal prison inmates. We see similar patterns with regards to gender and race. Over one-fifth of several mentally ill inmates were homeless prior to arrest. Severely mentally ill inmates are

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8 In the inmate surveys, the period before arrest to which the question applies pertains to either the period between a previous incarceration and the current incarceration or the year prior to the current arrest. The former is the reference period when there is less than one year between a previous incarceration and the arrest leading to the current incarceration.

also nearly twice as likely to have been arrested for a violent crime relative to inmates with no such diagnosis. One interesting finding that jumps out from this table is the relatively small proportion of inmates who are being held for safekeeping. Only half a percent of all inmates are described in this manner. While the proportion held for safekeeping among the mentally ill is three times that for non-mentally ill inmates, only one percent of jail inmates with severe mental illness are being held for this reason.[9]

Prior research on the trans-institutionalization of the mentally ill

The prevalence rates in Table 1 and the comparisons of inmate characteristics in Tables 2 through 4 clearly indicate that the mentally ill are at relatively high risk of experiencing incarceration. Moreover, mentally ill inmates are often serving time for quite serious, often violent crimes, while on any given day there are relatively few being held for safekeeping. To be sure, a high propensity among the mentally ill to commit violent acts and a relatively high incidence of mental illness among prison inmates do not imply that the closing of mental hospitals contributed significantly to growth in prison populations. If the difference in the propensity to commit violent acts is slight, deinstitutionalization may not cause notable increases in prison populations. Moreover, it is plausible that the incidence of mental illness among criminal offenders has always been high and that the mentally ill who would have been hospitalized in the past and the mentally ill who commit crime are separate populations.

There are, however, two studies that directly correlate prison populations with mental hospital population. Penrose (1939) is probably the first to raise the issue. Data on 18 European countries revealed a negative correlation between the size of the prison and mental hospital populations. Based on this inverse correlation, Penrose advanced what he labeled the "balloon

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9 To be sure, it may be the case that many mentally ill individuals are arrested and held overnight for safekeeping. However, if such arrests are followed by unusually short jail stays (a night or two), in the steady state we may not observe a very large group of inmates held for this reason on any given day.

theory;" assuming a stable population in need of institutionalization, squeezing the population of one institution (for example, closing mental hospitals) will cause a ballooning of the other as the displaced population is transferred. By modern standards the study is flawed,[10] but it is interesting to note that the inverse relationship observed in Figure 1 existed in a different time and place.

A more recent study provides a simple time series analysis of aggregate national data for the U.S. between 1926 and 1987 (Palermo, Smith, & Liska 1991), revealing significant negative correlations between the size of mental hospital population and prison and jail populations. No attempt is made to control for other possibly important variables or to assess the direction of causality. Nonetheless, the correlations are strong (the Pearson correlation coefficients for various time periods range from -.4 to -.5) and highly significant.

To summarize, existing research documents a significant relationship between mental illness and a propensity towards violent behavior. In addition, the rate of mental illness among prison inmates far exceeds that for the general population. Two studies which correlate prison populations with mental hospital populations find a negative correlation. These studies, however, are based on highly aggregated data, do not attempt to control for other factors, and make no attempt to assess the direction of causality.

3. Putting an Upper Bound on the Possible Contribution of Deinstitutionalization to Prison and Jail Growth

The research findings regarding the relationship between severe mental illness and criminal activity, combined with the over-representation of the mentally ill behind bars suggests

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[10]There is no attempt to control for other determinants of the institutionalized population and no attempt to net out common trends -- i.e., the panel aspects of the data analyzed are not fully exploited.

that deinstitutionalization may be an important contributor to U.S. prison growth during the last few decades of the 20th century. However, a careful analysis of the characteristics of those in mental hospitals during the peak-period of use reveals large differences between the characteristics of those who were subsequently deinstitutionalized and those who experienced large increases in incarceration rates.

To be specific, prison and jail inmates in the United States are overwhelmingly male, disproportionately minority, and are relatively young. The same cannot be said for mental patients at mid century. Table 5 uses data from the Public Use Microdata Samples (PUMS) of the U.S. Census of Population and Housing for the years 1950 through 1980 to characterize mental hospital inpatients, prison and jail inmates, and the non-institutionalized.[11] Beginning with tabulations for 1950, there are several notable differences between the inpatient and correctional populations. First, the mental hospital population is considerably older with larger proportions over 40 and a population 65 and over that is more than ten times the comparable figure for the correctional population. Second, the proportion black or Hispanic is not appreciably larger than the comparable proportion for the non-institutionalized population, while minorities are very much over-represented in prisons and jails. One of the most pronounced disparities is the gender composition. Nearly half of the mental hospital population is female, while in 1950 only 9 percent of those in prison or jail are women.

Between 1950 and 1980, the mental hospital inpatient population becomes younger, more minority, and more male, although the elderly and women still constitute larger proportions of the population of mental hospital inpatients than they do of prison and jail inmates. These changes suggest that deinstitutionalization proceeded in a non-random fashion, with

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11 For each of the census years, one is able to distinguish those in mental hospitals from those in correctional institutions using the detailed group quarters variable.

institutionalization rates declining first for those who are perhaps the least likely to be trans-institutionalized (for example, women and/or the elderly), followed by subsequent declines in mental hospital institutionalization among groups who subsequently experience increases in incarceration (young men and racial and ethnic minorities). While we cannot characterize further changes in the composition of the mental hospital population beyond 1980, we know from aggregate statistics that by 2000 the mental hospital population becomes trivially small. Hence, the mental hospital population depicted in 1980 largely represents the demographics of deinstitutionalization over the subsequent two decades.

These demographic differences between prison and jail inmates and mental hospital patients suggest that the potential impact of deinstitutionalization on prison growth is substantially less than what one might infer from comparisons of aggregate time series. While the time series presented in Figure 1 reveal a decline in mental hospital institutionalization rates of a comparable order of magnitude to the late century increase in incarceration a fact that may lead one to believe that we are simply re-housing the mental patients of 1950 in current prisons and jails, the demographic dissimilarities in Table 5 suggest that one should be cautious about drawing such an inference.

To illustrate the importance of these compositional differences, we pose the following two questions. First, how has the overall institutionalization risk (in either mental hospitals or prisons/jails) for someone who is institutionalized in 2000 changed since 1950? Second, how did the institutionalization risk for someone institutionalized in 1950 change over the subsequent half century? To the extent that we have simply transferred the same types of people from one institution to another, the 2000 institutionalization risk of the currently institutionalized should resemble their comparable institutionalization risks at mid-century. Similarly, the

institutionalization risks of those institutionalized in 1950 should be comparable in magnitude to the comparable risk in 2000.

To answer these questions, we calculate the following weighted average institutionalization risks. Let i index the eight age groups between 18 and 64 listed in Table 5, r index the four race/ethnicity groups, g index gender, and t index year. Furthermore, define w_{girt} as the proportion of the institutionalized population in year t that is of gender g, age group i, and race/ethnicity group r, and define I_{girt} as the corresponding institutionalization rate for this group. Taking the product of the group specific institutionalization rate and the group institutionalization share and summing over all dimensions gives the institutionalization risk for someone with demographic characteristics that mirror those of the average institutionalized person. For example, this institutionalization risk in 2000 for those institutionalized in 2000 is

(1)
$$IR_{2000}^{2000} = \sum_g \sum_i \sum_r w_{gir2000} I_{gir2000}.$$

The institutionalization risk in equation (1) will of course exceed the overall institutionalization rate as it is a weighted average with higher weights placed on those demographic groups that disproportionately comprise the institutionalized population.

To answer the two questions posed, we calculate the institutionalization risk for each analysis year for the institutionalized population from a specific year. For example, the institutionalization risk in 1950 for someone with demographic characteristics that resemble the institutionalized in 2000 is given by the equation

$$IR_{1950}^{2000} = \sum_g \sum_i \sum_r w_{gir2000} I_{gir1950}.$$

(2)

To the extent that we are institutionalizing the same people in 2000 as we did in 1950, the

alternative risk measures in equations (1) and (2) should be of comparable magnitude. Calculating subsequent institutionalization risks for those who resemble the institutionalized in 1950 simply requires substituting the 1950 weights for the 2000 weights and the group-specific institutionalization rate for subsequent years.

Figure 2 graphically depicts the actual overall institutionalization rate for adults 18 to 64 years of age as well as the institutionalization risk for those who resemble the 2000 institutionalized population and for those who resemble to 1950 institutionalized population. The overall institutionalization risk exhibits a pattern comparable to that in Figure 1; a substantial decline between 1960 and 1980 from 1,156 per 100,000 to 716 per 100,000 followed by a more than offsetting increase to 1,309 per 100,000 in 2000. Regarding the time series for the institutionalization risk weighted by the 1950 institutionalized population shares, the institutionalization risk for this group exceeds the overall risk in the peak year of 1960 by about 14 percent. However, by 2000 the institutionalization risk for this group falls short of the overall institutionalization rate by approximately 7 percent. Moreover, relative to the 1960 peak this weighted institutionalization risk declines by nearly 9 percent.

By contrast, the institutionalization risk weighted with the 2000 institutionalization shares exhibits a sharp increase between 1950 and 2000. Relative to the peak year of 1960, the institutionalization risk for this group increase nearly 80 percent from 2,521 per 100,000 to 4,512 per 100,000. In conjunction, these two series suggest real declines in the institutionalization risks for those who would have been institutionalized in the past (both absolutely and relative to overall trends) and real, particularly large increases in institutionalization risks for those who are most likely to be institutionalized today.

Figures 3 and 4 reproduce the analysis by gender. For women, institutionalization rates

have declined quite sharply overall. For women likely to be institutionalized in 1950, the decline exceeds the declines for women overall. Even among women who disproportionately comprise the institutionalized in 2000, the overall institutionalization risk has declined over the period depicted. However, the risk for this latter group of women increases somewhat between 1980 and 2000.

The results for men are comparable to the results for all adults present in Figure 2, with some slight difference. We still see that the institutionalization risk weighted by the 1950 male institutionalized population exceeds the overall risk for males in 1950 and 1960, but falls below the overall risk after 1970. For these men, however, the overall institutionalization risk does increase somewhat from the 1960 peak (1,701 per 100,000 in 1960 to 1,924 per 100,000 in 2000). Among men from demographic groups reflecting the 2000 institutionalized population, the institutionalization risk increases sharply.

The dissimilarities between those in mental hospitals and those in prisons and jails as well as the limits of the potential contribution of deinstitutionalization to prison growth becomes particularly salient when we take a close look at the period between 1980 and 2000. Note, nearly 92 percent of growth in U.S. incarceration rates occurring between 1950 and 2000 happens during this latter period, with most of the remaining eight percent occurring during the latter half of the 1970s. Figures 5 through 8 present comparisons of mental hospitalization rates in 1980 to change in incarceration rates between 1980 and 2000 for white and black males (figures 5 and 6) and white and black females (figures 7 and 8). Each figure provides comparisons for eight age groups between 18 and 64. Note, we would ideally wish to compare the change in mental hospital institutionalization rates over this period to the corresponding changes in incarceration rates. However, the census does not separately identify the incarcerated from mental hospital

inpatients in public use microdata beyond 1980. Nonetheless, we know that by 2000 the overall population of state and county mental hospitals declines to below 60,0000 people, and declines in all states. Thus, if one assumes for the sake for the argument that the mental hospital population zeros-out by 2000, the change in incarceration can be measured by the difference between the 2000 institutionalization rate and the 1980 incarceration rate, while the change in mental hospital inpatient rates simply equals the inpatient rate for the base year 1980. Moreover, the base mental hospital population rate can be thought of as providing an upper bound estimate of the potential contribution of deinstitutionalization to incarceration growth.

For white males, the mental hospital inpatient rate in 1980 is roughly 12 to 17 percent of the change in incarceration rates occurring between 1980 and 2000, with larger percentage figures for older groups of males. For black males, the comparable figures are considerably smaller. For relatively young black males (under 40) the base mental hospital inpatient rates range from three to six percent of the change in incarceration occurring over the subsequent two decades. Similar to white males, the comparable figures for older groups of black males are higher, though never exceeding 20 percent of the actual change. For white women, mental base hospitalization rates constitute relatively larger proportions of the subsequent change in incarceration (40 to 60 percent) while for black females the comparable figures range from 10 to 30 percent across age groups.

These comparisons can be used to calculate an upper bound of the potential contribution of deinstitutionalization to incarceration growth as well as several estimates of the impact of deinstitutionalization under alternative trans-institutionalization rates between mental hospitals and prisons. To do so, we first tabulate what the incarceration rate would have been in 2000 for demographic groups defined by gender, race/ethnicity, and age assuming (1) that the mental

hospitalization rate did not decline from the 1980 value, and (2) that each one-person change in the mental hospitalization rate causes a one-person change in the incarceration rate of opposite sign. We then use actual 2000 population shares across the gender/race/age groups to tabulate a hypothetical overall incarceration rate in 2000. Comparing actual growth to counterfactual growth towards this hypothetical rate provides our upper bound estimate.

Table 6 provides some of the intermediate inputs for this tabulation (to conserve space, we don't provide the age-specific tabulations). The first two columns of figures present the actual incarceration rate in 1980 as well as the actual institutionalization rate in 2000 by gender and race/ethnicity. The third column presents the hypothetical incarceration rate for each group assuming one-for-one trans-institutionalization and assuming a change in mental hospital inpatient rates equal to negative one times the base rate in 1980. The fourth and fifth columns provide alternative hypothetical estimates assuming trans-institutionalization rate of 0.5 and 0.25.

The results of this exercise reveal the likely modest contribution of deinstitutionalization to incarceration growth. Starting with black males (the group most over-represented among the incarcerated and that experiences the largest growth in incarceration), these tabulations indicate that at most deinstitutionalization contributed 331 persons per 100,000 to the 5,842 persons per 100,000 change in the incarceration rate experienced by black males (less than 6 percent of growth). For white males, the tabulations suggest that deinstitutionalization could be culpable for at most 17 percent of incarceration growth. The comparable figure for Hispanic males is four percent. Among women, the upper bound estimates suggest that deinstitutionalization may be a proportionally more important contributor to incarceration growth (39 percent for white women, 19 percent for black women, 16 percent for other women, an 26 percent for Hispanic women).

Naturally, when we assume lower trans-institutionalization rates, the tabulated contribution of deinstitutionalization to prison growth falls.

Of course, our upper bound estimate of the overall contribution of deinstitutionalization to prison growth over this latter time period will more closely reflect the group-specific estimates for demographic groups that constitute disproportionate shares of the prison population. That is to say, the overall impact will be closer to that of males, and in particular, to that of black and Hispanic males. Figure 12 graphically displays the actual incarceration rates for 1980 and 2000 and several hypothetical overall incarceration rates in 2000 assuming no deinstitutionalization between 1980 and 2000 and one-for-one trans-institutionalization, trans-institutionalization of one-half for one, and trans-institutionalization of one-quarter for one. The hypothetical 2000 incarceration rate assuming a one-for-one transfer rate is roughly 90 percent of the actual rate for that year. Growth between 1980 and this hypothetical rate amounts to 87 percent of the actual growth in incarceration rates occurring between 1980 and 2000. In other words, these tabulations indicate that deinstitutionalization over this periods can account for no more than 13 percent of corresponding growth in incarceration. To be sure, the estimated contributions to incarceration growth are smaller when we assume lower trans-institutionalization rates (7 percent assuming a transfer rate of 0.5 and 3 percent assuming a transfer rate of 0.25).

While the potential contribution to overall incarceration growth is relatively modest, the potential contribution to growth in incarceration levels of the mentally ill is much larger. Above, we presented estimates from inmate surveys finding that 14.3 percent of state prison inmates, 6.1 percent of federal prison inmates, and 14.7 percent of local jail inmates have a prior diagnosis of severe mental illness. Combining these lifetime prevalence rates with 2000 correctional population totals suggests that in 2000 there was roughly 277,000 incarcerated severely mentally

ill individuals (66 percent of which were in state or federal prison). The hypothetical estimate in Figure 12 assuming a one-for-one transfer rate suggests that deinstitutionalization contributed a maximum of 129 per 1000,000 to the adult incarceration rate in 2000. With approximately 108 million adults between 18 and 64 in 2000, this contribution translates into 140,000 additional prisoners (roughly half of the population of incarcerated persons with severe mental illness).

Moving beyond upper-bound estimates requires that we generate more precise estimates of the trans-institutionalization rate. We turn next to this estimation challenge.

4. Estimating the Transfer Rate from Mental Hospitalization to Incarceration

There are a number of reasons to suspect that the empirical relationship between the mental hospital inpatient rate and the incarceration rate should be heterogeneous, with a stronger empirical association in latter years, and perhaps a stronger association for certain demographic subgroups. Given the differences between the impetus to early deinstitutionalization (the introduction of pharmacological therapies and the incentives created by Medicare to transfer the elderly to nursing homes) and the forces driving latter declines (legal challenges to involuntary commitment and state legal reforms making such commitments relatively more difficult), it is likely that deinstitutionalization followed a chronologically selective path with the least ill and perhaps the least prone to felonious behavior deinstitutionalized the earliest. This alone suggests that the impact of declining inpatient populations on prison growth may be larger during the latter decades of the twentieth century.

Beyond selective deinstitutionalization, the impact of declining hospitalization rates on prison counts should interact with the degree of stringency in sentencing policy. In other words, a one person decline in the mental hospitalization rate will have a larger impact on incarceration

the more likely society is to incarcerate a criminal offender and the longer the effective prison sentence. A further concern is the possibility that increases in incarceration may be causing declines in the mental hospital population, to the extent that the mentally ill get caught up in correctional systems or if correction expenditures displace expenditures on mental health services.[12]

These issues are best demonstrated with a simple mechanical Markov model of steady-state incarceration and hospitalization rates. Define N as the proportion of the population that is not incarcerated and not in a mental hospital, M as the proportion in mental hospitals, and P as the proportion in prison. The vector $S'=[N,M,P]$ thus describes the distribution of the adult population across these three possible states of being. All three possible states are dynamic in the sense that individuals flow into and out of each state over defined time periods and in that the response to changes in the underlying determinants of each probability, the vector of population shares adjusts over time towards a steady-state vector share.

Transitions between the three states are governed by the transition probability matrix

(3)
$$T = \begin{bmatrix} 1-T_{NM}-T_{NP} & T_{NM} & T_{NP} \\ T_{MN} & 1-T_{MN} & 0 \\ T_{PN} & 0 & 1-T_{PN} \end{bmatrix},$$

where T_{ij} is the probability of transitioning from state i to state j in any given period (with $0 \leq T_{ij} \leq 1$), and where the transition probabilities in any given row must sum to one. For simplicity, we assume that the direct transition probabilities from mental hospitals to prison and from prison to mental hospitals are zero. While the elements of the matrix **T** are certainly determined in part by behavior (for example higher offending levels should increase T_{NP}), so will the policy changes

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12 Indeed, Gertskow and Ellwood (2009) find that correctional expenditure do displace spending on budget items usually covered by state health services departments.

and innovations driving deinstitutionalization as well as sentencing and corrections policy implemented in most states during the last quarter of the twentieth century. For example, raising the evidentiary bar for involuntary commitment would lower the transition probability, T_{NM}. Expanding the scope of offenses punishable by incarceration would increase T_{NP}. Enhancing prison sentences would reduce the flow rate out of prison, T_{PN}.

The steady-state population share vector is implicitly defined by the condition

(4) $$TS = S$$

in conjunction with the adding-up constraint, $N + M + P = 1$. Using these two conditions to solve for the steady-state population shares yields the solutions

(5) $$M = \frac{T_{PN}T_{NM}}{T_{PN}T_{MN} + T_{PN}T_{MN} + T_{MN}T_{NP}}$$

(6) $$P = \frac{T_{MN}T_{NP}}{T_{PN}T_{MN} + T_{PN}T_{MN} + T_{MN}T_{NP}}$$

(7) $$N = 1 - M - N.$$

Equations (5) and (6) can be used to illustrate how the relationship between deinstitutionalization and prison growth is likely to change over time. The steady-state solutions are also useful for uncovering a somewhat subtle identification problem that will muddy our interpretation of the coefficient estimates below. Beginning with the solution for M, one can characterize deinstitutionalization as reducing the admissions rate into mental hospitals, T_{NM}, and decreasing the length of stay for anyone committed to mental hospital (with the reduction in spell length captured by an increase in the transition probability T_{NM}). It is simple to verify that

$\dfrac{\partial M}{\partial T_{NM}} > 0$ and that $\dfrac{\partial M}{\partial T_{MN}} < 0$. Hence, both developments would lead to declines in the mental

hospital inpatient rate.

The impact of these changes on the incarceration share can be analyzed by differentiating

equation (6) with respect to the transition rates into and out of mental hospitals. Doing so yields

the result that the proportion incarcerated decreases when the admission rate into mental hospital

increases while the incarceration rate increases with increases in the transition rate out of mental

hospitals – i.e., $\dfrac{\partial P}{\partial T_{NM}} < 0$ and that $\dfrac{\partial P}{\partial T_{MN}} > 0$. In essence, these derivatives represent the trans-

institutionalization effect of deinstitutionalization that is the central question of this paper.

The suspicion that the values of these partial derivatives will differ at different points in

time is based on the fact that the transition parameters into and out of prison are not stable over

time. Raphael and Stoll (2009) demonstrate that between 1984 and 2002 the admissions rates

into U.S. prisons increased sharply as did the expected value of time served conditional on the

conviction offense (increases in time served results in decreases in T_{PN}). The effects of these

changes on our parameter of interest depend on the sign of specific cross partial derivatives of

the steady-stat incarceration rate.

For example, suppose that prison admissions increase due to enhanced resource

allocation to police investigations and prosecutions. Such a change would lead to an increase in

the transition probability T_{NP}.[13] This change will impact the marginal effect of transfer rates into

and out of mental hospitals on the incarceration share, effectively enhancing the impact of

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13 Here, we are abstracting from any deterrent effects of the increased risk from incarceration on the prison admissions rate. This necessarily follows from the pure mechanical nature of the model we have laid out, where there is essentially no allowance for systematic behavioral responses to criminal justice or mental hospitalization parameters. However, so long as the deterrent is relatively small, one would still expect an increase in admissions rates in response to increased allocation of resources of police and prosecutorial activity.

changes that lead to further deinstitutionalization of the mentally ill. This follows from the fact that the cross partial derivative, $\dfrac{\partial P}{\partial T_{NM} \partial T_{NP}}$, is negative. In other words, the negative effect on the incarceration rate of an increase in mental hospital admissions is larger (in absolute value) the larger the admission rate to prison. Conversely, the positive impact on incarceration rates of decreasing mental hospital admissions will be larger the higher the prison admissions rate. A similar argument can be made with respect to the cross partial derivate $\dfrac{\partial P}{\partial T_{MN} \partial T_{NP}}$. As this cross-partial derivative is positive, the effect on incarceration of increasing the release rate out of mental hospital is enhanced by a higher admissions rate into prison.[14]

The steady-state equation for the mental hospitalization rate is also useful for illustrating one of the several identification problems that we face in interpreting any correlation between incarceration and hospitalization rates. Specifically, differentiating equation (5) with respect to the two incarceration transition probabilities, it is easy to show that $\dfrac{\partial M}{\partial T_{NP}} < 0$ and that $\dfrac{\partial M}{\partial T_{PN}} > 0$.

In other words, policy choices that increase the prison admissions rate will decrease the mental hospital population share as will policy choices that increase sentence length. As such changes would increase the incarceration rate the move towards stiffer sentencing in the 1980s and 1990s will create an inverse relationship between the mental hospitalization and incarceration rates. Here, however, the interpretation is different. Rather than a reduction in services for the mentally ill leading to increased incarceration, stiffer sentencing essentially increases the competing risk that the mentally ill get swept into corrections systems before ever being able to be hospitalized for their ailments.

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14 One could also work through the cross-partial effects of increasing prison sentence lengths (which would cause a decline in T_{PN}) on the marginal effect of further deinstitutionalization on incarceration rates. Naturally, longer sentences enhance the impact reductions in mental hospital admissions and increases in releases.

In the remainder of this section, we present a series of estimates of the trans-institutionalization rate between mental hospitals and prisons that attempt to account for some of the factors raised by this simple model. In particular, we first estimate the empirical relationship during the early phases of deinstitutionalization (1950 through 1980). We then present estimates for the period from 1980 to 2000. Finally, we present some tests to assess whether changes in incarceration are in part driving declines in the mental hospitalization rate.

Estimates for 1950 through 1980

To estimate the trans-institutionalization rate for this early phase of deinstitutionalization, we employ data from the one percent PUMS files of the U.S. census for the years 1950, 1960, 1970, and 1980. Again, these census years permit separate identification of those institutionalized in mental hospitals and those institutionalized in jails or prisons. For each year, we estimate the proportion in mental hospitals and the proportion incarcerated for demographic sub-groups defined by state of residence, gender, the eight age groups listed in the stub of Table 5 between 18 and 64, and the four mutually-exclusive race/ethnicity groups that we have been using throughout our discussion. We estimate a series of models where the dependent variable is the group-specific inter-census change in the incarceration rate and the key explanatory variable is the corresponding change in the hospitalization rate.

The exact model specification that we estimate for each gender is given by

(8) $\Delta Incarceration_{tsgra} = \alpha_{tsg} + \beta_{sgr} + \delta_{sga} + \gamma_g \Delta hospitalization_{tsgra} + \varepsilon_{tsgra}$

where t indexes specific ten year periods, s indexes states, g indexes gender, r indexes race/ethnicity, a indexes age groups, $\Delta Incarceration_{tsgra}$ is the inter-census change in the incarceration rate for a specific ten year period, in state s, for group gra, $\Delta hospitalization_{tsgra}$ is

the corresponding change in the mental hospitalization rate, $\alpha_{tsg}, \beta_{sgr}, \delta_{sga}$, and γ_g are parameters to be estimated, and ε_{tsgra} is a random error term.

Note, the key parameter of interest, γ_g, is permitted to vary by gender. We expect a priori that this coefficient should be negative for both genders, but perhaps larger in absolute value for men relative to women. The specification includes decade-state-gender fixed effects to control for any corrections policy changes that may vary across decades and have differential impact on gender groups. These fixed effects also control for a possible reverse-causal impact of incarceration growth on hospitalization rates operating through budgetary displacement, assuming the impact of such budgetary pressures is the same within gender. The state-gender-race fixed effects adjust both series for average differences in ten-year changes in incarceration and hospitalization rates that vary by state, gender, and race, while the state-gender-age fixe effects account for similar differences along groups defined by this triple interactions. In addition, we also estimate equation (8) separately for each of the four racial/ethnic groups, effectively interacting all of the fixed effects with race and permitting the gender-specific trans-institutionalization parameter to vary for each racial/ethnic group. All models are weighted by the number of observations used to compute the incarceration rate in the starting year of the change observation. Finally, in calculating standard errors for our parameters, we cluster on gender-race-state-age cells.

Table 7 presents estimations results for the period from 1950 to 1980. For all men pooled, men by race/ethnicity, all women pooled, and women by race/ethnicity, the table reports estimates of the trans-institutionalization parameter from several alternative specifications. First, we estimate the parameter with no controls. Next, we add year, state, age, and race fixed effects. We then add interaction terms between year and state to the previous specification. Finally, we

estimate the complete model as specified in equation (8). There is essentially no evidence of a negative relationship between incarceration and institutionalization rates during this early period. All of the coefficients are relatively small and insignificant, and few have the theoretically expected sign. Thus, we conclude that during the early phases of deinstitutionalization, there is no evidence that the declining mental hospital population counts contributed to prison growth.[15]

Estimating the Tran-Institutionalization Parameter for the 1980 to 2000 Period

Beginning with the 1990 census, the PUMS data stopped separately identifying mental hospital inpatients from prison and jail inmates among those enumerated by the census who were residing in institutional group quarters. Hence, the exact equation that we estimate for the earlier phase of deinstitutionalization cannot be estimated for this latter phase. However, the ability to separately identify mental hospital inpatients in 1980 coupled with the fact that the mental hospital population declined to very low levels by 2000 (despite substantial population growth over this time period) does allow us to construct a proxy for the actual change in hospitalization rates occurring within demographic groups.

Specifically, we gauge the change in hospitalization rates between 1980 and 2000 by negative one times the base hospitalization level in 1980. This approximation would be exact if the mental hospital population declined to zero by 2000. As this is not the case however, we sought corroborating evidence on the suitability of our proxy using state level data on state and county mental hospital populations for this time period. Figure 9 presents a state-level scatter plot of the change in mental hospital inpatients per 100,000 between 1980 and 2000 against the mental hospital inpatient rate in 1980. Note, our proposed proxy measure is basically the variable plotted on the horizontal axis (but measured at the level of each demographic sub-

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15 We also estimated models separately by decade to test for possible heterogeneity along this dimension. Similar to the results in Table 7 we found little evidence of a trans-institutionalization effect.

group). As is evident in the graph, the base level in 1980 is a very strong predictor of the overall change in hospitalization rates over the subsequent two decades. The slope coefficient on the bivariate regression lines fit to the data is near -1 (the exact coefficient is -0.73 with a standard error of 0.04) and the explanatory power of this simple regression is quite high ($R^2 = 0.87$). Hence, the 1980 hospitalization value provides a strong proxy for the subsequent change in hospitalization rates through 2000.[16]

For the period from 1980 to 2000, we thus estimate the equation

$$(9) \qquad \Delta Incarcerat\ ion_{gsra} = \alpha_{gsr} + \beta_{gsa} + \gamma_g\ hospitaliz\ ation\_1980_{gsra} + \varepsilon_{gsra}$$

where all dimensions and variables are as define above, and where we have substituted the base mental hospitalization rate for the actual change. There are a few differences between this model and that specified for the earlier period that bear mentioning. First, since we observe only one change per demographic group (following from the fact that we cannot observe hospitalization rates for 1990) we have dropped the time subscript and all interactive fixed effects with time. Second, since we cannot separately identify the incarcerated from mental hospital inpatients in 2000, we effectively assume that all adults within our age range of study that are in institutional group quarters in 2000 are incarcerated in prisons or jails. Hence, the change in incarceration for each sub-group is measured by the overall institutionalization rate in 2000 for that group minus the proportion incarcerated in 1980. Similar to the results for the earlier period, we also estimate equation (9) separately for each racial/ethnic. The one necessary change when we estimate separate models by race/ethnicity is that we must drop the gender-state-age interactions cine

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16 We also produced similar graphs using specific demographic cohorts for early decades for which we can observe mental hospitalization for both the beginning and ending years (for example, the change from 1970 to 1980 in the PUMS data). These analyses produced similar results – i.e., base level institutionalization rates are strong predictors of the actual changes occurring within specific demographics groups.

there is only one observation per age groups in each state.   Again, all models are estimated by the number of observations used to compute the incarceration rate in the starting year of the change observation. We estimate the model in equation (9) using data from the 5 percent PUMS files for 1980 and 2000.

Table 8 presents the results from this analysis. The first column presents estimates of the coefficient on the 1980 hospitalization rate[17] by gender and by gender interacted with race/ethnicity when no other controls are added to the model. The second column presents estimates of the trans-institutionalization effect from estimating the complete specification in equation (9). There is considerably stronger evidence of trans-institutionalization during this latter period, especially for men. The bivariate regression estimate for all men pooled yields an implausible large statistically-significant negative coefficient. After adding the complete set of fixed effects in equation (9), the coefficient attenuates considerably yet remains significant at the one percent level of confidence. The estimate suggests that each one percent change in the male hospitalization rate between 1980 and 2000 resulted in a 0.4 increase in the corresponding male incarceration rate.

The results for men by race and ethnicity reveal further heterogeneity in this relationship. The bivariate regression for white males gives a large positive and significant effect of changes in mental hospitalization on incarceration. The corresponding results from the complete specification, however, yields a significant (at the one percent level) negative impact for white males. In fact, the estimate suggests a near one-for-one transfer rate from mental hospitals to prisons for white men over this time period. For black males, the bivariate estimate is negative yet insignificant while the estimate from the complete specification is negative (-0.501) yet

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17 Before estimating the regression we multiplied the base hospitalization rate by negative one. With this transformation, evidence of a trans-institutionalization effect would require a negative statistically significant coefficient on the pseudo-change in hospitalization.

imprecisely estimated.   The p-value on this coefficient is 0.130.   For other men and Hispanic men there is no evidence of trans-institutionalization.

The results for women indicate that the relationship between the hospitalization and the incarceration rate is substantially weaker than that observed for men. For women overall, the coefficient estimate on the pseudo-change in hospitalization is significant and negative in both the bivariate model as well as in the complete specification (at the one percent level in the former and the 10 percent level in the latter).   The magnitudes of these estimates, however, are substantially lower than those observed for men.   While there are several negative coefficients in the race/ethnicity-specific estimate for women, none of the estimates from the complete model specification are significant.

Thus, we do find evidence of trans-institutionalization for the latter phases of deinstitutionalization but not for the first few decades of this process. This pattern is in line with expectations, as deinstitutionalization proceeded in a chronologically selective manner and since those deinstitutionalized after 1980 (either literally through release or effectively by not being admitted to a mental hospital when in the past they would have) were subject to increasingly harsh penalties for criminal activity.

Did stiffer sentencing policies drive the decline in mental hospital inpatient populations?

In the introduction to this section, we raised two potential alternative interpretations of a negative relationship between mental hospitalization and incarceration, both where causation runs in the opposite direction of what has been hypothesized. First, budgetary pressures caused by increasing prison population may force states to pair back resources allocated to state mental hospitals. We believe that our empirical methodology addresses this particular threat to internal validity by the inclusion of state fixed effects in our change regressions and the analysis of

multiple demographic groups within states.

The second reverse-causal explanation is derived from our mechanical model of incarceration and hospitalization rates. In particular, we showed that in steady-state the population share in mental hospitals will depend on the parameters that determine the flows into and out of prisons. Policies that increase the flow into prison or reduce the flow out of prison will both increase the prison population at the same time that they reduce the mental hospital population. The qualitative interpretation of the large mentally-ill population currently behind bars is substantially different under this alternative scenario. Rather than deinstitutionalization effectively hoisting the mentally ill into state corrections systems, a more aggressive sentencing structure is capturing and punishing the mentally ill with incarceration, effectively diverting these individuals away from state mental health systems.

While this subtle difference in interpreting an inverse relationship may appear to be splitting hairs, the importance of this distinction extends beyond mere semantics. If deinstitutionalization post-1980 is responsible for this inverse relationship, than it must necessarily be the case that the reduction in the likelihood of a mental health intervention has resulted in more crime, and by extension more crime victims, than the nation would have otherwise experienced has this change not occurred. On the other hand, if newly aggressive sentencing is driving the inverse relationship, then the criminal justice system is simply more likely to incarcerate (and perhaps incarcerate for longer periods) those among the mentally ill who commit felonies. Under such circumstances, crime may actually decrease due to greater incapacitation.

One way to address this more subtle identification problem would be to find a third factor that impacts mental hospitalization rates but impact prisons only indirectly through its impact on

hospitalization. With such a variable, we could re-estimate the models in Tables 7 and 8 using instrumental variables rather than OLS. We were unable to identify such a variable that varies at the level of demographic groups that we employ in this paper. One possibility that we explored in detail is to use inter-state differences in the stringency of laws pertaining to the involuntary commitment of the mentally ill and re-estimate our model using state-level data on incarceration and hospitalization. The intuition here is that states with more stringent standards should have exogenously lower mental hospital populations. Quantifying these standards across states and over time, however, proved to be quite difficult. First, the language of state statutes is quite similar and thus it is difficult to identify differences that in practice would result in differences in hospitalization rates. For example, all states allow for the involuntary civil commitment of those who, as a result o their illness, pose a danger to themselves or others. The primary existing differences pertain to whether someone who is "gravely ill" (unable to care for oneself) can be involuntarily committed and the evidentiary requirements stipulated in the legislation (Ross, Rothbard, and Shinnar 1996). We are unable to find a strong first-stage effect of this statutory variation on hospitalization rates.[18]

Second, the existing body of state case law plays an important role in determining how easy or hard it is to commit someone involuntarily (Brakel, Parry, and Winer 1985, LaFond and Durham 1992). Given that this case law is not necessarily reflected in the language of state statutes and given the enormity of the task of categorizing the body of cases related to involuntary commitment proceedings, using variation in state precedents does no appear to be a

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18 We estimated several alternative two-stage-least-squares models using a single year of cross-sectional state observations and two alternative characterizations of state involuntary commitments laws. In the first model we used data from the 1980s and a classification scheme developed by Ross, Rothbard and Shinnar (1996). While we did find a weak first-stage relationships, the standard errors from the 2SLS model for our parameter of interest was too large to draw any conclusive inferences. For the second model, we used a classification scheme constructed by the American Bar Foundation (Parry 1994) characterizing state laws as of 1994. Here we find no first stage relationship. The two classifications schemes are sufficiently different to prevent their combinations to form a two-year panel.

viable identification strategy.

Having few options for identifying the effect of mental hospital on prisons, we turn to trying to rule out a causal relationship in the opposite direction. In particular, we sough to identify exogenous variation in incarceration rates to assess whether a shock to corrections transition rates results in subsequent declines in the mental hospitalization rates.

To be sure, identifying and operationalizing a policy instrument that exogenously impacts incarceration rates is as difficult as finding an instrument for inpatient hospitalization rates. Here we exploit the fact that in most states, the initiation of incarceration growth tended to occur with a sharp break from previous trends. We identify the year when state incarceration rate growth commences along an accelerated path relative to a pre-defined historical average. We then assess whether the pace of deinstitutionalization accelerates around these structural breaks and also assess whether the change in growth rates in the mental hospital inpatient rate accelerates relatively more in states with relatively sharp breaks in incarceration trends.

Figure 11 presents a scatter plot of state incarceration rates relative to the year when the state's incarceration permanently rises above its twenty year-moving average. The figures presents incarceration rates for the seven years preceding the break date, the year of the break date, and the seven years following the break date. Trend lines estimated from bivariate regressions are also plotted on either side of the break year. To identify the breaks, we employ annual incarceration data covering the period from 1925 through 2004 from the National Prisoner Statistics data base. As most observable structural breaks (as we define them) occur during the 1970s, only states with sufficient prior data to estimate the twenty year moving average are included. A few states with continually increasing incarceration rates from relatively early periods (for example, from the 1940s and 1950s) are also excluded. In all, Figure 11

depicts the incarceration series around the identified breaks from 41 states. The distribution of break dates ranges from 1974 to 1981. There is a clear acceleration in incarceration growth around the timing of these structural breaks. The coefficients on the trends line increases from 1.64 prior to the break to 8.54 after, with the increase statistically significant at the one percent level of confidence.

To the extent that these sudden structural breaks are driven by shifts in corrections policy and that such shifts effectively divert people from state mental health services systems, one should see an acceleration of the pace of deinstitutionalization around these breaks. Figure 12 presents the corresponding scatter plot for state mental hospitalization rates. Contrary to this theoretical prediction, the rate at which hospitalization rates are declining declines following the structural breaks in the prison series (the slope coefficient on the trend line fit to the pre-break period is -10.77 while the coefficient to the right of the break is -2.85).

To be sure, the slowing of deinstitutionalization following these breaks may simply reflect the fact that inpatient rates at some point are bound from below – i.e., the overall decline in the slope post-break may reflect the maturation of this trend. An alternative test for reverse causality is to assess whether the pre-post change in annual changes in the mental hospital inpatient rate is higher in states that experience relatively larger pre-post changes in the annual changes in incarceration rates. The idea here is comparable to the identification strategy used in Johnson and Raphael (2008) to identify the effect of incarceration growth on crime. The authors exploit the disparity between a states actual incarceration rate and the steady-state incarceration rate implied by the rate at which states are admitting and releasing prisoners. When the actual rate falls short of the steady-state rate, one would expect the incarceration rate to rise in subsequent periods. Hence, the disparity between actual and current incarceration rates and the

hypothetical steady state rate serves as an instrument for subsequent change in incarceration.[19]

The intuition behind grafting this identification strategy to the current situation is the following. States that experience sharper structural breaks will experience sharper increase in the annual year-over-year changes in incarceration. Accelerated growth following the break year among states experiencing sharper breaks reflects state prison populations effectively "catching up" to relatively higher new steady-state values. If changes in incarceration reverse cause change in mental hospital inpatient rates, we should see sharper deceleration in deinstitutionalization among states experiencing relatively sharp breaks in prison growth rates.

To operationalize this test, for each state we first calculate the average of the six annual changes in incarceration rates and hospitalization rates occurring during the seven-year period preceding the identified break in incarceration (not inclusive of the break year). Next, we calculate the comparable averages for the seven-year period following the break year (again, not inclusive of the break year). We then calculate the pre-post break changes in these average year-over-year changes for the two institutionalized populations. If prison increases are causing further declines in mental hospital inpatient rates, we should see lower relative increases in annual changes in inpatient rates (i.e., smaller decelerations in deinstitutionalization) in states experiencing sharper breaks in their incarceration trends.

Figure 11 presents the results from this exercise. The figure plots the pre-post change in annual inpatient growth against the pre-post change in incarceration growth. We find a negative relationship (significant at the five percent level of confidence) between the degree to which annual prison growth accelerated and the degree to which the deinstitutionalization of the mentally ill decelerated.

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19 The exact instrument used by Johnson and Raphael (2008) is somewhat more complicated and derived explicitly from a theoretical model of incarceration and offending. The authors derive the conditions under which the proposed instrument is exogenous to any changes in human behavior that may simultaneously impact crime.

Hence while we do not observe an overall acceleration in deinstitutionalization around the timing of the structural acceleration in prison populations identified in figure 9, we do observe a relative acceleration in deinstitutionalization in states experiencing stronger accelerations in incarceration growth. What does this mean for the interpretation of our results? Essentially, the negative partial correlation between incarceration and hospitalization rates that we observe for some demographic groups for the period 1980 through 2000 likely reflects both causal effects of deinstitutionalization on prison as well as stiffer sentencing policies increasing the likelihood that the competing risk of prison wins our over that of mental hospitals for the mentally ill. We have already discussed the likely alternative implications of these two causal pathways with regards to crime. While a causal impact of deinstitutionalizations must necessarily result in additional crime and victimization to generate the prison increase, a causal effect in the opposite direction likely prevents crime through the earlier and perhaps longer incapacitation of the criminally-active mentally ill. That said, both causal stories imply that more mentally ill serve time in prisons and jails rather than mental hospitals as a results of these policy shifts (whether driven by deinstitutionalization or sentencing).

5. Discussion

The estimation results from the previous section can be used to estimate the proportion of prison growth attributable to those who in years past would likely have been mental hospital inpatients. Using the gender-specific trans-institutionalization parameter estimates for the 1980 to 2000 period, our estimates suggest that such individuals account for four percent of incarceration growth during this period. Employing the trans-institutionalization parameters estimated separately by gender and race, our models suggest that that the incarceration of those

who would have formally been hospitalized accounts for seven percent of prison growth between 1980 and 2000. Thus, despite the impressions created by the juxtaposition of aggregate trends, deinstitutionalization is not the smoking gun behind the tremendous growth in incarceration rates. While a significant contributor, mental health policy is of second-order importance when compared against the contribution of shifts in sentencing policy occurring within most states.

Nonetheless, it is certainly the case that a relatively high proportion of the currently incarcerated mentally ill would not have been incarcerated in years past and would be likely be receiving inpatient treatment in a mental facility. For the year 2000, our estimates indicate that there are between 40,000 and 72,000 incarcerated individuals who in years past would likely have been mental hospital inpatients. Relative to a stock of 277,000 severely mentally ill, this constitutes 14 to 26 percent of the mentally ill incarcerated population.

Certainly, it would be preferable from the viewpoint of the mentally ill as well as from that of crime victims to intervene prior to the commission of a felony. There is research evidence finding that mental health interventions impact violent crime, suggesting that the criminal activity associated with mental illness could be prevented through non-criminal justice channels. Perhaps most relevant to the current paper, Harcourt (2006) finds significant relationships between total institutionalization rates inclusive of mental hospital inpatients and state-level homicide, suggesting that the withdrawal of service in the form the shuttering of mental hospitals leads to more crime. A more positive development concerns the findings of Marcotte and Markowitz (2009). The authors demonstrate a negative association between increases in prescription for antidepressants and ADHD medication and violent crime. Both papers suggest that the current criminal activity attributable to the mentally ill is not a necessary consequence of this particular human ailment.

In addition, interventions that prevent incarceration among those with severe mental illness would certainly benefit those diverted from prisons and jails. The regimented, often predatory, environment common in U.S. prisons are not ideal setting for treating mental illness. It is likely the case that the mentally ill are at elevated risk for assault and victimization while incarcerated, and likely receive insufficient mental health services.

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Table 1
Lifetime Prevalence of Mental Illness Among Prison and Jail Inmates and the General Population

Have you ever been told by a mental health professional such as a psychiatrist or a psychologist that you have …	Prison		Jail	Non-Institutionalized	
	State, 2004	Federal, 2004	2002	All persons 18 and over, 2000-2002	All males 15 to 54, 1990-1992
A depressive disorder	0.191	0.108	0.194	0.166	0.121
Manic depression, bipolar, or mania	0.097	0.041	0.101	0.039	0.016
Schizophrenia or another psychotic disorder	0.046	0.020	0.046	0.007[a]	0.006[a]
Post-traumatic stress disorder	0.057	0.033	0.051	0.068	-
Another anxiety disorder such as panic disorder	0.071	0.046	0.071	0.057[b]	0.036[b]
Personality disorder such as antisocial or borderline	0.060	0.033	0.051	-	-
Any other mental or emotional condition	0.019	0.008	0.020	-	-
Any of the above	0.248	0.144	0.250	-	-

Prevalence levels for prison inmates are based on our analysis of the 2004 Survey of Inmates in State and Federal Corrections Facilities. Prevalence estimates for jail inmates are based on our analysis of the 2002 Survey of Inmates in Local Jails. Prevalence estimates for the total non-institutionalized population (the third column of figures) are based on analysis by Kessler et. al.(2005) of the National Comorbitity Survey Replication. This survey was conducted between 2001 and 2003. The data is nationally representative of all non-institutionalized English-speaking residents of the U.S. over 18 years of age. The estimates for men 15 to 54 come from Kessler et. al. (1994) and are based on analysis of the original National Comorbitity Survey. This data set pertains to all non-institutionalized persons between 15 and 54 years of age and was conducted from 1990 through 1992.
a. For the non-institutionalized, prevalence is measured for all individuals with a history of nonaffective psychosis, including schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder, and atypical psychosis. See Kessler e. al. (1994) for details. Note, the figures in this cell pertain to the earlier NCR survey and thus measures the lifetime prevalence of non-affective psychoses as of the early 1990s.
b. For the non-institutionalized, prevalence is measured for those indicating that they have generalized anxiety disorder.

Table 2
Characteristics of State Prison Inmates by Whether They Indicate Being Diagnosed with a Mental Illness, 2004

	All State Prison Inmates	No Diagnosed Mental Illness	Diagnosed Mental Illness	Diagnosed with Bipolar, Manic, or Psychotic Disorder
Male	0.932	0.953	0.868	0.846
Married	0.164	0.167	0.154	0.142
Any Children	0.555	0.558	0.546	0.555
Homeless prior to arrest	0.086	0.065	0.151	0.173
Latino	0.181	0.199	0.125	0.110
White	0.488	0.444	0.619	0.633
Black	0.430	0.466	0.321	0.317
American Indian	0.252	0.047	0.067	0.075
Offense				
Murder/homicide/man.	0.139	0.139	0.140	0.123
Sexual assault	0.107	0.102	0.124	0.099
Robbery	0.127	0.129	0.120	0.135
Assault	0.086	0.082	0.098	0.103
Other Violent	0.020	0.019	0.024	0.023
Burglary	0.082	0.080	0.088	0.085
Fraud/Larceny	0.078	0.072	0.096	0.114
Auto Theft	0.012	0.011	0.016	0.020
Other Property	0.010	0.010	0.012	0.013
Drugs	0.213	0.230	0.161	0.155
Weapons	0.025	0.027	0.018	0.019
Other	0.101	0.100	0.104	0.112
Parent/stepparent served time	0.201	0.247	0.247	0.263
Age				
25th percentile	27	26	27	27
50th percentile	34	34	35	35
75th percentile	42	42	42	42
Age at first arrest				
25th percentile	15	15	14	14
50th percentile	17	17	17	17
75th percentile	21	21	20	20

Figures tabulated from the 2004 Survey of Inmates in State and Federal Prisons.

Table 3
Characteristics of Federal Prison Inmates by Whether They Indicate Being Diagnosed with a Mental Illness, 2004

	All Federal Prison Inmates	No Diagnosed Mental Illness	Diagnosed Mental Illness	Diagnosed with Bipolar, Manic, or Psychotic Disorder
Male	0.929	0.943	0.847	0.834
Married	0.259	0.266	0.221	0.167
Any Children	0.643	0.653	0.589	0.527
Homeless prior to arrest	0.037	0.026	0.100	0.154
Latino	0.249	0.261	0.179	0.112
White	0.435	0.412	0.575	0.574
Black	0.463	0.489	0.327	0.356
American Indian	0.040	0.036	0.064	0.044
Offense				
Murder/homicide/man.	0.029	0.029	0.026	0.029
Sexual assault	0.009	0.008	0.014	0.004
Robbery	0.085	0.077	0.134	0.205
Assault	0.017	0.017	0.019	0.029
Other Violent	0.006	0.004	0.013	0.015
Burglary	0.005	0.004	0.008	0.021
Fraud/Larceny	0.034	0.032	0.043	0.053
Auto Theft	0.001	0.001	0.003	0.009
Other Property	0.001	0.002	0.007	0.016
Drugs	0.552	0.575	0.418	0.339
Weapons	0.110	0.099	0.175	0.192
Other	0.150	0.151	0.140	0.089
Parent/stepparent served time	0.148	0.140	0.199	0.233
Age				
25th percentile	29	29	29	27
50th percentile	35	35	36	34
75th percentile	44	44	44	43
Age at first arrest				
25th percentile	16	16	15	13
50th percentile	18	18	18	17
75th percentile	23	23	22	22

Figures tabulated from the 2004 Survey of Inmates in State and Federal Prisons.

Table 4
Characteristics of Jail Inmates by Whether They Indicate Being Diagnosed with a Mental Illness, 2002

	All Jail Inmates	No Diagnosed Mental Illness	Diagnosed Mental Illness	Diagnosed with Bipolar, Manic, or Psychotic Disorder
Male	0.883	0.913	0.792	0.781
Married	0.161	0.169	0.142	0.124
Any Children	0.552	0.552	0.554	0.546
Homeless prior to arrest	0.127	0.102	0.207	0.228
Latino	0.184	0.208	0.114	0.105
White	0.500	0.462	0.614	0.617
Black	0.430	0.456	0.337	0.336
American Indian	0.045	0.041	0.057	0.053
Reason Held				
Awaiting arraignment	0.109	0.114	0.096	0.097
To stand trial	0.259	0.244	0.302	0.309
Awaiting par/prob hearing	0.095	0.096	0.095	0.099
For safekeeping	0.005	0.003	0.010	0.009
As a witness	0.002	0.001	0.005	0.002
For contempt of court	0.014	0.014	0.001	0.016
Awaiting sentencing	0.109	0.103	0.128	0.114
Serving a sentence	0.353	0.362	0.325	0.302
Awaiting transfer	0.072	0.071	0.075	0.085
Other Reason	0.067	0.068	0.064	0.066
Defining Offense				
Violent offense	0.082	0.079	0.090	0.149
Property offense	0.251	0.261	0.218	0.183
Violation for financial gain	0.068	0.065	0.076	0.076
Drug offense	0.032	0.035	0.025	0.016
Public order offense	0.568	0.560	0.591	0.575
Parent/stepparent served time	0.212	0.192	0.272	0.289
Age				
25th percentile	23	23	24	24
50th percentile	31	30	32	32
75th percentile	39	39	40	40
Age at first arrest				
25th percentile	15	16	15	15
50th percentile	18	18	17	17
75th percentile	21	22	21	20

Figures tabulated from the 2002 Survey of Inmates in Local Jails.

Table 5
Distribution of Institution and Non-Institutional Populations Across Age Groups, Race/Ethnicity Groups, and Gender, 1950 through 1980

	1950			1960			1970			1980		
	Mental hospital	Prison & jails	Non-Institut.	Mental hospital	Prison & jails	Non-Institut.	Mental hospital	Prison & jails	Non-Institut.	Mental hospital	Prison & jails	Non-Institut.
Age groups	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<10	0.85	0.84	19.51	0.43	0.03	22.03	0.57	0.15	18.48	0.73	0.04	14.77
10 to 17	1.06	11.10	11.51	1.66	2.85	14.21	3.59	3.43	16.18	6.26	2.23	13.69
18 to 25	5.31	27.54	12.13	5.03	30.01	9.86	9.09	39.67	12.76	14.63	43.15	14.80
26 to 30	6.32	17.28	8.19	4.30	16.38	6.13	6.13	16.67	6.43	9.18	21.66	8.41
31 to 35	8.02	12.88	7.54	5.94	13.76	6.73	5.75	11.24	5.50	9.02	12.90	7.41
36 to 40	8.40	8.69	7.45	7.36	11.86	6.90	6.50	9.15	5.51	6.91	7.65	5.97
41 to 45	8.34	7.23	6.53	8.32	8.39	6.39	8.04	6.69	5.85	6.95	4.60	5.06
46 to 50	11.16	5.24	6.08	9.52	6.40	5.89	8.02	5.34	5.90	5.81	2.67	4.91
51 to 55	11.69	4.08	5.20	10.11	4.78	5.28	9.00	3.29	5.28	7.76	2.41	5.20
56 to 64	18.54	3.25	7.75	18.61	4.50	7.71	18.33	3.35	8.11	12.52	1.63	8.54
65+	20.30	1.88	8.10	28.72	1.03	8.88	24.99	1.03	10.00	20.24	1.06	11.24
Race/Ethnicity	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
White	87.62	62.20	87.99	85.03	58.86	86.63	82.80	54.67	85.52	79.40	47.14	81.50
Black	10.52	33.40	9.90	12.73	35.57	10.47	15.45	40.29	11.03	17.15	42.65	11.65
Other	0.43	1.26	0.43	1.00	1.87	0.89	0.93	1.82	1.18	1.95	5.14	3.41
Hispanic	1.43	3.14	1.68	1.24	3.69	2.01	0.82	3.23	2.27	1.50	5.07	3.45
Gender	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Male	52.55	90.79	49.60	53.23	95.10	49.01	55.95	94.84	48.45	60.79	94.10	48.37
Female	47.45	9.21	50.40	46.77	4.90	50.99	44.05	5.16	51.55	39.21	5.90	51.63
Population Estimate (000)	621	315	151,274	698	356	178,247	440	341	202,257	246	461	226,024

Tabulates from the 1950, 1960, 1970 and 1980 1% Public Use Micro Data Samples from the U.S. Decennial Censuses of Population and Housing.

Table 6
Institutionalization/Incarceration Rates by Race/Ethnicity and Gender, Actual (1980 and 2000) and Hypothetical Assuming Complete Mental Hospital Deinstitutionalization Since 1980 and Alternative Trans-institutionalization Rates Between Mental Hospitals and Prisons

	1980 Actual Incarceration Rate	2000 Actual Institutionalization Rate	2000 hypothetical assuming a trans-institutionalization rate of 1	2000 hypothetical assuming a trans-institutionalization rate of 0.5	2000 hypothetical assuming a trans-institutionalization rate of 0.25
White males	356	1,285	1,127	1,206	1,246
Black Males	2,625	8,467	8,136	8,301	8,384
Other Males	980	1,398	1,250	1,324	1,361
Hispanic Males	1,000	2,919	2,833	2,876	2,897
White Females	18	265	169	217	241
Black Females	144	852	716	784	818
Other Females	54	217	191	204	211
Hispanic Females	60	265	212	239	252

Hypothetical institutionalization rates assume a contribution of deinstitutionalization to the overall 2000 institutionalization rate equal to the mental hospital inpatient rate in 1980 multiplied by the assumed trans-institutionalization parameter. Average institutionalization rates within gender/race groups are calculated by averaging the age-specific estimates using the 2000 population shares within gender/race groups as weights. The hypothetical tabulations assume complete deinstitutionalization between 1980 and 2000 –i.e., the simulations assume no mental hospital inpatients in 2000

Table 7
Estimation of the Effect of Changes in Mental Hospitalization Rates on Changes in Corrections Incarceration Rates, Overall, By Gender, and by Gender and Race Based on Decade Changes Between 1950 and 1980

	Model Specifications			
	No controls	Year, age, race, and rstate effects	Adding interaction terms between year and state to previous specification	Adding interaction terms between age and state and race and state to previous specification
All Men	0.044 (0.030)	0.005 (0.031)	0.011 (0.032)	-0.001 (0.032)
White men	0.078 (0.029)	0.034 (0.034)	0.057 (0.036)	0.066 (0.036)[c]
Black men	0.034 (0.069)	-0.040 (0.069)	-0.060 (0.075)	-0.068 (0.074)
Other men	-0.045 (0.037)	-0.053 (0.046)	-0.031 (0.053)	-0.025 (0.051)
Hispanic men	0.193 (0.144)	0.162 (0.143)	0.106 (0.130)	0.187 (0.151)
All women	0.002 (0006)	0.001 (0.007)	0.001 (0.007)	-0.002 (0.007)
White women	0.003 (0.005)	0.003 (0.005)	0.001 (0.006)	-0.001 (0.006)
Black women	0.008 (0.013)	0.008 (0.013)	0.007 (0.015)	0.008 (0.015)
Other Women	-0.014 (0.015)	-0.030 (0.015)	-0.069 (0.040)	-0.055 (0.042)
Hispanic women	-0.056 (0.040)	-0.062 (0.048)	-0.037 (0.063)	-0.014 (0.061)

Standard errors are in parentheses. Standard errors are calculated assuming clustering in the error variance-covariance matrix within gender-race-age-state cells. Each coefficient comes from a regression of the inter-decade change in the corrections incarceration rate on the corresponding inter-decade change in mental hospital inpatient rates. Models are estimated by gender (pooling all racial groups within gender) and separately by gender and race. The remainder of the model specification is as specified across the top of the table. Rates are calculated for cells defined by the interaction of states, ten age groups (within the range of 18 to 64), four race/ethnicity groups, four years (1950, 1960, 1970, 1980), and gender.
a. Statistically significant at the one percent level of confidence.
b. Statistically significant at the five percent level of confidence.
c. Statistically significant at the ten percent level of confidence.

Table 8
Regression of the 1980 to 2000 Change in Institutionalization Rates On the 1980 Mental Hospital Inpatient Rate, Measured at the Level of Census Regions and at the state Level

	No Controls	Additional covariates[d]
All Men	-4.272 (0.313)[a]	-0.383 (0.136)
White men	1.358 (0.314)[a]	-0.928 (0.276)
Black men	-0.447 (0.565)	-0.501 (0.329)
Other men	-0.369 (0.171)[b]	0.013 (0.156)
Hispanic men	0.148 (0.320)	0.019 (0.251)
All Women	-0.592 (0.083)[a]	-0.110 (0.068)
White women	-0.494 (0.131)[a]	-0.157 (0.121)
Black women	-0.228 (0.190)	-0.184 (0.175)
Other women	-0.056 (0.096)	-0.008 (0.095)
Hispanic women	-0.109 (0.131)	0.008 (0.132)

Standard errors are in parentheses. Each coefficient comes from a regression of the 2000 institutionalization rate minus the 1980 incarceration rate on the 1980 mental hospital inpatient rate. Each change is measured by state, sex, race/ethnicity (four groups), and age (10 groups).
a. Statistically significant at the one percent level of confidence.
b. Statistically significant at the five percent level of confidence.
c. Statistically significant at the ten percent level of confidence
d. The specifications for all men and all women include a full set of race-state and age-state fixed effects. The separate specifications by race include full sets of race-specific state)and age effects.

Figure 1

Prisoners per 100,000, Mental Hospital Inpatients per 100,000, and Total Institutionalized per 100,000, 1930 to 2000
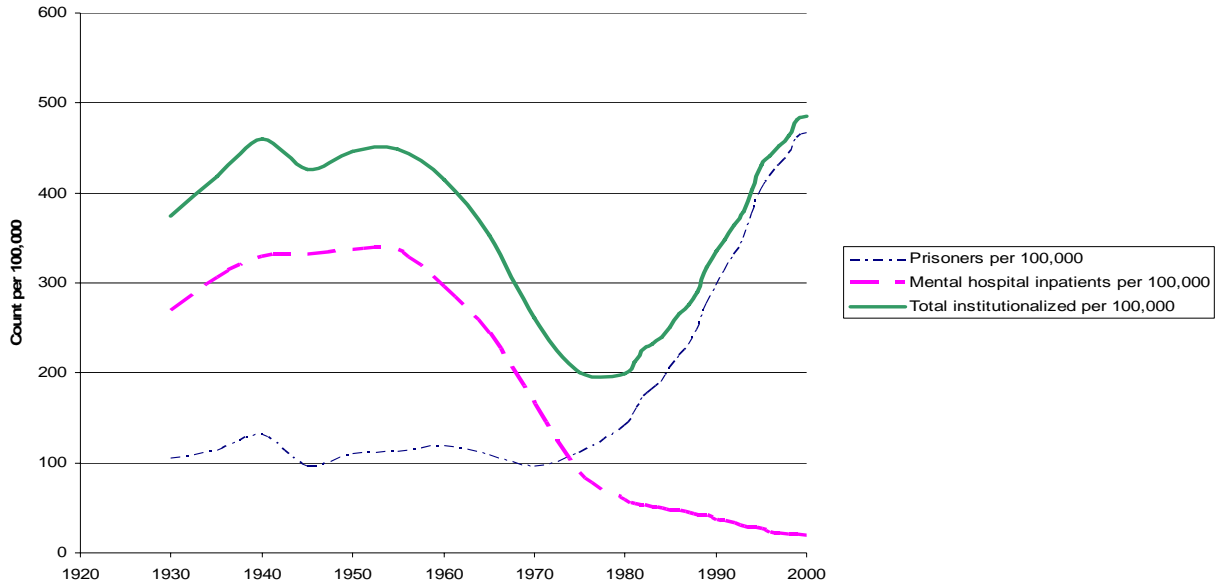
Figure 2

Institutionalization Rates for Adults 18 to 64 Years of Age Between 1950 and 2000, Actual Rates, Rates Weighted by the 1950 Distribution of Mental Hospital Patients, and Rates Weighted by the 2000 Distribution of Institutionalized Adults
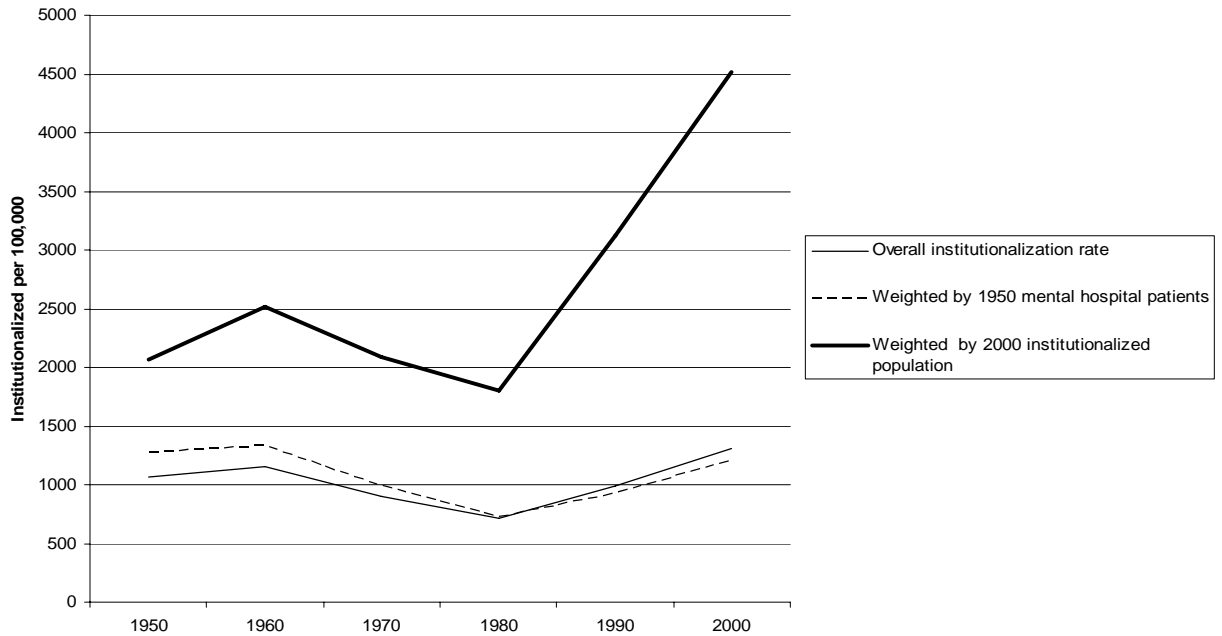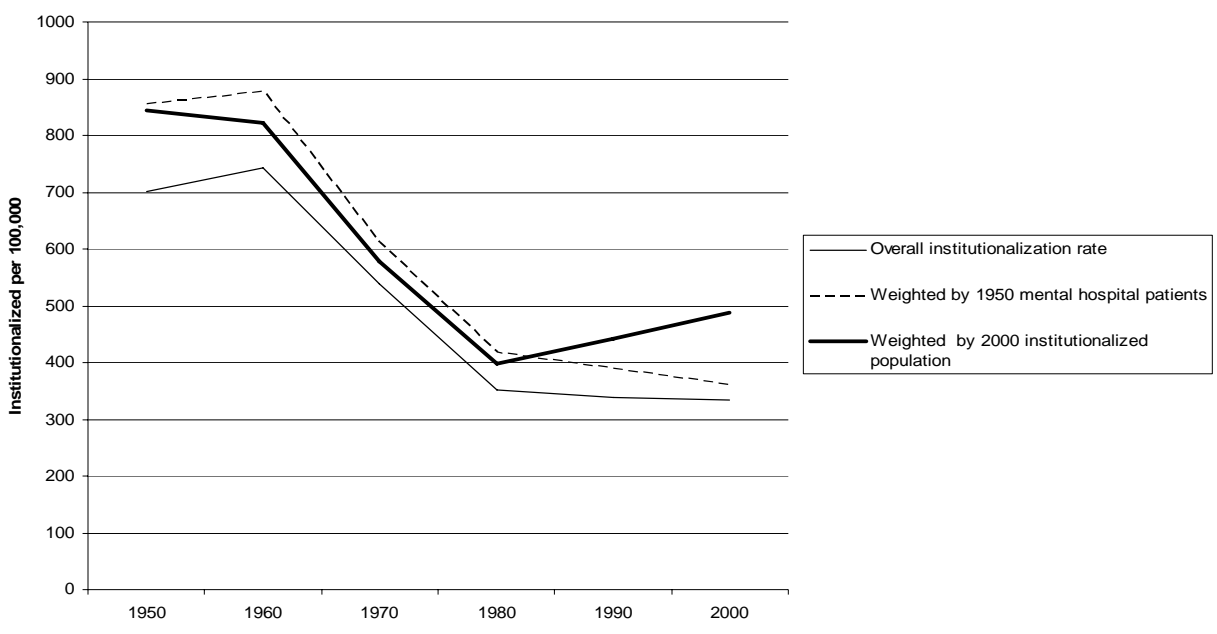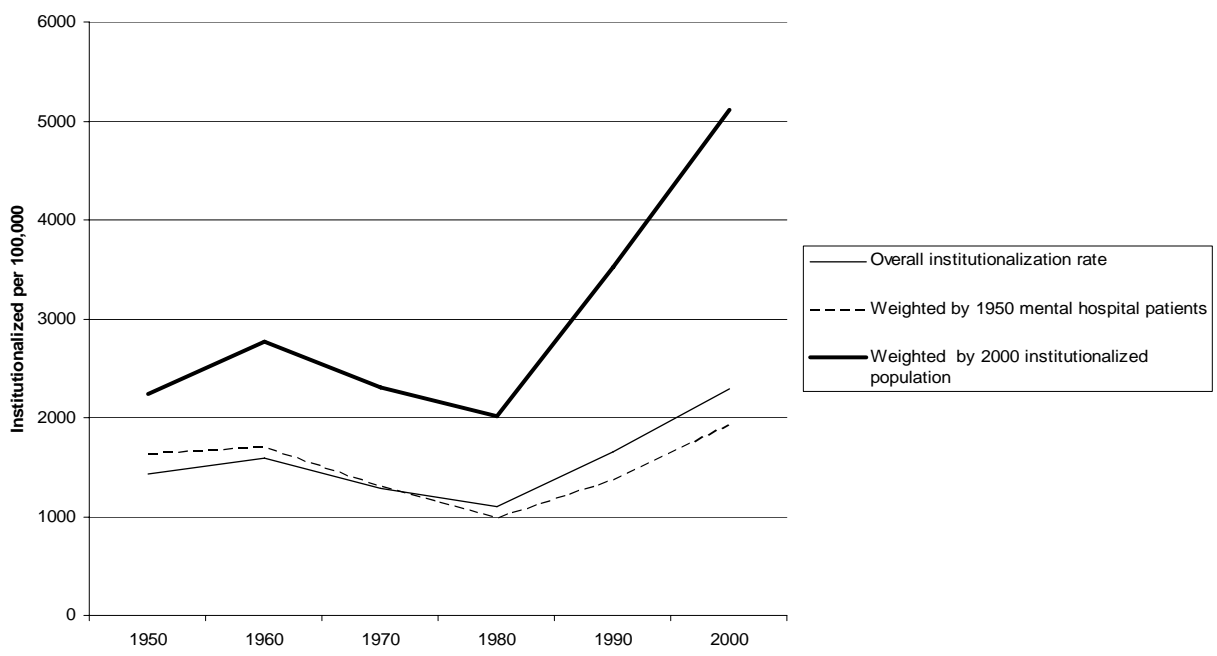
Figure 3

Institutionalization Rates for Females 18 to 64 Years of Age Between 1950 and 2000, Actual Rates, Rates Weighted by the 1950 Distribution of Female Mental Hospital Patients, and Rates Weighted by the 2000 Distribution of Institutionalized Adult Females

Figure 4

Institutionalization Rates for Males 18 to 64 Years of Age Between 1950 and 2000, Actual Rates, Rates Weighted by the 1950 Distribution of Male Mental Hospital Patients, and Rates Weighted by the 2000 Distribution of Institutionalized Adult Males

Figure 5

Comparison of the Change in Institutionalization Rates (2000 Institutionalization Minus 1980 Incarceration) to the Mental Hospital Inpatient Rate as of 1980, White Males
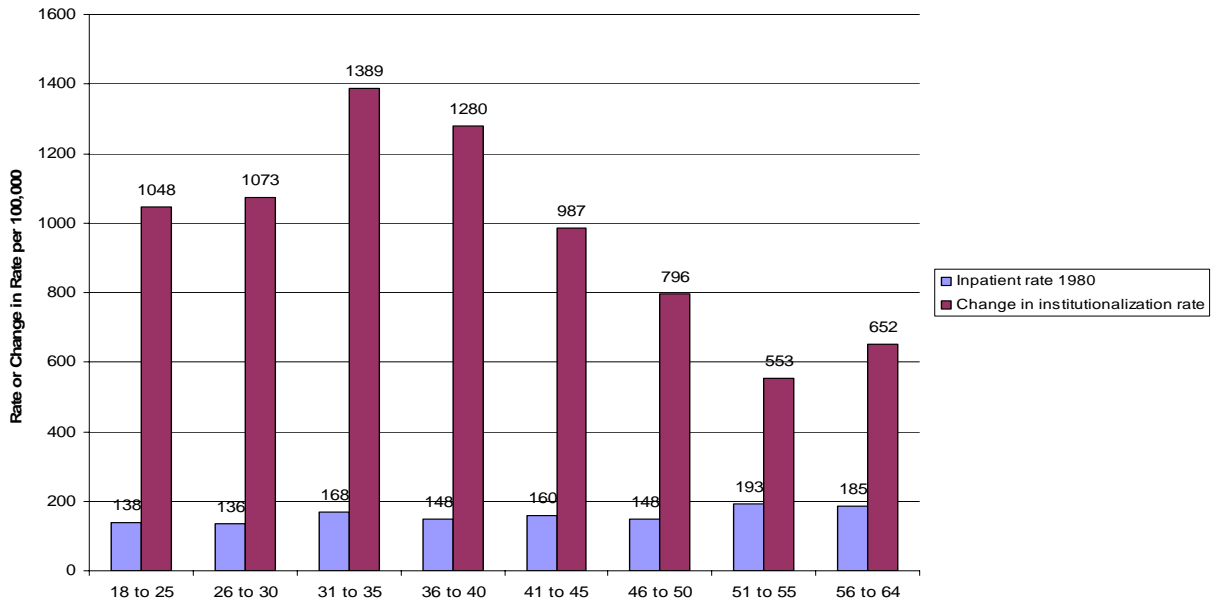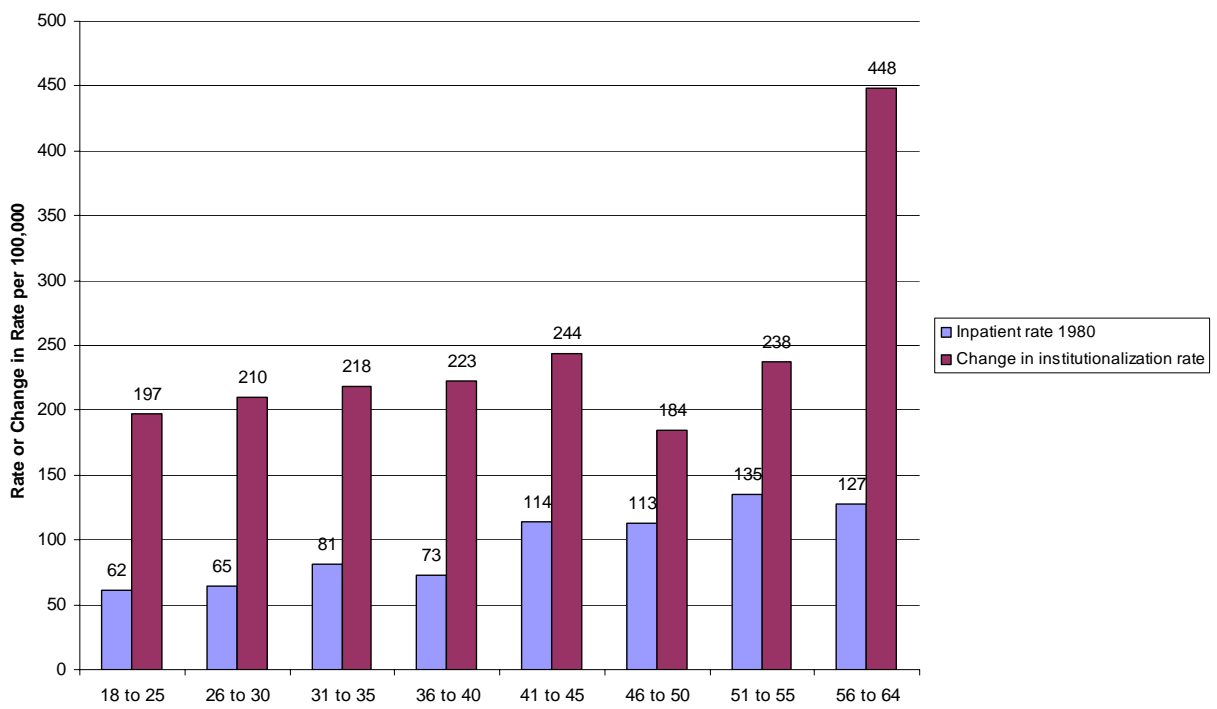

Figure 6

Comparison of the Change in Institutionalization Rates (2000 Institutionalization Minus 1980 Incarceration) to the Mental Hospital Inpatient Rate as of 1980, Black Males
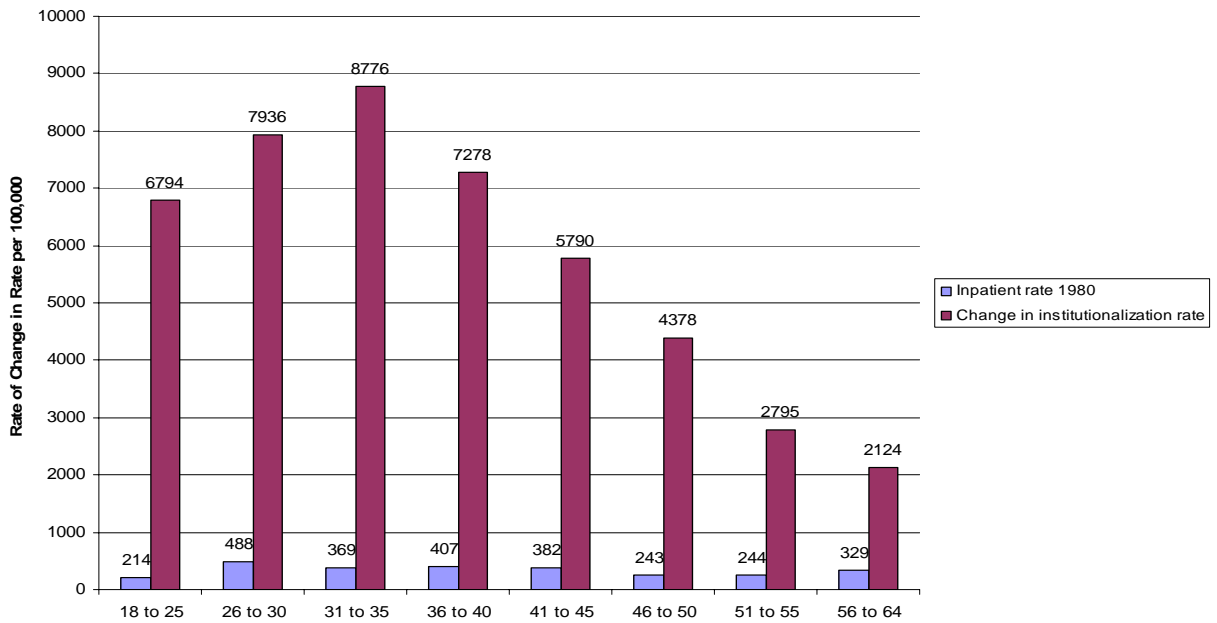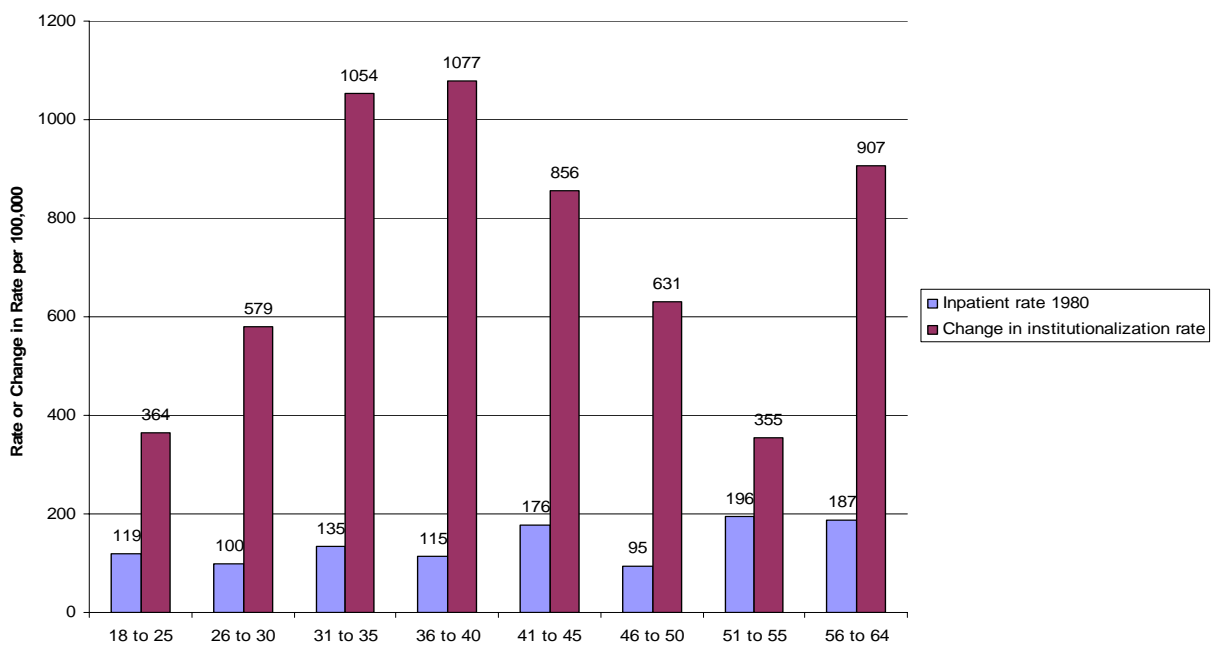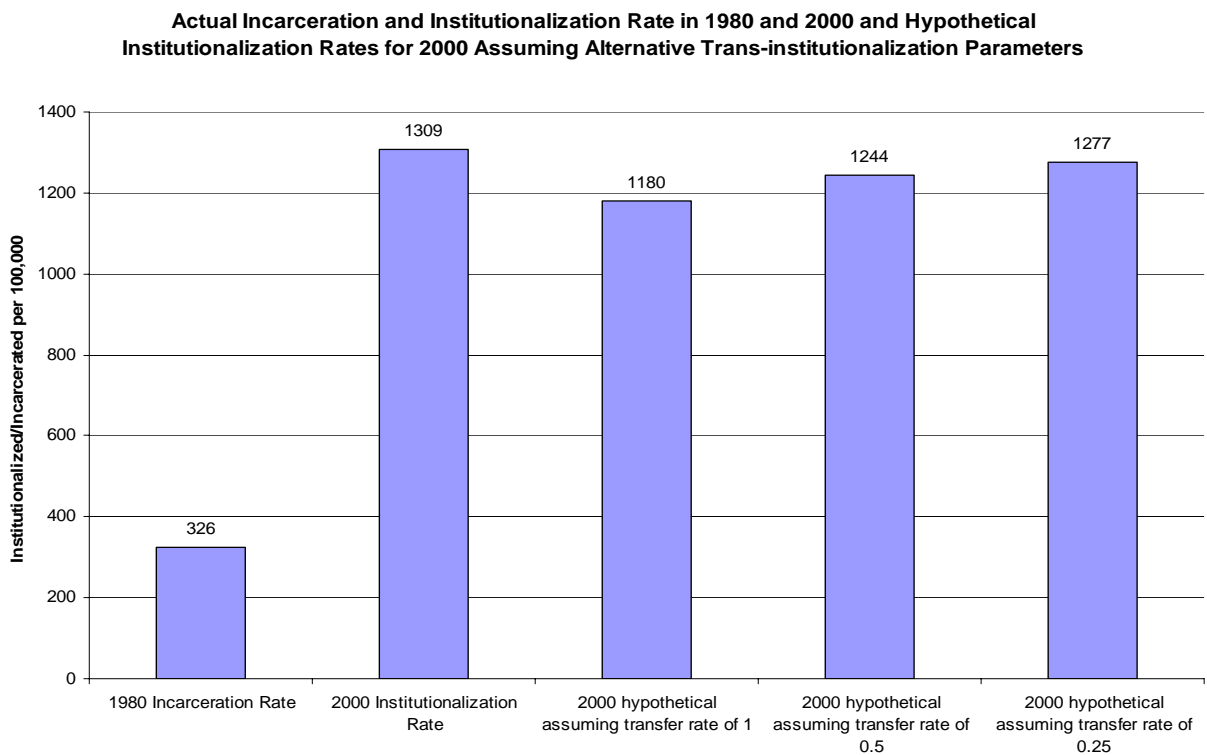
Figure 7

Comparison of the Change in Institutionalization Rates (2000 Institutionalization Minus 1980 Incarceration) to the Mental Hospital Inpatient Rates as of 1980, White Females

Figure 8

Comparison of the Change in Institutionalization Rates (2000 Institutionalization Minus 1980 Incarceration) to the Mental Hospital Inpatient Rate as of 1980, Black Females

Figure 9

Actual Incarceration and Institutionalization Rate in 1980 and 2000 and Hypothetical Institutionalization Rates for 2000 Assuming Alternative Trans-institutionalization Parameters

Figure 10: Scatter Plot of the 1980 to 2000 Change in Mental Hospital Inpatient Rate Against the 1980 Level of the Mental Hospital Inpatient Rate by State
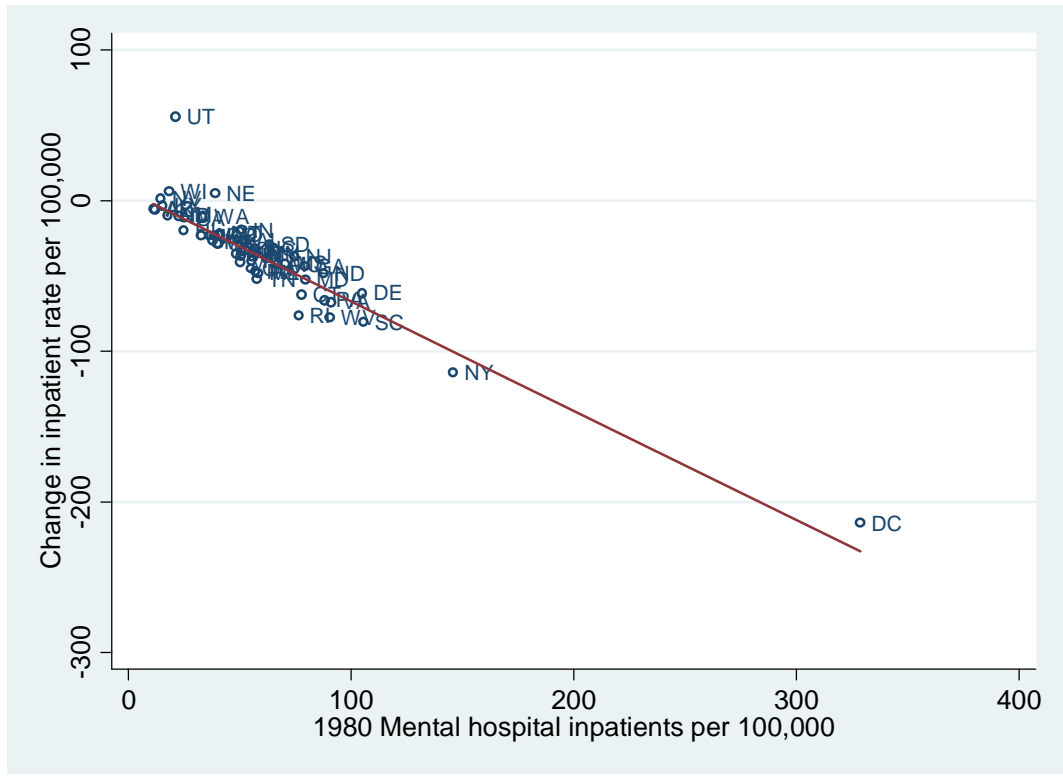
Figure 11: Incarceration Trends Over the 15-Year Period Bracketing Each State's Break From the Twenty-Year Moving Average in Incarceration Rates
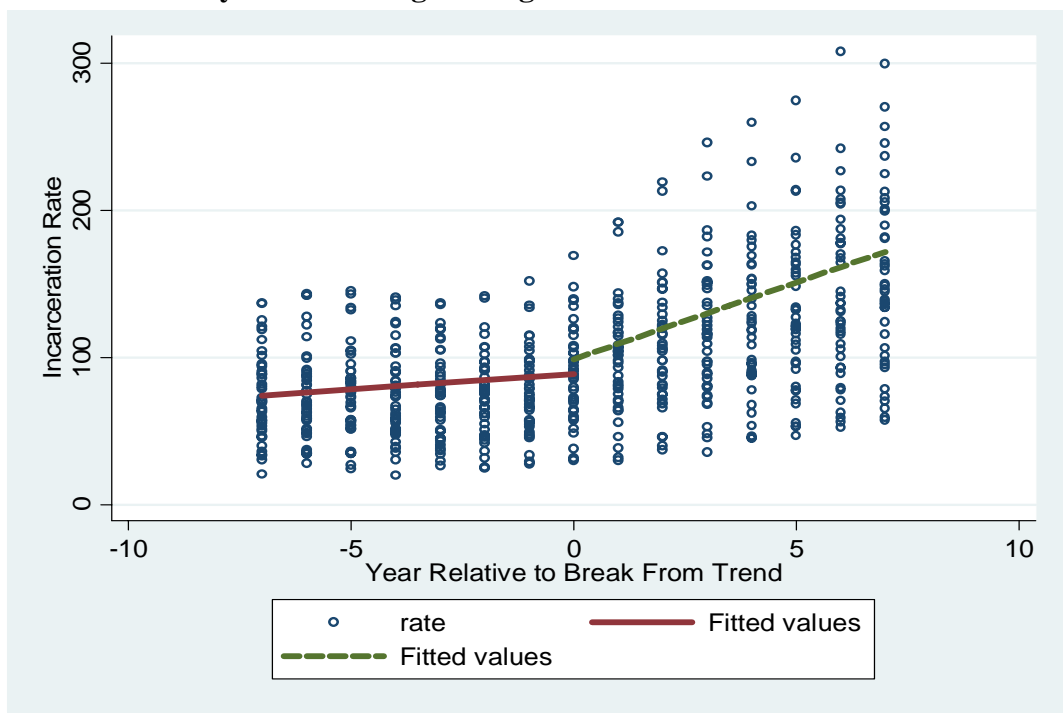

Figure 12: Mental Hospitalization Trends Over the 15-Year Period Bracketing Each State's Break From the Twenty-Year Moving Average in Incarceration Rates
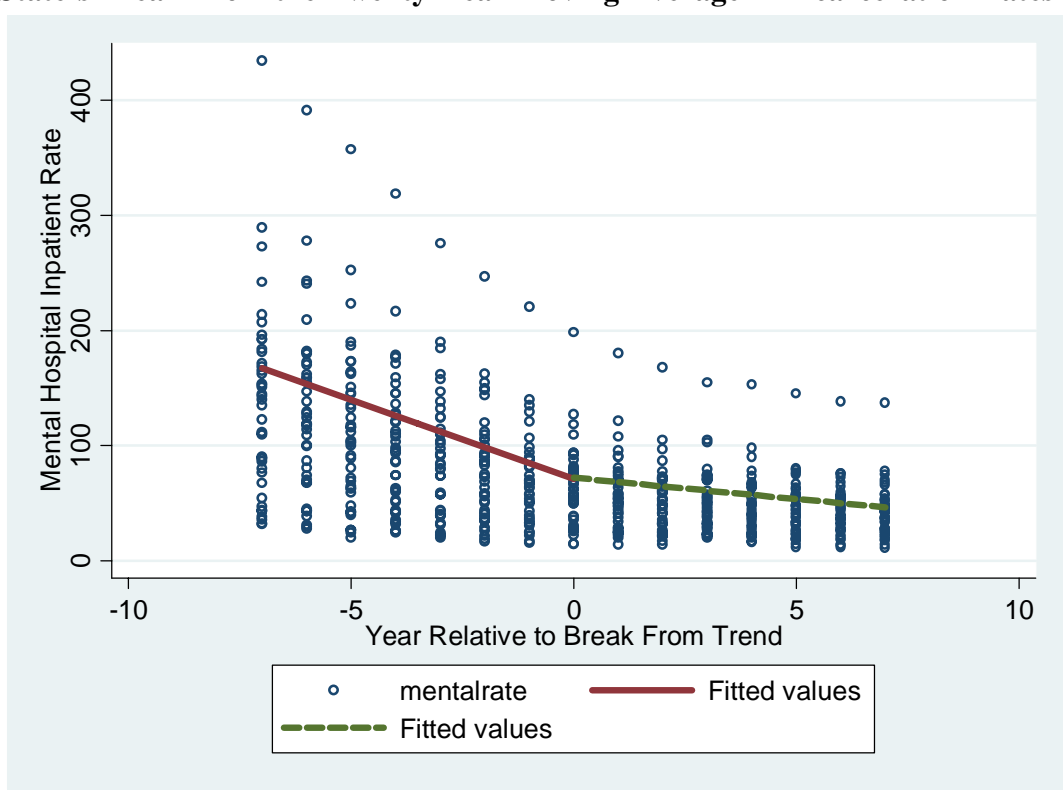
57

Figure 13: Scatter Plot of Pre-Post Break in the Change in Annual Mental Hospital Inpatient Rate Growth Against the Corresponding Pre-Post Break in the Change in Annual Prison Rate Growth