An Institutionalization Effect: The Impact of Mental Hospitalization and Imprisonment on Homicide in the United States, 1934–2001

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ABSTRACT

Previous research suggests that mass incarceration in the United States may have contributed to lower rates of violent crime since the 1990s but, surprisingly, finds no evidence of an effect of imprisonment on violent crime prior to 1991. This raises what Steven Levitt has called "a real puzzle." This study offers the solution to the puzzle: the error in all prior studies is that they focus exclusively on rates of imprisonment, rather than using a measure that combines institutionalization in both prisons and mental hospitals. Using state-level panel-data regressions over the 68-year period from 1934 to 2001 and controlling for economic conditions, youth population rates, criminal justice enforcement, and demographic factors, this study finds a large, robust, and statistically significant relationship between aggregated institutionalization (in mental hospitals and prisons) and homicide rates, providing strong evidence of what should now be called an institutionalization effect—rather than, more simply but inaccurately, an imprisonment or incapacitation effect.

INTRODUCTION

Mass incarceration in the United States is one of the most salient political, social, and economic issues facing the nation. After 50 years of relative stability, state and federal prison populations began rising ex-

ponentially in 1973, climbing from under 200,000 to more than 1.3 million persons by 2002. With more than 700,000 additional persons held in local jails, by 2008 the United States incarcerated over 2 million people, more than 1 percent of its adult population—the highest number and rate in the world (Pew Center on the States 2008).[1]

The issue of mass incarceration has generated significant research across the social sciences, from political science to anthropology, criminology, economics, and sociology (see, respectively, Gottschalk 2006; Rhodes 2004; Pfaff 2008; Levitt 2004; Wacquant 2001; see generally Loury and Western 2010). One dimension that has stimulated considerable controversy is the purported effect of mass incarceration on the level of violent crime in this country. Research along this axis has been fueled, in part, by conflicting historical trends during the 20th and 21st centuries regarding, on the one hand, patterns of imprisonment and, on the other hand, cycles of homicide victimization.

During an earlier period, from the 1920s to the 1970s, incarceration rates remained essentially flat while homicide rates fluctuated wildly, first dropping sharply by more than 50 percent in the 1930s and then rising steeply—in fact more than doubling—in the 1960s and 1970s. During the later period, from the 1970s to the present, incarceration rates rose exponentially while homicide rates remained, at first, stable and high, and then began falling sharply in the 1990s. The contrast between these conflicting trends during these two historical periods has given rise to an important before-and-after mystery.

In the period before the prison expansion of the 1970s, research explored the puzzling homeostasis of imprisonment during periods of sharply fluctuating crime rates and converged on the "stability of punishment hypothesis" (Blumstein and Moitra 1979, p. 389). According to that dominant view, prison populations remained relatively constant despite fluctuations in crime, and there was essentially little net cross-effect: prison did not have a large incapacitative, or deterrent, effect on crime, and, vice versa, crime rates did not have a significant criminal justice effect on prisons—or at least, any effects canceled out. In the period after a period marked by mass incarceration and the "great American crime decline" of the 1990s (Zimring 2006), the consensus shifted dramatically. The most reliable research from this period finds that changes in prison rates accounted for almost one-fourth to one-third of

1. See also BBC News: Special Reports: World Prison Populations (http://news.bbc.co.uk/2/shared/spl/hi/uk/06/prisons/html/nn2page1.stm; last visited June 27, 2010).

the drop in crime since 1991 (Levitt 2004, p. 186; Spelman 2000, p. 123). The received wisdom now is that rates of imprisonment were not a good predictor of violent crime for any period prior to the 1990s but are a good predictor after 1991—and the reason for this difference has remained a mystery.

This study offers the answer: the error in all prior research is that it focused exclusively on imprisonment rates and never included in the measure of incapacitation or deterrence the rate of institutionalization in mental hospitals. The metric in all prior studies was always rates of incarceration in state and federal prisons (and in some cases in jails), but never included the population in asylums, mental hospitals, or institutions for the "mentally defective." Yet the startling fact is that the United States institutionalized a massive portion of its population in mental institutions in the 1930s, 1940s, and 1950s, and those mental hospitalization rates exhibited starkly different patterns than trends for imprisonment.

To be precise, the patterns of mental hospitalization versus incarceration are practically inverted over the 20th and 21st centuries. An early period—from the 1920s through the 1950s—was marked by remarkable stability in both prison and mental hospital populations but by sharply higher rates of institutionalization in mental hospitals. During this "before" period, the United States institutionalized people in mental hospitals at extraordinarily high rates, consistently near or above 600 persons per 100,000 adults throughout the 1940s and 1950s—with peaks of 627 and 620 persons per 100,000 adults in 1948 and 1955, respectively. The 1970s marked a transition period: prison populations began to rise, while mental health populations plummeted dramatically. Thus, in the "after" period, during the 1980s, 1990s, and into the 21st century, mental health populations dwindled to negligible levels, while state and federal prison populations exploded, rising exponentially to their present levels. As evidenced in Figure 1, when the data on mental hospitalization rates are combined with the data on prison rates for 1934–2001, the imprisonment revolution of the late 20th century takes on an entirely different appearance: aggregated institutionalization—in other words, the combination of prison and mental hospital populations—is now returning to the elevated levels that the United States experienced in the mid-20th century. This figure does not include jail populations, because data on jail populations were not reliably or consistently measured until 1970; however, when national-level jail counts are included (linearly
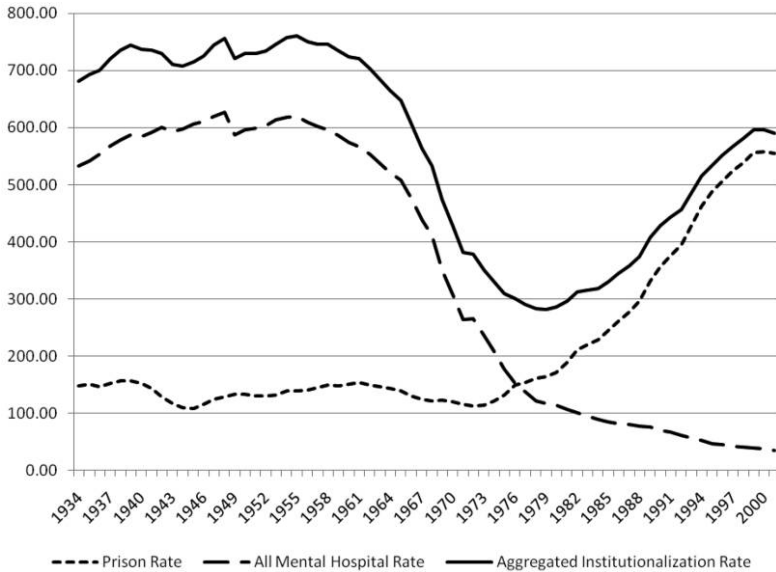
Figure 1. Rates of institutionalization in the United States (per 100,000 adults), 1934–2001

interpolated for missing years), the graph is similarly striking, as evidenced by Figure 2.

Despite these sharply different patterns of institutionalization, all of the academic research on the incapacitative or deterrent effect of imprisonment—whether econometric, criminological, sociological, or other—has systematically ignored rates of mental hospitalization. With one single exception (Harcourt 2006), no existing study includes asylums or mental hospitals in its measure of persons effectively detained and incapacitated.

This is the first study to explore what might be called an "institutionalization effect"—rather than simply an "incapacitation" or "imprisonment" or "incarceration" effect—using state-level panel data. The findings are striking. Over the course of the 20th century, the effect of institutionalization on homicide rates in the United States is large and statistically significant (at the .031 level) only when the data combine the rates of institutionalization in prisons and mental hospitals, but not when the analysis considers only the rate of imprisonment alone or the rate of mental hospitalization alone.
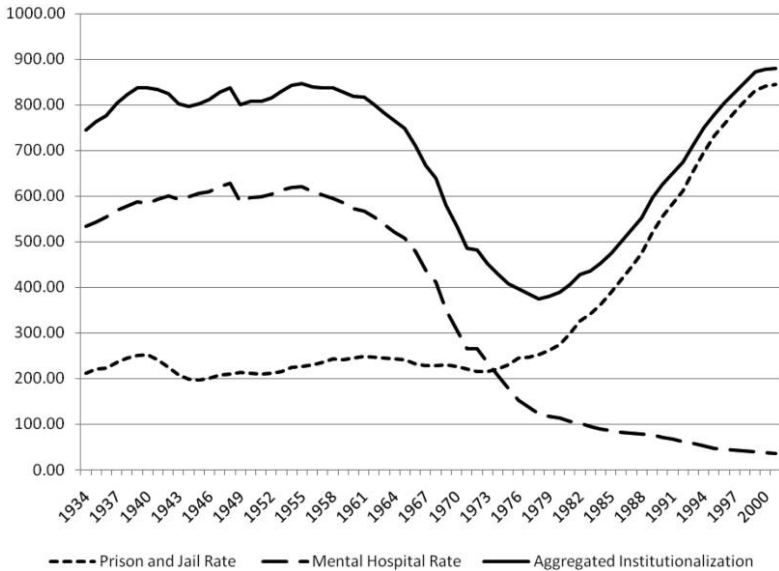
Figure 2. Rates of institutionalization, including jails, in the United States (per 100,000 adults), 1934–2001.

This study relies on an intensive state-by-state data collection effort regarding the number and rate of persons in mental hospitals going back to the early 1930s. It runs a number of quantitative analyses on the state-level panel data—as well as on individual state data—to test the relationship between aggregated institutionalization and homicide, holding constant the seven leading correlates of homicide. The three principal findings from the analyses are as follows.

First, at the national level, the only prior study that broached this topic (Harcourt 2006) actually underestimated the number and rate of persons institutionalized for mental illness by including only residents in public (state, county, and city) mental hospitals. There were significant numbers of persons institutionalized in other types of mental institutions—variously called public and private institutions for "mental defectives and epileptics" or for "the mentally retarded," "psychopathic" hospitals and wards in general and VA (U.S. Department of Veterans Affairs) hospitals, and other private mental hospitals. When those additional patients are included in the data, the historical trend over the 20th century is even more stark: the aggregated institutionalization rates

(in all mental hospitals and prisons) between 1936 and 1963 consistently exceeded 700 persons per 100,000 adults—with peaks of 760 in 1955, 757 in 1954, and 756 in 1948.

Second, using a clustered regression model with fixed state and year effects, adjusted for correlated error with robust standard errors, on the state-level panel data over the entire 68-year period from 1934 to 2001, this study finds a large and statistically significant relationship between aggregated institutionalization and homicide rates. There is, in fact, a remarkable correlation that survives the introduction of control variables for all leading correlates of homicide. The findings are robust and hold under a number of permutations.

Third, analyzing individual states, this study shows a nuanced land-scape, with some states, such as Texas, California, Michigan, Georgia, and Massachusetts, displaying stronger associations than others. Al-though the states understandably vary, the more consistent direction of influence is negative: greater aggregated institutionalization tends to cor-relate with lower homicide rates. An analysis of the largest states es-pecially suggests the pattern.

The bottom line is straightforward: prison rates alone do not predict homicide, nor do mental hospitalization rates alone, but when the two are combined, they are significantly and robustly related to homicide rates over a 68-year period across the 50 separate states, holding con-stant the leading covariates of homicide. This study identifies a previ-ously unnoticed empirical relationship and cautiously speculates on the mechanism. The mechanism, it turns out, may be victimization rather than perpetration. Research has consistently shown that persons suffer-ing from mental illness are far more likely to be victims of violent crime than the general population (Teplin et al. 2005; Teasdale 2009). Research has also identified a high correlation between being convicted of a crime and being a crime victim oneself (that is, outside prison): a substantial percentage of murder victims—one study indicates 44 percent overall and 51 percent of nonfamily murder victims (Dawson and Langan 1994, p. 1)—are individuals with a prior criminal history, and, vice versa, individuals in prison are at higher likelihood of being violent crime victims outside of prison (Karmen 2010, pp. 101–3). What may explain the results, then, is that the large institutionalized populations contain a higher proportion of potential homicide victims than the general pop-ulation. The size of the institutionalized population may be relevant to homicide rates, not simply through perpetration, but through the higher victimization rates of the persons detained.

This article proceeds in six sections. Section 1 sets forth the context for this research and reviews related prior areas of research. Sections 2 and 3 discuss the collection of data. Section 4 presents the state-level panel-data regressions. Section 5 turns to individual state analyses, and Section 6 explores avenues for future research.

1. PRIOR RESEARCH

This study is located at the intersection of three bodies of prior research: first, studies that explore the flow and relationship between populations in mental hospitals and in prisons; second, research into the stability of correctional populations before mass incarceration starting in the 1970s; and third, studies analyzing the effect of mass incarceration on violent crime since the 1990s. None of the prior studies links these different areas of research.

The first body of research focuses on the relationship between mental hospital and prison populations. In a prescient paper published in Great Britain, Penrose (1939) reported the results of a cross-sectional study of 18 European countries, finding an inverse relationship between the number of persons in prison and the number of mental hospital beds. Since then, there have been sporadic efforts—predominantly since deinstitutionalization of mental hospital patients in the 1960s and 1970s—to explore the relationship between the prison and mental health systems in the United States (Liska et al. 1999; Grabosky 1980; Steadman et al. 1984; Raphael 2000).

In their 1984 study, Steadman, Monahan, and their colleagues (Steadman et al. 1984) tested the degree of cross-institutionalization between mental health and prison systems on a sample of 3,897 male prisoners and 2,376 male mental hospital patients from six different states over the period 1968 to 1978. They found that in three of the states (New York, Arizona, and Massachusetts) there were relative declines in the percentage of former mental health patients who were incarcerated in 1978 and concluded that "[l]ittle evidence was found to support the idea that mental hospital deinstitutionalization was a significant factor in the rise of prison populations during [the] period [from 1968 to 1978]" (p. 490). Although the six states were evenly distributed in the direction of the effect, a subsequent reevaluation of the study found that the aggregated numbers told a different story: the number of prison inmates with prior mental hospitalization in 1978 was more than 50 percent higher than would have been expected, even given prison growth,

which supports a hypothesis of some interdependence of the populations (Harcourt 2006, pp. 1778–79). On the other side of the equation, Steadman and Monahan found evidence that mental hospitals were becoming more "criminal" (p. 487): "In all study states but Iowa, the actual number of hospital admittees with one or more prior arrests is substantially higher (from 11.7% to 99.9%) than would be expected from total admission trends" (p. 486).

Several years later, in an unpublished paper, Raphael (2000) found that mental hospitalization rates had a significant negative effect on prison incarceration rates over the period 1971–96. The magnitude of the effect was large. Translated into real population numbers, Raphael's findings suggested that deinstitutionalization from 1971 to 1996 resulted in between 48,000 and 148,000 additional state prisoners in 1996, which, according to Raphael, "account[ed] for 4.5 to 14 percent of the total prison population for this year and for roughly 28 to 86 percent of prison inmates suffering from mental illness" (p. 12). None of this research, however, addresses the possible effect of such interdependence on crime rates.

A second body of research focuses on the inexplicable "relative stability" or "homeostatic" nature of prison incarceration rates in the face of significant changes in crime rates from the 1930s to the 1970s (Blumstein and Moitra 1979, p. 389). This literature consistently characterized the period from 1926 (when the federal government began compiling prison data) to 1973 as "a fifty-year period of impressive stability" of imprisonment (Blumstein and Wallman 2000, p. 5)—correctly, that is. As Figure 3 demonstrates, prison rates remained relatively flat during the period. Despite this stability, homicide rates fluctuated wildly. First, they tumbled from highs of 10 per 100,000 in the late 1920s to lows of 4.5 per 100,000 in the mid-1950s; and then they doubled back to highs of 10 per 100,000 by the mid-1970s, as evidenced in Figure 4. Most of the longitudinal research on incapacitation and deterrence focused on this mismatch and, using pre-1980 data, converged on the "stability-of-punishment hypothesis" (Blumstein and Moitra 1979, p. 389), finding no significant prison-crime nexus (McGuire and Sheehan 1985, pp. 73–74; Bowker 1981, p. 206; Chiricos and Waldo 1970, p. 200).

The shock of the incarceration explosion in the 1980s and 1990s, followed by the crime drop of the 1990s, triggered an outpouring of new research on the effect of incarceration on crime and led many to revise their earlier findings (Spelman 2000, p. 97). Although homicide
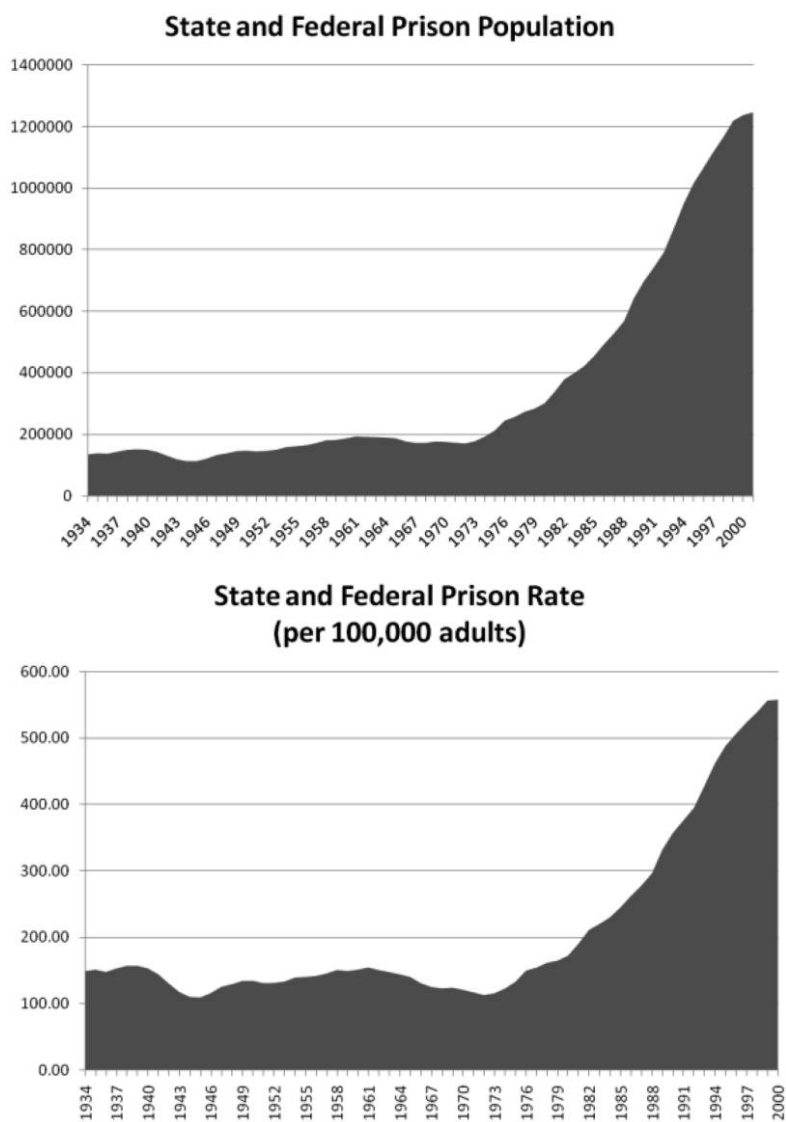
State and Federal Prison Population

State and Federal Prison Rate
(per 100,000 adults)

Figure 3. State and federal prison population and rate (per 100,000 adults) in the United States, 1934–2001.
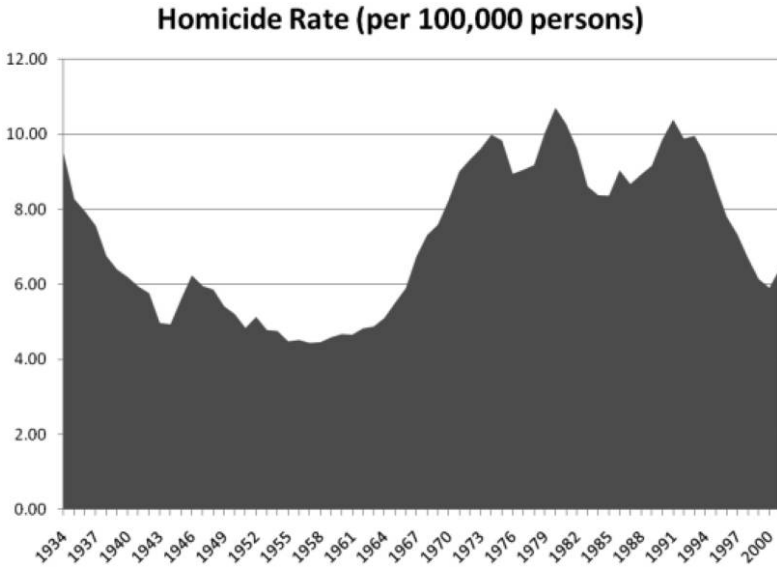
Homicide Rate (per 100,000 persons)

Figure 4. Homicide rate in the United States (per 100,000 persons), 1934–2001

rates initially undulated between 9 and 11 per 100,000 during the period 1973–91, they began a steep decline in the 1990s toward their current rate of approximately 6 per 100,000—a level that had not been seen since the early 1960s (as exhibited, again, in Figure 4). The sharp rise in incarceration led many researchers, including Blumstein (1995), to reconsider the idea of the stability of punishment. The studies from this period find that mass incarceration accounts for between one-fourth and one-third of the crime drop since 1991 (Levitt 2004, p. 186; Spelman 2000, p. 123). This produced the third body of research, which focuses on the effect of mass incarceration on violent crime—this time using primarily post-1980 data.

As a result of the historical discontinuities (and use of different data) between the second and third bodies of research, the explanations for the early and later trends in crime generally diverge sharply: explanations offered to elucidate the sharp rise in crime in the 1960s are consistently different from those offered to illuminate the crime drop of the 1990s. The authoritative treatment of Blumstein and Wallman (2000), for instance, reviews all the usual suspects for the crime rise of the 1960s, namely, the baby-boom generation, lack of political legitimacy, and hard

economic times; but it deploys an entirely different set of explanatory variables for the crime drop of the 1990s, focusing instead on, for instance, changing patterns of drug use, decreased gun violence, "broken windows" policing in the style of former New York City mayor Rudolph Giuliani, the federal COPS (Community Oriented Policing Services) program, and increased incarceration (p. 4).

Practically all the studies that examine the two distinct periods—before and after mass incarceration—find inexplicable discontinuity. This poses, as Levitt has suggested, a "real puzzle," which Levitt himself observes in his own work (Levitt 2004, p. 186). In his 2004 article analyzing the explanations for national crime trends, Levitt identifies the prison population buildup as one of the four factors that explain the crime drop since the 1990s. He estimates that the increased prison population over the 1990s accounted for a 12 percent reduction of homicide and violent crime and an 8 percent reduction in property crime—for a total of about one-third of the overall drop in crime in the 1990s (pp. 178–79). But when Levitt extends his analysis to discuss the period 1973–91, he is surprised that the drop in crime did not start sooner (p. 186). Regarding the period 1973–91, he writes:

> The one factor that dominates all others in terms of predicted impact on crime in this earlier period is the growth in the prison population. Between 1973 and 1991, the incarceration rate more than tripled, rising from 96 to 313 inmates per 100,000 residents. By my estimates, that should have reduced violent crime and homicide by over 30 percent and property crime by more than 20 percent. Note that this predicted impact of incarceration is much larger than for the latter [1990s] period. (p. 184)

Levitt is left with a significant gap between projected and actual crime rates for the period 1973–91. "[I]n contrast to the 1990s, the actual crime experience in the 1973–1991 period is not well explained by the set of factors analyzed in this paper. There appears to be a substantial unexplained rise in crime over the period 1973–1991" (p. 186). He finds this remarkable given the important effect of incarceration in the 1990s. "In the light of the estimates linking increased incarceration to lower crime, it is perhaps surprising that the rising prison population of the 1980s did not induce a commensurate decline in crime in that period" (p. 179 n.7). The same puzzle, naturally, applies to the decades prior to 1973—in fact, to the entire period from 1926 to 1991. Levitt concludes his analysis in the following terms: "The real puzzle in my opinion,

therefore, is not why crime fell in the 1990s, but why it did not start falling sooner" (p. 186).

Absent from all of the empirical literature, however, are rates of mental hospitalization. All existing research on the prison-crime nexus conceptualizes the level of confinement in society through the lens of imprisonment only, and not institutionalization writ large. In fact, none of the research that uses confinement as an independent variable—in other words, that studies the effect of confinement (and possibly other social indicators) on crime, unemployment, education, or other dependent variables—includes mental hospitalization in its measure of confinement (see, for example, DeFina and Arvanites 2002; Levitt 2004). Moreover, none of the studies that explore the specific relationship between confinement and unemployment, or confinement and crime, or confinement and any other non-mental-health-related indicator uses a measure of coercive social control that includes rates of mental hospitalization (see, for example, Blumstein and Moitra 1979; Bowker 1981; Chiricos and Waldo 1970; Levitt 1996; McGuire and Sheehan 1985). Even the most rigorous recent analyses of the prison-crime relationship use only imprisonment data (DeFina and Arvanites 2002; Marvell and Moody 1994). Although a tremendous amount of empirical work has been done on long-term crime trends (Cohen and Land 1987), structural covariates of homicide (Land, McCall, and Cohen 1990), and the prison expansion (see generally Spelman 2000), none of this literature conceptualizes confinement through the larger prism of institutionalization, and none of it aggregates mental hospitalization data with prison rates.[2]

2. THE AGGREGATED INSTITUTIONALIZATION DATA

The primary variable of interest is aggregated institutionalization, which is composed of the population in mental hospitals and in prisons. In order to properly explore the relationship between this variable and

2. There are only two exceptions. The first is an article published in 2006 that discovers a relationship between aggregated institutionalization (in prison and in mental hospitals) and the national homicide rate, holding constant three leading structural covariates of homicide (youth demographics, unemployment, and poverty; Harcourt 2006, pp. 1774–75). Those findings, however, are based on a single-jurisdiction (national-level data) analysis and therefore present a risk of masking different processes at the subunit level (through an ecological fallacy or other potential aggregation error). The second exception is a criminology and economics article that reviews the literature on the prison-crime nexus and, noting the Harcourt (2006) study, mentions the potential relevance of mental hospitalization (Pfaff 2008).

homicide, and to avoid ecological error, it is necessary to conduct the analysis at the state level. Since the work has never been done before, it is necessary first to collect state-level data on aggregated institutionalization.

2.1. Mental Hospitalization Data

The data on patients in mental hospitals consist of state-by-state panel data with observations running from 1934 to 2001. The regular enumeration of patients in mental hospitals was first undertaken by the U.S. Census Bureau beginning in the early 1920s. There had been census counts of patients in mental hospitals and of "the insane and feeble-minded" in 1880, 1890, 1904, and 1910, as well as an extensive census effort in 1922 and 1923, but the Census Bureau began performing annual enumerations in 1926, producing detailed state-by-state tables that would eventually include population data concerning state, county, city, and private mental hospitals, psychopathic hospitals and psychiatric wards of general and VA hospitals, and public and private institutions "for mental defectives and epileptics" and for "the mentally retarded."[3] Starting in 1947, the task of enumeration and analysis was turned over to the National Institute of Mental Health (NIMH), a unit of the U.S. Public Health Service, which continued to issue detailed analyses. Beginning in 1952, the yearly pamphlets were divided into four separate parts focusing on public and private mental hospitals and institutions for persons with mental retardation. Starting in 1970, the survey department of the NIMH took responsibility for tracking these populations, but published only census data for state and county mental hospitals.

The American Hospital Association (AHA) began tracking the pop-

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3. In addition, the government census data also enumerated persons on parole from mental hospitals during the period through 1969. The category of "on parole" covered a number of different situations, ranging from trial leaves of absence to extramural or family care and escaped patients. In 1933, for instance, the official census reports defined being "on parole" as the "temporary absence from an institution of a patient who is being carried on the books," usually "a trial leave of absence preliminary to discharge," but often also an "absence on a visit or for other purposes" (U.S. Department of Commerce and U.S. Bureau of the Census 1935, p. 11). The parole numbers were large. On December 31, 1933, for example, 46,071 mental patients were on parole or otherwise absent, representing a little less than 10 percent of the total institutionalized patient population of 435,571. Because this article focuses on the question of incapacitation, these patients "on parole" have not been included in the data set of persons in mental hospitals. When they are included, however, the statistical relationship with homicide becomes larger, more significant, and more robust.

ulation of persons in all mental hospitals in 1946 through surveys of all hospitals in the United States and has continued to collect data on public and private mental hospitals and institutions for persons with mental retardation to the present. For the year 1969 and the years 1971 through and including 1995, the AHA collected and published annual data on average daily census counts for all psychiatric institutions. The data for 1969 and 1971 are average daily census counts at all nonfederal psychiatric hospitals; the data for 1972–95 are average daily census counts for all psychiatric institutions, including psychiatric hospitals and institutions for "mental retardation." The AHA surveys achieved very high participation rates and are comparable to the earlier government series, with the exception of a few outlier states, such as Montana and Arkansas, where hospital response rates have been low at times.

In order to maintain the highest level of consistency in mental health populations over the seven decades, two data sets of mental hospital populations were compiled. The first includes only patients in residence in public (state, county, and city) mental hospitals. This first data set is compiled entirely from the federal government census data.[4] The second data set includes all resident patients in mental hospitals, including not only public mental hospitals but also private mental hospitals, psychopathic hospitals, psychiatric wards at general hospitals and VA hospitals,[5] and public and private institutions for "mental defectives and epileptics" and for "the mentally retarded." This data set is compiled from the federal government census data for the period 1934–68 and the AHA data for 1969–2001.[6] The rates of institutionalization using these two different data sets on mental institutions are reflected in Figure 5.

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4. For the period 1967–96, Raphael (2000) compiled a similar state-level data set of state and county mental hospital populations for a study he conducted. Those data are practically identical over the 30-year period to the data I compiled for that portion and subtype of the data set. Because the documents from the NIMH became less formal and are merely photocopied reports starting in 1969 (in large part because of deinstitutionalization and the reduction of the populations), some of the reports are now difficult to obtain. The data set I compiled therefore relies on the Raphael data for 10 years (1970–71, 1974, 1977, 1980, 1984–87, and 1991). I thank Steven Raphael for generously sharing those data with me. For this first data set, all other years, including all the yearly census counts from 1992 to 2001, rely on the Census Bureau and NIMH reports.

5. Patients in VA hospitals are reported by their home state in the census reports. As the 1947 government report notes (National Institute of Mental Health 1950, p. 36 n.1), "Veterans are distributed by home state rather than state of hospitalization."

6. In those few states where hospital survey response rates were low and where the AHA hospital census count was lower than the government data on state and county hospitals (there were 173 such cases in the data set of 1,683 observations over the period 1969 to 1995), the latter counts were used. Data were interpolated for 1970 (which was missing
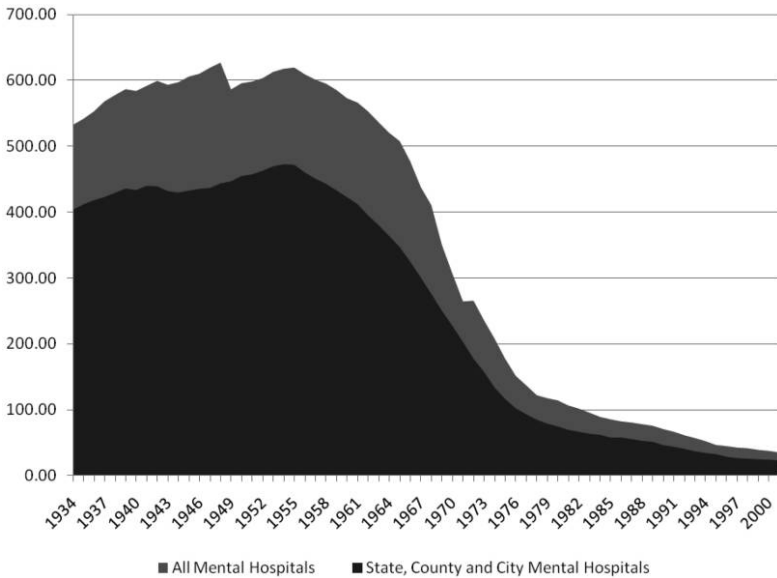
Figure 5. Rates of institutionalization in mental hospitals in the United States (per 100,000 adults), 1934–2001.

2.2. State and Federal Prison Populations

For the period beginning 1977, state and federal prison populations are well enumerated and documented in electronic format by the Bureau of Justice Statistics (BJS) of the Department of Justice; prior to that, the breakdowns are available in written reports issued since 1926 on a yearly basis with annual counts of state and federal prisoners—first compiled by the Census Bureau along the lines of the mental health population breakdowns. The data on prison populations were thus compiled from the Census Bureau reports titled *Prisoners in State and Federal Prisons and Reformatories* [year]: *Statistics of Prisoners Received and Discharged during the Year, for State and Federal Penal Institutions* [year].

because of the switch from one AHA series, the *Guide* annual supplement to *Hospitals*, to another format, *Hospital Statistics*). An algorithm was used to interpolate for the period 1996 to 2001, using the total aggregate national data for the period, which continue to be published by the AHA.

For the period beginning 1977, the data are taken directly from the BJS (2005).[7]

2.3. County Jail Populations

By contrast, the data on jail populations are sparse and not reliable at the state level for the period prior to 1970, the year that the Law Enforcement Assistance Administration (LEAA) conducted the first state-by-state census of jails (Cahalan 1986, pp. 73, 76 table 4-1). Prior to that, there were decennial Census Bureau counts for 1880, 1890, 1940, 1950, and 1960, but even those counts were not entirely reliable.[8] Since 1970, the data are more reliable, but they remain extremely spotty. The BJS conducts census counts of jails every 5–6 years, and those counts produce state-level data. These censuses are supplemented by the annual survey of jails, which is a sample and does not allow for state-by-state estimates. As a result, since 1970, jail inmate counts by state are available only for 1978, 1983, 1988, and 1993, as well as 1999; in addition, there is a midyear 2005 state-by-state estimate of jail inmates. There are national trends from 1990 to 2005, but those are for the nation, not for the states.

A state-level data set for jail populations can be compiled using extensive interpolation from these and decennial census counts, but it is not sufficiently reliable to use in state panel-data regressions. Aggregated to the national level and interpolated, it can provide some indications of overall trends for national-level analysis. Such a data set was compiled from the following sources: (1) Census Bureau data for decennial years 1940, 1950, and 1960, as well as Census Bureau counts of prisoners and jail inmates for 1923 and 1933 (Cahalan 1986, pp. 76 table 4-1, 78 table 4-3); (2) LEAA census data for 1970 (Cahalan 1986, p. 76 table 4-1); and (3) the BJS jail inmate counts for 1978, 1983, 1988, 1993, 1999, and 2005. Missing years were linearly interpolated using these data.

7. The source for the BJS report is the National Prisoner Statistics data series (NPS-1), version date December 6, 2005.

8. For instance, in 1970, the census reported 129,189 inmates in jail, whereas the first Department of Justice LEAA count that same year reported 160,863 inmates in jail—24.5 percent more (Cahalan 1986, p. 76 table 4-1). In addition, between 1904 and at least 1940, the census counted only jail inmates who were sentenced (pp. 73–74). The special report *Prisoners, 1923* also excluded inmates who were not sentenced and omitted certain jails that were believed not to contain sentenced jail inmates (p. 73). All those data, including the 1933 *County and City Jails* report, excluded jail inmates who had not been sentenced yet (Cahalan 1986).
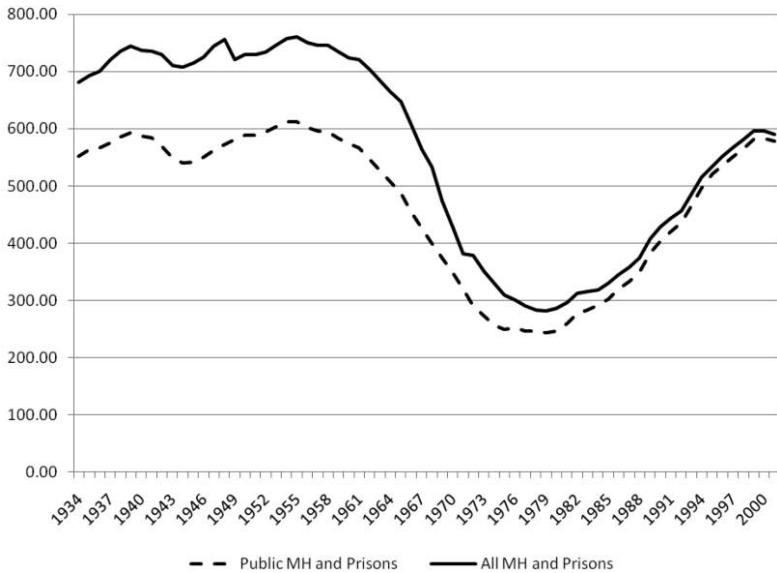
Figure 6. Rates of institutionalization in mental hospitals and state and federal prisons (per 100,000 adults), 1934–2001: the two data sets.

2.4. Aggregated Institutionalization and Homicide Trends

When the patients in all mental health facilities are included with prison populations and aggregated at the national level, the rates of institutionalization in the 20th and 21st centuries take on a different air: in the period between 1936 and 1963, the United States consistently institutionalized (in all mental institutions and prisons) at rates above 700 per 100,000 adults—with highs of 760 and 757 in 1955 and 1948, respectively. The trend lines including the two different data sets of mental hospitalization are visualized in Figure 6.

In this light, the relationship between aggregated institutionalization and homicide rates looks very different. Over the course of the 20th century, homicide rates appear to have fluctuated in an inverse relationship with rates of aggregated institutionalization. The relationship is graphically represented in its most basic form, without controlling for other indicators, in Figure 7.

To make the point somewhat more dramatically, if the data are sorted in descending order on the homicide rate, the relationship between ag-

Figure 7. Rate of aggregated institutionalization in mental hospitals and prisons (per 100,000 adults) and rate of homicide (per 10,000,000 persons) in the United States, 1934–2001.

gregated institutionalization and homicide rates forms the X-pattern represented in Figure 8. The correlation between the aggregated institutionalization rate (all mental hospitals plus state and federal prisons) and the homicide rate is remarkably high: −.8554. A Prais-Winsten regression model used at the national level shows the relationship to be statistically significant over the period 1934–2001, holding constant three leading correlates of homicide—namely, youth demographics, poverty, and unemployment.[9]

3. THE OTHER DATA

3.1. Dependent Variable: Homicide Victimization

Homicide victimization, as reported by vital statistics, is the only reliable measure of violent crime that goes back as far as the 1930s and is therefore used as the measure of violent victimization in this study. The

9. See Appendix A for discussion and results of Prais-Winsten regression on the national-level data.
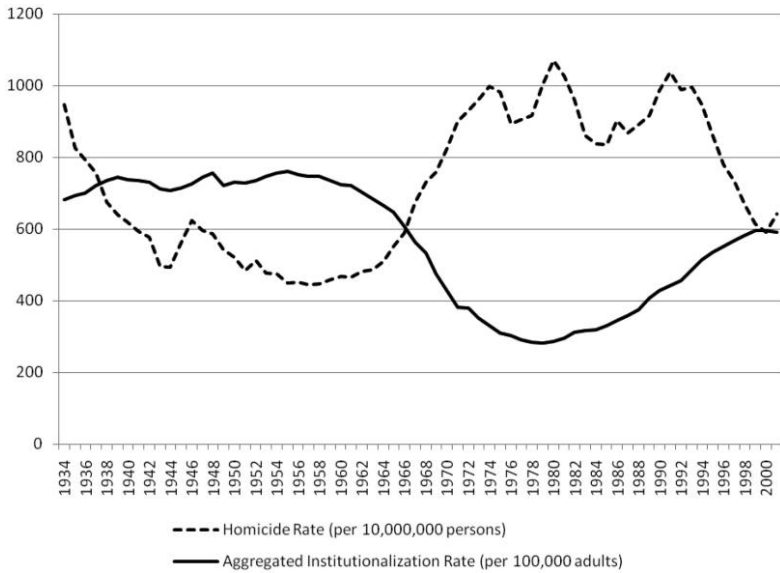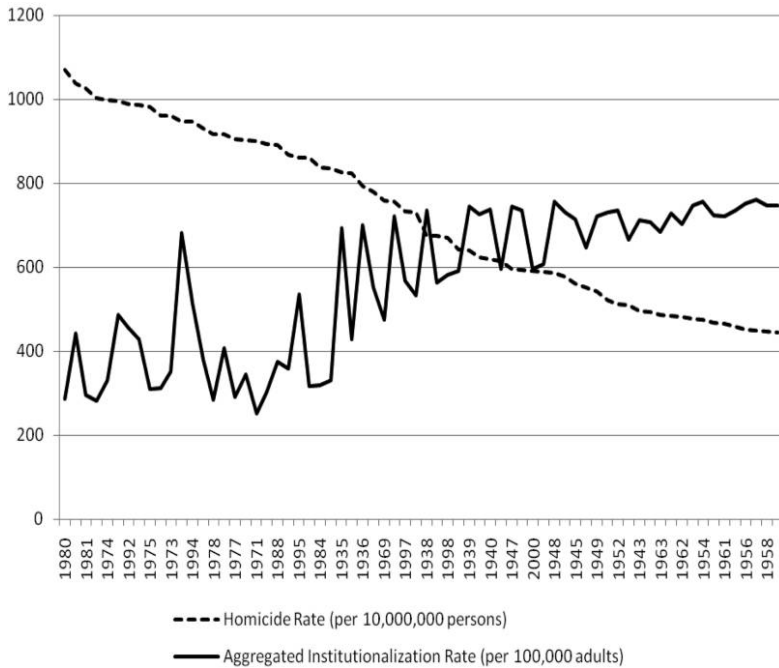
Figure 8. Rate of aggregated institutionalization in mental hospitals and prisons (per 100,000 adults) and rate of homicide (per 10,000,000 persons) in the United States, 1934–2001, sorted on the homicide rate (in descending order).

annual homicide count for each state is derived from the annual report on mortality statistics published by the Census Bureau. These are vital statistics data compiled from transcripts of certificates of death received from each state. The data were complete for the first time and embraced all the existing states in 1934; prior to 1934, certain states, such as Texas, Georgia, Nevada, and others, were not part of the reporting system (U.S. Bureau of the Census 1934, p. 3). For this reason, the state-level panel regressions start in 1934.

3.2. Control Variables

The state-level panel-data regressions include seven control variables related to the four leading covariates of homicide—economic conditions, youth populations, criminal justice enforcement, and demographics:

1. *Real per capita income for each state.* The data for state-level

per capita income are derived from the U.S. Census Bureau annual *Statistical Abstract of the United States*, and the values from the *Statistical Abstract* are converted into present dollars using the consumer price index. Katz, Levitt, and Shustorovich (2003, pp. 318–43) originally compiled these data for the period 1950 to 1990. Donohue and Wolfers (2005, pp. 791–845) extend the data sets to cover the period 1934 to 2000. John Donohue generously made those data available.

2. *Proportions of the population that are ages 15 to 19, ages 19 to 24, nonwhite, black, and urban*. These data are based on decennial census data, linearly interpolated between censuses, and derived from the *Statistical Abstract of the United States*. They were obtained from Donohue and Wolfers (2005), who expanded the Katz, Levitt, and Shustorovich (2003) data set.

3. *The annual execution rate for each state*. The state-level annual count of executions is collected from official reports of the Census Bureau for the period 1926–30, the Federal Bureau of Prisons for the period 1930–70, and the BJS for the period 1977–2005. There were no executions between 1971 and 1976 because of the Supreme Court's decision in *Furman v. Georgia* (408 U.S. 238 [1972]). Here and elsewhere, when necessary to compute state rates, the annual state population numbers are collected from the U.S. Census Bureau's annual *Statistical Abstract of the United States*.

4. *The rate of police force*. The state-level annual count of police officers is drawn from several sources. First, for each year from 1982 to 2005, the BJS has police protection employment data by state under the category "police protection: full-time equivalent" for state and local governments. The BJS obtains its data from the Census Bureau's *Annual Survey of Public Employment*. Second, for the years 1953 to 1981, the same publication by the Census Bureau, then titled *Government Employment*, has similar annual census data. Third, for the years prior to 1953, the data were obtained from the decennial census publications, which divide the labor force by occupation for each state.

4. ANALYSIS

In order to test the relationship between aggregated institutionalization and homicide rates at the state level, this study uses clustered regression models on the state panel data with fixed state and year effects and an adjustment for correlated error (robust standard errors). Fixed-effects models are especially useful for correcting for the possibility of omitted-

variable bias, and the robust standard error enhances confidence in the tests of statistical significance. The specific estimating equation of this class of models is as follows:

$$\log \text{Homicide Rate}_{sy} = \alpha + \beta \, \text{Institutionalization Rate}_{sy} \tag{1}$$
$$+ \, \theta \, \text{Controls}_{sy} + \gamma_s + \delta_y + \gamma + \varepsilon_{sy},$$

where s represents states and y reflects the year. The dependent variable of interest in this class of models is the natural log of the annual homicide rate for each state, which is obtained using vital statistics measures of death by homicide. The key explanatory variable of interest is the 1-year-lagged rate of aggregated institutionalization in state and federal prisons, in public mental hospitals, and in other institutions for the mentally ill. The model uses a weighted least squares regression, with weights equal to the annual population of the states, clustering standard errors at the state level. The model conditions on state and year fixed effects (γ_s and δ_y) to account for unmeasured factors that influence crime and either are constant within states over the study period or change over time but exert a constant influence over the entire set of states. The later models also include the seven control variables along four principal dimensions of alternative explanations—namely, indicators of state economic condition, percentages of youth populations, criminal law enforcement measures, and demographics. To remove trend in these time-structured data and avoid the possibility of spurious results from nonstationarity, all models incorporate a linear trend variable by adding γ (year) as a predictor. The study accounts for arbitrary forms of correlation in the models' error structure by calculating robust standard errors, again clustered at the level of the state. To maintain commensurability across states, all models use rates of homicide and institutionalization, rather than counts.

The models use the natural logarithm of the homicide rate as the dependent variable and thus imply a nonlinear prediction as to the main independent variable (the institutionalization rate) so as to incorporate some elasticity. The reason to use a nonlinear model is that, as most research has shown, there is likely less of an effect on homicide rates at higher levels of incapacitation: as institutionalization rates rise beyond a certain point, it is likely that the type of people institutionalized are no longer the clearest candidates for institutionalization. For this reason, there is likely some elasticity in the relationship between institutionalization and homicide. In addition, using a log-linear estimation means

that the models are multiplicative with regard to the other independent variables. Most of the more reliable studies on the crime-prison nexus use similar nonlinear models with elasticity.

Finally, the models use a 1-year-lagged institutionalization rate. It is common in analyses of the effect of imprisonment on crime rates to use a 1-year lag (DeFina and Arvanites 2002; Rosenfeld 2009). A lag is often introduced to address simultaneity concerns, although the possibility of simultaneity in this case would entail only a conservative bias and would minimize the correlations. In this particular study, it is more likely that any potential effect would be contemporaneous rather than lagged, and so, from a theoretical perspective, one might not necessarily include a lag; however, the data in this case were collected in such a way as to call for a lagged model. All the government census data on mental hospitalization are collected on December 31 of the given year, and thus the entire public mental hospitalization data set (from 1934 to 2001) and the majority of the total mental hospitalization data set (from 1934 to 1968) are December 31 data. The prison counts are also December 31 census counts. (The AHA total mental hospitalization data [from 1969 to 2001] are annual averages of daily census counts, but represent a minority of the data.) The dependent variable, in contrast, is yearly homicide rates. For this reason, institutionalization rates are lagged 1 year.[10]

4.1. Results on Data Set of All Mental Hospitals and Prisons

Beginning with the larger data set of all residents in mental hospitals and aggregating those data with the prison populations, the log-linear model from equation (1) offers a robust and significant prediction of homicide rates for the period 1934–2001, as evidenced in Table 1. In the first model, the state-level aggregated institutionalization data explain a large amount of the variation in homicide rates, and the models explain more as the control variables are introduced. In the fourth and last model, which has introduced the seven competing control variables, the influence of aggregated institutionalization remains statistically sig-

10. To clarify, as a result of the 1-year lag, for all the public mental hospitalization data and for the total hospitalization data from 1934 to 1968, the models use institutionalization rates on December 31 of a given year (for example, 1950) and the homicide rate for the full following year (for example, 1951); for the total hospitalization data from 1969 to 2001, the models use average daily census rates from a given year (for example, 1990) and the homicide rate of the following year (for example, 1991).

Table 1. State-Level Panel-Data Regressions (1934–2001), All Mental Hospitals and Prisons

	(1)	(2)	(3)	(4)
Aggregated institutionalization				
rate per 1,000	−.133**	−.040*	−.037*	−.036*
	(.017)	(.017)	(.016)	(.016)
% Ages 15–19		.036	.026	.031
		(.046)	(.044)	(.045)
% Ages 20–24		.091*	.089**	.088*
		(.035)	(.033)	(.035)
% Urban		−.013**	−.011*	−.011*
		(.004)	(.004)	(.004)
% Black		.037**	.037**	.036**
		(.006)	(.006)	(.006)
Rate of execution per 100,000			.039	.041
			(.144)	(.147)
Police officer rate per 100,000			−.002*	−.002*
			(.001)	(.001)
Real per capita income				.001
				(.002)
Observations	3,285	3,235	3,235	3,235
R^2	.89	.93	.93	.93

Note. The dependent variable is the log of the homicide rate. The institutionalization rate is lagged 1 year. The models are estimated using population-weighted least squares regression, controlling for year and state fixed effects, and detrended. Robust standard errors clustered at the state level are reported in parentheses.
  *Significant at 5%.
  **Significant at 1%.

nificant (*p*-value of .031): the 95 percent confidence interval is narrow, ranging from −.068 to −.003.

To give a sense of the actual relationship between aggregated institutionalization and the homicide rate—recall that these models use the natural logarithm of homicide—we can exponentiate the coefficient for the variable institutionalization in the models. In model 1, the coefficient of −.133 translates to .8755, meaning that if the rate of aggregated institutionalization increased by one person per 1,000 (or, in other words, 100 persons per 100,000), the expected homicide rate would be 87.55 percent of what it was before. In other words, the homicide rate would decline by about 12.45 percent. In model 4, the coefficient of −.036 translates to .9646, meaning that an increase in institutionalization of 100 per 100,000 would likely result in homicides at 96.46 percent of the previous rate, or a decline of 3.54 percent. These are significant numbers.[11]

  11. The results are slightly sensitive to weighting by population; although the regression
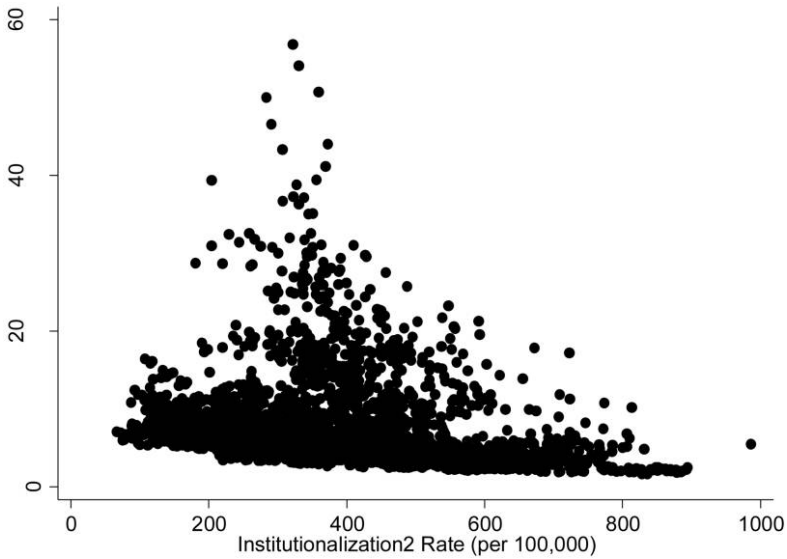
Figure 9. Predicted values of homicide rate based on state-level panel-data regression using log of homicide rate as dependent variable, with fixed year and state effects, including all independent variables, 1934–2001: all mental hospitals and prisons.

To help visualize this, it may be useful to plot the predicted (non-logged) values of the homicide rate in the final model (model 4) against the aggregated institutionalization rate. Figure 9 graphically represents the predicted values of the homicide rate using model 4, which includes all the control variables. Figure 10 focuses on the values of the homicide rate lower than 12 in order to give a better sense of the elasticity of the predicted values by magnifying the area of greatest interest. What is entirely remarkable about these findings is that they span such a lengthy period of time—68 years, from 1934 to 2001—and cover all 50 states, resulting in more than 3,200 observations; they control for all of the leading correlates of homicide; and they achieve statistical significance at the .031 level.

Several results on control variables are also interesting. The important influence of youth population is entirely consistent with what many social scientists have argued, namely, that one of the most important

coefficients are substantially similar using non-population-weighted clustered regressions, the reliability of the predictions in model 4 decreases (see Appendix B).
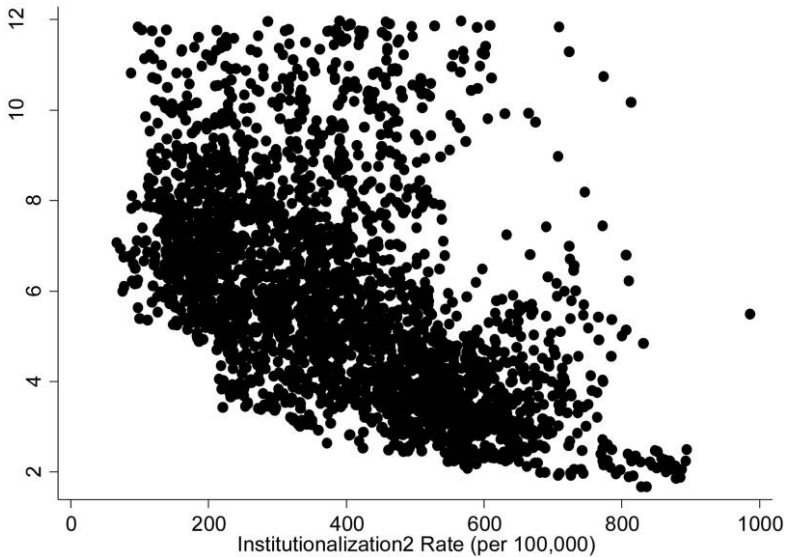
Figure 10. Predicted values of homicide rate below 12 per 100,000 based on state-level panel-data regression using log of homicide rate as dependent variable, with fixed year and state effects, including all independent variables, 1934–2001: all mental hospitals and prisons.

driving factors in rates of violent crime is the size of the youth cohort.[12] Research has consistently attributed a large portion of the rise in crime during the 1960s to the post–World War II baby boom, which spanned the period 1946–64 and produced a large number of high-risk persons ages 14–24 during the 1960s and 1970s (Blumstein and Nagin 1975, pp. 221–22; Laub 1983, pp. 192–94). There is debate, though, over the extent of the influence, as well as over how to interpret the results. On the one hand, Cohen and Land (1987, pp. 170, 172–75) studied the relationship between the proportion of the population between ages 15 and 24 and variations in homicide and auto theft rates and found a highly significant statistical relationship accounting for a substantial fraction of the change. On the other hand, Levitt (1999, p. 582) found that "the changing age distribution can explain only 10–20% of the dramatic rise in crime observed between 1960 and 1980." He charac-

12. See generally Fox (2000, p. 288): "[C]rime statistics that overlook differences by demography can easily lead to misinterpretation"; see also South and Messner (2000, p. 84); but see Marvell and Moody (1991, pp. 250–54).

terizes this as "a limited impact" (p. 581). By contrast, Fox and Piquero (2003, pp. 339, 354) contend that about 10 percent of the drop in crime in the 1990s was due to changing demographics and refer to this phenomenon as "deadly demographics." So the estimates, and especially the interpretations, vary significantly.

What is particularly interesting about the regression results here, though, is that the effect shows up with the ages 20–24 cohort when all the variables are introduced, but not the ages 15–19 cohort. This suggests that the actual ages chosen may have a significant effect on the results. In other words, it may not be enough to focus on "ages 14–24" or other age groups; it may be important to slice the age groups in more refined ways, perhaps even year-by-year.

The race effects are also remarkable and, in all likelihood, have to do with high victimization rates in the African-American community. As Bobo notes (Bobo and Johnson 2004, p. 156), "Blacks are more likely to be the victims of crime than Whites and to live in communities with higher levels of crime and disorder" (see also Blumstein 2001; Kennedy 2001). This is consistent with research that shows that, at the individual level, "young people, males, and members of disadvantaged minorities are at comparatively high risk of becoming offenders and victims, at least with respect to the common 'street' crimes" (South and Messner 2000, p. 84).

The findings regarding both criminal justice variables are interesting as well. The first, the execution rate, does not seem to play any discernible role. In both models 3 and 4, the execution rate is positively related to homicide but the estimates are entirely unreliable, with a 95 percent confidence interval in the fourth model that spans from −.254 to +.336. Much has been written recently about the deterrent effects of capital punishment. Donohue and Wolfers (2005, p. 841) have carefully reviewed the recent studies, including state-level panel data analyses, and concluded that "none of these approaches suggested that the death penalty has large effects on the murder rate." A recent study by Land, Teske, and Zheng (2009) on Texas-only data suggests that any modest short-term reductions in homicide may be attenuated by displacement of homicides from one month to another. The findings from this analysis are consistent with these conclusions.

The findings regarding the police force indicate some mild and slightly significant negative effect on homicide rates, which is also consistent with the most reliable evidence. Levitt (2004) attributes a portion of the 1990s crime drop to increased police forces and suggests that an in-

creased number of police officers on the beat—regardless of their exact policing technique—seems to correlate with reductions in violent crime. The findings of this study are consistent again.

The single economic indicator—real per capita income—does not seem to be statistically important in the analysis. In their seminal study, Land, McCall, and Cohen (1990, pp. 922, 951) review 21 of the leading homicide studies and find that "[b]y far, the strongest and most invariant effect is due to the resource-deprivation/affluence index; consistently across the four decennial census periods, cities, metropolitan areas, or states that are more deprived have higher homicide rates, and those that are more affluent have lower rates." It may be that the state per capita income is not the best proxy for an affluence index. It could also be that using a model that controls for fixed state effects might mute the expected relationship between affluence and homicide. The lack of a relationship is nonetheless surprising.

4.2. Results on the Data Set of Public Mental Hospitals and Prisons

Similar results obtain using the aggregated data set that includes only public (state, county, and city) mental hospitals. The log-linear model from equation (1) again offers a robust and significant prediction of homicide rates for the period 1934–2001, as evidenced in Table 2. Again, from the first model, aggregated institutionalization explains a large amount of the variation in homicide rates, and even by the fourth model, which has introduced all seven competing control variables, this measure of aggregated institutionalization remains statistically significant (at the level of .038). The 95 percent confidence interval runs from $-.078$ to $-.002$. Again, a sense of the actual relationship is useful: in model 1, the coefficient of $-.142$ translates to .8676, meaning that if the rate of aggregated institutionalization (in public mental hospitals and prisons) increased by 100 persons per 100,000, the expected homicide rate would be 86.76 percent of what it was before, or, in other words, the homicide rate would decline by 13.24 percent. In model 4, the coefficient of $-.04038$ translates to .9604, meaning that an increase in institutionalization of 100 per 100,000 would likely result in a decline in homicides of 3.96 percent. Again, these are significant numbers of homicides. The visualization of the relation can be plotted using nonlogged values of the homicide rate in the final model (model 4) against the measure of aggregated institutionalization. Figure 11 represents the predicted values of the homicide rate in model 4. Figure 12 focuses on the values of the homicide rate lower than 12 per 100,000 to give a better sense of the

Table 2. State-Level Panel-Data Regressions (1934–2001), Public Mental Hospitals and Prisons

	(1)	(2)	(3)	(4)
Aggregated institutionalization rate per 1,000	−.142**	−.044*	−.042*	−.040*
	(.019)	(.020)	(.019)	(.019)
% Ages 15–19		.039	.028	.034
		(.044)	(.044)	(.045)
% Ages 20–24		.091**	.090**	.088*
		(.034)	(.032)	(.034)
% Urban		−.013**	−.011*	−.011**
		(.004)	(.004)	(.004)
% Black		.038**	.038**	.037**
		(.006)	(.006)	(.006)
Rate of execution per 100,000			.042	.045
			(.142)	(.145)
Police officer rate per 100,000			−.002*	−.002*
			(.001)	(.001)
Real per capita income				.001
				(.002)
Observations	3,285	3,235	3,235	3,235
R^2	.89	.93	.93	.93

Note. The dependent variable is the log of the homicide rate. The institutionalization rate is lagged 1 year. The models are estimated with population-weighted least squares regression, controlling for year and state fixed effects, and detrended. Robust standard errors clustered at the state level are reported in parentheses.

   *Significant at 5%.

   **Significant at 1%.

elasticity. Once again, these findings are remarkable since they cover such a lengthy period of time and all 50 states and control for the leading correlates of homicide. The results on the control variables are substantially similar to those in the previous discussion.

4.3. Comparison with Imprisonment or Mental Hospitalization Only

Aggregating mental hospital and prison populations offers a far stronger prediction of homicide rates than using either the mental hospitalization rate alone or the imprisonment rate alone. In fact, using the prison rate alone does not come close to predicting homicide rates with the high degree of reliability that aggregated institutionalization rates provide. This is demonstrated in the next table, Table 3, which distinguishes and compares all the possible institutionalization variables and displays the statistical results using the model that includes all control variables (essentially model 4 above). The primary independent variable of interest
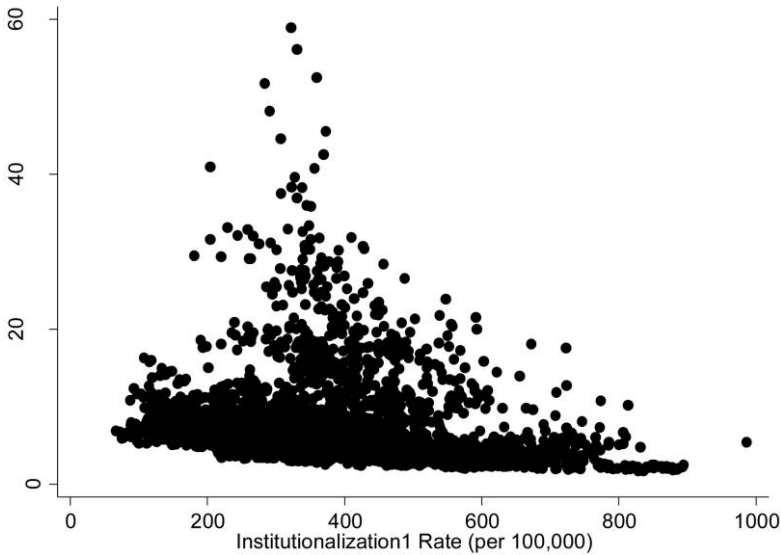
Figure 11. Predicted values of homicide rate based on state-level panel-data regression using log of homicide rate as dependent variable, with fixed year and state effects, including all independent variables, 1934–2001: public mental hospitals and prisons.

in Table 3 remains total aggregated institutionalization (model 5), but for the sake of completeness, Table 3 includes models for every possible permutation, including public mental hospitals alone (model 1), all mental institutions alone (model 2), prisons alone (model 3), public mental hospitals and prisons (model 4), all mental institutions and prisons (model 5), and a horse-race comparison of all mental institutions versus prisons (model 6).

Notice that the mental hospitalization rates alone and the prison rates alone have relatively similar magnitudes of effect but are not reliable or precise in their prediction of homicide rates. The public mental hospitals coefficient in model 1 (−.048) is only significant at the .129 level, which means that the 95 percent confidence interval spans widely, from −.112 to +.015. The all mental institutions coefficient in model 2 (−.036) is also unreliable, with a significance at the .135 level and a 95 percent confidence interval that spans, again, a wide range, from −.083 to +.0115. The prisons coefficient in model 3 (−.041) is even less reliable, with significance standing at the .14 level and a 95 percent confidence
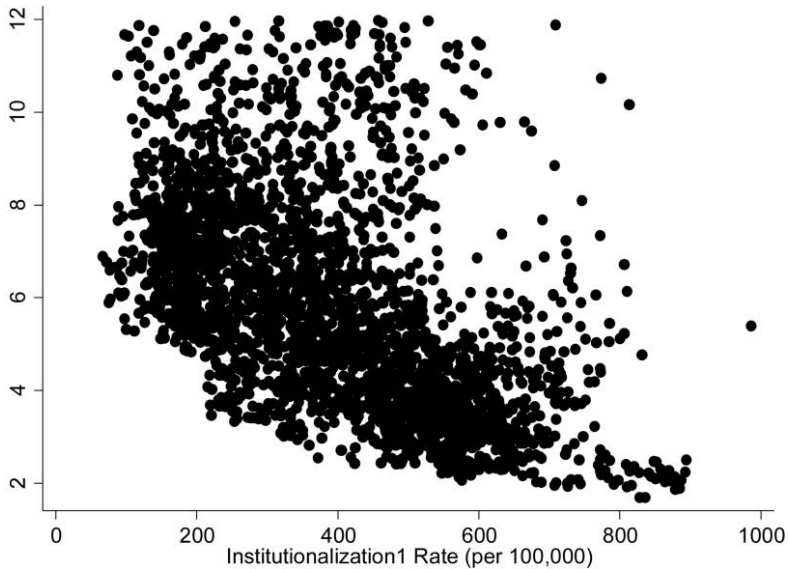
Figure 12. Predicted values of homicide rate below 12 per 100,000 based on state-level panel-data regression using log of homicide rate as dependent variable, with fixed year and state effects, including all independent variables, 1934–2001: public mental hospitals and prisons.

interval that spans from −.096 to +.014. In the horse-race comparison in model 6, neither mental institutions nor prisons fare well in terms of their reliability.[13] The bottom line is that combining mental hospitals and prisons in an aggregated measure of institutionalization produces by far the best and most reliable predictor of homicide rates over the 20th century.

5. STATE VARIATIONS

State-by-state variation can be expected and is interesting to explore. The individual state data are each single-jurisdiction time-series data

13. In the horse-race comparison in model 6 of Table 3, a joint F-test of the two separate institutionalization variables (mental hospitalization versus imprisonment) yields a result of .0889. That result is significant at the 10 percent level, but does not match the level of significance (.031) of aggregated institutionalization in model 5. In essence, this means that using a single coefficient on the more constrained aggregated variable performs better than allowing each separate element to have its own coefficient. This confirms that aggregated institutionalization remains a more significant predictor of homicide than the two separate elements and the most significant and strongest predictor of homicide in Table 3.

Table 3. State-Level Panel-Data Regressions (1934–2001): Comparison of Data Sets

	Public MH (1)	All MH (2)	Prisons (3)	Public MH and Prisons (4)	All MH and Prisons (5)	Horse Race (6) All MH	Horse Race (6) Prisons
Institutionalization rate per 1,000	−.048 (.031)	−.036 (.024)	−.041 (.027)	−.040* (.019)	−.036* (.016)	−.033 (.024)	−.039 (.027)
% Ages 15–19	.032 (.045)	.030 (.044)	.043 (.043)	.034 (.045)	.031 (.045)		.032 (.044)
% Ages 20–24	.083* (.034)	.084* (.036)	.095** (.035)	.088* (.034)	.088* (.035)		.088* (.037)
% Urban	−.011** (.004)	−.011** (.004)	−.012** (.004)	−.011** (.004)	−.011* (.004)		−.011** (.004)
% Black	.038** (.007)	.037** (.007)	.040** (.007)	.037** (.006)	.036** (.006)		.037** (.007)
Rate of execution per 100,000	.029 (.155)	.025 (.157)	.036 (.147)	.045 (.145)	.041 (.147)		.042 (.146)
Police officer rate per 100,000	−.002** (.001)	−.002* (.001)	−.001* (.001)	−.002* (.001)	−.002* (.001)		−.002* (.001)
Real per capita income	.001 (.002)	.001 (.002)	.002 (.002)	.001 (.002)	.001 (.002)		.001 (.002)
Observations	3,246	3,246	3,236	3,235	3,235		3,235

Note. The dependent variable is the log of the homicide rate. Institutionalization is lagged 1 year. Models are estimated with population-weighted least squares regression, controlling for year and state fixed effects, and detrended. Robust standard errors clustered at the state level are reported in parentheses. R^2 for all models = .93. MH = mental hospitals.

*Significant at 5%.

**Significant at 1%.

and, as a result, are highly autocorrelated—the value in the time series at any one time depends heavily on the value in the preceding period or periods. In order to adjust for error autocorrelation, a Prais-Winsten regression model is used with an autocorrelation adjustment at one time lag.[14] The Prais-Winsten model, which corrects for first-order autocorrelated error, fits the data well because the correlograms (autocorrelation function plots) and partial correlograms (partial autocorrelation function plots) of the residuals from the ordinary least squares (OLS) regression analyses reveal that an AR1 (autoregressive effect at one time lag) effect is the principal time-series error component at the individual state level.

The Prais-Winsten model is a straightforward model for the study of time-series data. The method produces an unbiased regression estimate, and as a result, the coefficient is typically very close in value to the OLS coefficient. Apart from the adjustment for error autocorrelation, the regression model is simple: the log of the national homicide rate serves as the dependent variable, and the rate of aggregated institutionalization (all mental institutions plus prisons) for each state (lagged 1 year), as well as the seven control variables, are the regressors. The control variables employed in these individual state regressions are the same ones that are employed in the state panel-data analyses. Again, to remove trend in these time-structured data and avoid the possibility of spurious results, the model incorporates a linear trend variable (γ) as a predictor. The analysis runs a single model for each state that takes account of the effect of these other seven indicators.

The individual state findings reveal a complex and nuanced picture. Looking first at the five largest states, which combined constitute more than one-third of the total U.S. population, there are very strong and robust relationships in Texas and California, where the results remain statistically significant with all control variables included. In both states, the negative coefficients (−.1 and −.122, respectively) are large and significant. Wherever there is a significant relationship, it is in the direction predicted by the state-level panel data: more aggregated institutionalization results in lower homicide rates. Among these five states, there is not a single model that produces a positive and statistically significant relationship.[15]

14. For an extensive explanation of the Prais-Winsten model, see Ostrom 1990, pp. 31–39.

15. See Appendix C for the results of the Prais-Winsten regressions for the five largest states.
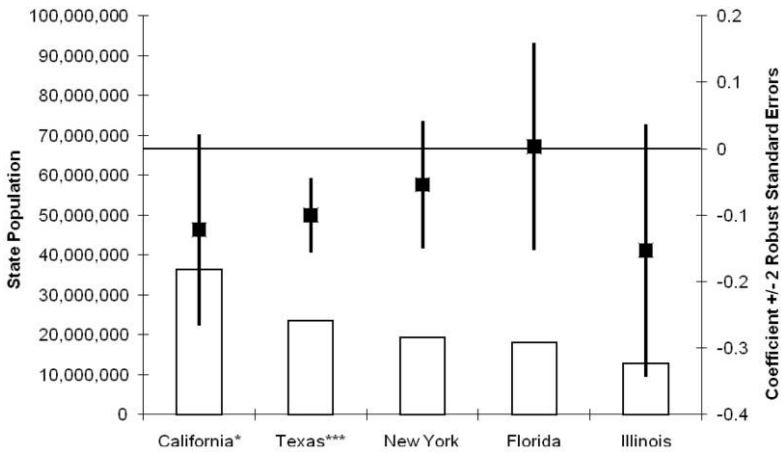
Figure 13. Coefficient of aggregated institutionalization plus or minus two robust standard errors for the five most populous states, using log of homicide rate as dependent variable and including all controls, 1934–2001.

A useful way to visualize the key results is to plot the coefficient of the independent variable of interest (aggregated institutionalization), as well as the band represented by adding and subtracting two robust standard errors—which is very close to the 95 percent confidence interval. Figure 13 represents just this, mapped against the overall population of the five largest states.[16] The figure reveals that there are, indeed, slightly different relations within the five largest states, although the general direction of the relationship (with the possible exception of Florida) is clearly negative. The next graph, Figure 14, plots the same values of interest for the 50 states. Notice that the majority of predicted values are in the negative zone, especially for the larger states on the left-hand side of the graph.[17]

6. CONCLUSION AND AVENUES FOR FURTHER RESEARCH

This study provides strong evidence of what should now be called an "institutionalization effect." Naturally, these findings raise a number of

16. The results are significant at the 10 percent level for California, and at 1 percent for Texas.

17. The results are significant at the 10 percent level for California, Georgia, North Dakota, West Virginia, and Wisconsin; at 5 percent for Indiana, Maine, Michigan, Minnesota, and Oregon; and at 1 percent for Texas, Utah, and Vermont.
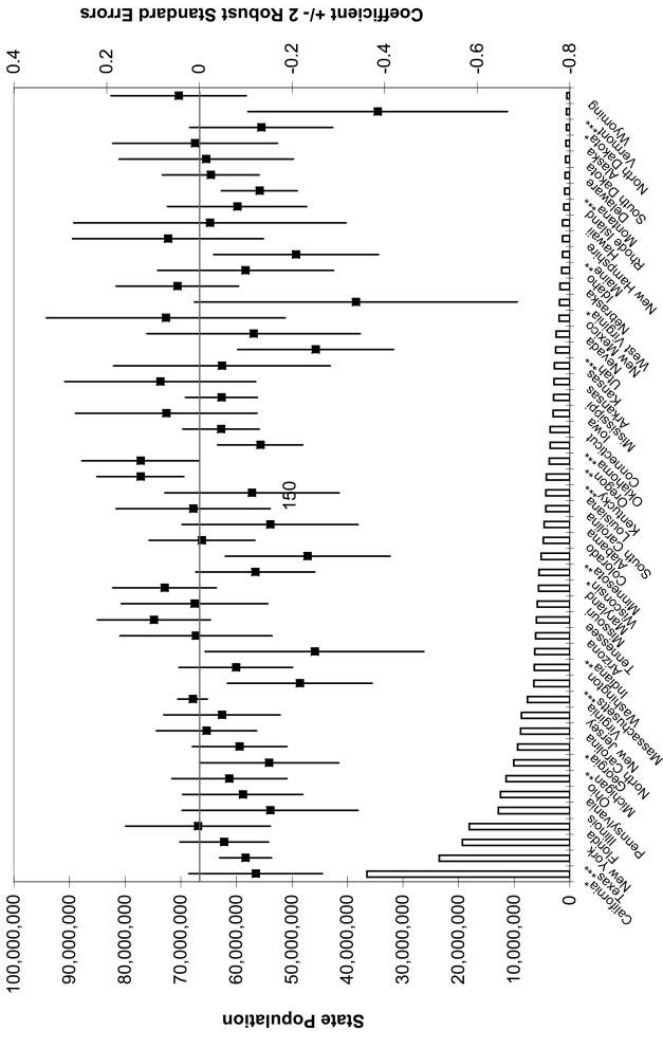
Figure 14. Coefficient of aggregated institutionalization plus or minus two robust standard errors for individual states, using log of homicide rate as dependent variable and including all controls, 1934–2001.

questions that warrant further research. The first has to do with the mechanism that might explain the correlations. In all likelihood, mental hospitalization and imprisonment rates have an effect on homicide rates through the potential victimization of the institutionalized populations. Research has consistently shown that persons with mental disorders are at far higher risk of violent victimization than the general population—one recent study finding that a quarter of persons with serious mental illness are victims of violent crime annually, at a rate that is 11 times higher than that of the general population (Teplin et al. 2005; see generally Teasdale 2009). This also holds true of prison and jail inmates: a large portion of murder victims, in fact a majority of nonfamily murder victims (Dawson and Langan 1994, p. 1), have a prior criminal history, and correlatively, inmates in prison have a higher likelihood of being the victims of violent crime outside of prison (Karmen 2010, pp. 101–3). Institutionalized populations therefore contain a higher proportion of potential homicide victims than the general population. This hypothesis—that the mechanism may well relate to victimization—is corroborated by recent demographic trends regarding both institutionalized and victimized populations. Residents of mental institutions at midcentury were characterized by sharply different demographic features than prison inmates today—they were whiter, older, and more female—and, inversely, today's prison population is, on the whole, far younger, more male, and more African-American (Harcourt 2006, pp. 1777–84). These demographic shifts track the pattern of changes in victimized populations closely (Smith and Zahn 1999, pp. 13–14; see generally Karmen 2010).

The second area for further research builds on these demographic shifts among the institutionalized populations. Demographic changes at the national level need to be placed in a richer historical context. On the issue of racial composition, the aggregate national picture may mask important differences at the state and regional levels. The early surveys by the Census Bureau are revealing in this respect. Aggregated to the national level, African-Americans represented a small fraction of residents in mental hospitals enumerated on January 1, 1923—7.6 percent to be exact—and had a relatively low institutionalization rate (192 per 100,000). Whites, in contrast, represented 92.9 percent of mental hospital residents and had a significantly higher institutionalization ratio of 259.8 per 100,000. But things look very different within and between states and regions. The New England and Pacific regions had high rates of black institutionalization, in fact far higher than white institutionalization in those regions, and also far higher than black institutional-

Table 4. Rate of Mental Hospitalization ("per 100,000 of Same Race"), January 1, 1923

	White	Negro	Indian	Chinese
New York	391.9	529.0	327.1	466.1
New Jersey	276.6	391.9	. . .	336.1
Pennsylvania	232.4	362	. . .	273.4
Illinois	291.2	370.9	. . .	324.2
California	350.4	528.9	864.0	281.1
Arkansas	137.0	77.7	. . .	. . .
Georgia	172.0	102.9	. . .	. . .
Mississippi	188.2	107.8	90.5	274.7

Source. U.S. Census Bureau 1926, p. 116.

ization in the South.[18] Table 4 illustrates some of these disparities in state breakdowns. Notice how the comparative rates differ as between states and regions. The racial demographics of mental hospitalization varied at the state level and will require further investigation and more nuanced analysis.

A third question is comparative. The United States today has an extraordinarily high rate of imprisonment, especially compared to other Western or industrialized countries. It has the highest rate and raw number of inmates in the world, but the contrast is even more shocking with peer countries, naturally. One immediate question that comes to mind is whether Western or industrialized countries with currently low prison populations use their mental health systems as an alternative form of social control.

Preliminary research suggests that the answer is a nuanced yes and no. Rates of mental hospitalization are higher in most countries, for instance, in the European Union, and they tend to be higher than the respective imprisonment rates, although the numbers do not reach the magnitudes achieved in the United States. The highest rate of beds in psychiatric hospitals per 100,000 inhabitants in 2000 was in the Netherlands, which had a rate of 188.5. Other highs were posted in Belgium (161.6), Switzerland (119.9), France (113), and Finland (102.9). The average for the 25 EU countries in 2000 was 90.1, down from 115.5 in

18. The Census Bureau in 1923 hinted at one possible explanation: "This is undoubtedly due to the lack of adequate hospitals for negroes in the South. In the parts of the country in which negro patients are admitted to State hospitals without discrimination, the rate for negroes generally exceeds that for whites. In Massachusetts, for example, the rate for resident negro patients is 644.4 and for resident white patients, 408.8" (U.S. Census Bureau 1926, p. 19).

1993.[19] These figures are, indeed, higher than the corresponding prison rates for the same countries, which stood in 2006 at 128 per 100,000 persons in the Netherlands, 91 in Belgium, 83 in Switzerland, 85 in France, and 75 in Finland (Walmsley 2006, p. 5). But they certainly do not reach the rates of aggregated institutionalization in the United States.[20]

On a related issue, though, there is evidence that in the past some European countries used institutions other than the prison more than they do now to control those deemed deviant—in other words, that the trends identified in the United States may bear some resemblance to trends in Europe. The Republic of Ireland, for example, had much higher rates of institutionalization in a wide range of facilities, including psychiatric institutions and homes for unmarried mothers, at midcentury—in fact, eight times higher—than at the turn of the 20th century (O'Sullivan and O'Donnell 2007). In Belgium, the number of psychiatric hospital beds per 100,000 inhabitants fell from 275 in 1970 to 162 in 2000; in France, it fell from 242 in 1980 to 111 in 2000; in the United Kingdom, from 250 in 1985 to 100 in 1998; and in Switzerland, from 300 in 1970 to 120 in 2000 (European Commission 2002, p. 358 table 6.2.6). Again, this requires more research, but there may be a parallel. The implications for the comparative international study of institutionalization are important.

Finally, this study raises serious questions about the alternative explanations for homicide that are traditionally offered. The conclusions here pose a challenge to criminological theory in general and to specific theories in particular—whether cultural, conflict, rational choice, differential association, biological, or other. The findings suggest a "social physics" explanation of crime: homicide is largely related to the number and rate of individuals involuntarily detained in closed institutions. This should not be entirely surprising and confirms a basic intuition, namely, that safely incapacitating portions of the population will have negative effects on crime rates (at least, outside of those closed facilities). But

19. Eurostat figures, available at http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-08-02-002-EN/KS-08-02-002-EN.PDF.

20. These are preliminary findings, and more research needs to be conducted on these comparative figures. The Russian Federation, for example, has a prison rate of 611 per 100,000 adults, which, when combined with mental health institutionalization, may offer some competition to the United States. There are, in fact, troubling reports concerning mental health institutionalization in Russia. See International Helsinki Federation for Human Rights 2006, p. 335; Murphy 2006.

this raises the stakes and presents us with a sharp trade-off. If this is indeed true, society chooses its level of incapacitation and victimization at the very same time and in the very same movement as it chooses its level of freedom. How we choose, given the trade-off, is ultimately a reflection on us and a mirror of our values—nothing more, nothing less.

APPENDIX A: PRAIS-WINSTEN REGRESSION ON NATIONAL-LEVEL DATA

The national-level data represent single-jurisdiction time-series data and as a result are highly autocorrelated. In order to adjust for error autocorrelation, a Prais-Winsten regression model is used with an autocorrelation adjustment at one time lag. The Prais-Winsten model fits the data well and produces an unbiased regression estimate. Prais-Winsten is used here so that the significance tests on the regression coefficients are correct; this would not be the case using an OLS regression since there is first-order autocorrelation in the error terms. Apart from the adjustment for error autocorrelation, the regression model is straightforward: the log of the national homicide rate serves as the dependent variable, and the rate of aggregated institutionalization (all mental hospitals plus prisons) and three control variables are the regressors. Aggregated institutionalization is lagged 1 year. To remove trend in the time-structured data, the model also incorporates a linear trend variable (γ or year) as a predictor.

The national-level control variables consist of the three leading structural covariates for homicide: the unemployment rate, the changing youth population age structure, and the poverty rate. The three control variables are summarized here:

1. *Unemployment.* The measure of unemployment is the official unemployment rate reported by the U.S. Census Bureau and Department of Labor, which consists of the percentage of the civilian labor force that is unemployed, in thousands of persons 16 years old and over (prior to 1947, 14 years old and over), in annual averages. These data draw on the Census Bureau's *Historical Statistics of the United States* (U.S. Bureau of the Census and U.S. Department of Commerce 1975) for the period 1925–70 and on reports from the Bureau of Labor Statistics of the U.S. Department of Labor for the period 1940–2004.

2. *Youth population.* The measure of youth demographics is drawn from the Census Bureau's "Current Population Reports."[21] Based on

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21. See the table Current Population Reports: Historical National Population Estimates; July 1, 1900 to July 1, 1999 (http://www.census.gov/popest/archives/1990s/popclockest.txt).

those reports, the annual percentage of the total population represented by 15–24-year-olds was calculated.

3. *Poverty*. This study uses the official poverty rate from the U.S. Census Bureau.[22] The rates are only available from 1959 onward, when the poverty line was first measured—so the regressions including this variable use a smaller number of observations ($N = 42$, rather than 68 as in all the other regressions).

Several models are used that take account of each control variable individually, as well as the combined effect of these other indicators. The results are reproduced in Table A1 below. As the table shows, regardless of the model specification, the aggregated institutionalization rate has a statistically significant relationship with the logged homicide rate. The institutionalization variable is lagged in this specification, which addresses simultaneity concerns. It is important to add, though, that the leading alternative explanation—that increases in homicide produce higher incarceration rates as more individuals are apprehended, convicted, and sentenced—would work in the opposite direction: the higher the homicide rate, the higher the institutionalization rate. In other words, the leading alternative mechanism would dampen any effect that we observe in the data and would entail a conservative bias.

Table A1
Prais-Winsten Regression of Aggregated Institutionalization Rates (All Mental Hospitals and Prisons) on National-Level Homicide Data (1934–2001)

	(1)	(2)	(3)	(4)	(5)	(6)
Institutionalization rate per 1,000	−.159*	−.155*	−.147*	−.145*	−.160*	−.158*
	(.026)	(.026)	(.035)	(.035)	(.025)	(.038)
% of Civilian labor force unemployed		.009		.009		.001
		(.005)		(.005)		(.013)
% of Population ages 15–24			.010	.008		.001
			(.021)	(.019)		(.025)
Official poverty rate					.001	.001
					(.011)	(.019)
Observations	67	67	67	67	43	43
OLS R^2	.78	.85	.79	.85	.85	.86

Note. The dependent variable is the log of the homicide rate. Standard errors are in parentheses. The R^2 from the OLS regression is reported here because it describes how well the regression model will perform better than the Prais-Winsten R^2 does.

*Significant at 1%.

22. See the table Historial Poverty Tables—People (http://www.census.gov/hhes/www/poverty/data/historical/people.html).

APPENDIX B

Table B1
Table 1 Results without Population Weights

	(1)	(2)	(3)	(4)
Institutionalization rate				
per 1,000	−.111**	−.040*	−.038[+]	−.034
	(.016)	(.019)	(.019)	(.021)
% Ages 15–19		.032	.033	.049
		(.038)	(.039)	(.041)
% Ages 20–24		.071*	.072*	.066*
		(.029)	(.029)	(.031)
% Urban		−.011**	−.010**	−.010**
		(.003)	(.003)	(.003)
% Black		.035**	.033**	.031**
		(.007)	(.006)	(.007)
Rate of execution per				
100,000			.140[+]	.148[+]
			(.074)	(.078)
Police officer rate per				
100,000			−.000	−.000
			(.001)	(.001)
Real per capita income				.002
				(.002)
Observations	3,285	3,235	3,235	3,235
R^2	.89	.91	.91	.91

Note. The dependent variable is the log of the homicide rate. The table presents a log-linear model using least squares regression, with fixed state and year effects, detrended. Institutionalization (in all mental hospitals and prisons) is lagged 1 year. Robust standard errors clustered at the state level are reported in parentheses.

  [+]Significant at 10%.

  *Significant at 5%.

  **Significant at 1%.

APPENDIX C

Table C1
Prais-Winsten Regressions for Five Most Populous States (1934–2001), All Mental Hospitals and Prisons

	California (1)	Texas (2)	New York (3)	Florida (4)	Illinois (5)
Institutionalization rate per 1,000	−.122[+]	−.100**	−.054	.003	−.153
	(.072)	(.028)	(.048)	(.078)	(.095)
% Ages 15–19	−.079	−.023	−.007	.111	−.023
	(.090)	(.059)	(.096)	(.088)	(.100)
% Ages 20–24	.220	.233**	.216[+]	.100	.017
	(.135)	(.059)	(.110)	(.082)	(.080)
% Urban	−.034	−.009	−.123	−.073[+]	.051
	(.044)	(.010)	(.090)	(.042)	(.078)
% Black	.004	−.020	.040	−.111*	−.041
	(.079)	(.084)	(.036)	(.045)	(.083)
Rate of execution per 100,000	.482	−.144	−.429	−.182[+]	.765
	(.673)	(.209)	(.608)	(.095)	(.648)
Police officer rate per 100,000	.004[+]	.001	−.002	.005[+]	.005*
	(.002)	(.002)	(.001)	(.003)	(.002)
Real per capita income	−.007[+]	−.009*	.000	.002	−.001
	(.004)	(.004)	(.004)	(.004)	(.004)
OLS R^2	.93	.88	.96	.90	.88

Note. The dependent variable is the log of the homicide rate. The number of observations is 66 for all models. Standard errors are reported in parentheses. I again report the R^2 from the OLS regression because it describes how well the regression model will perform better than the Prais-Winsten R^2 does.

[+]Significant at 10%.
*Significant at 5%.
**Significant at 1%.

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