Imprisonment and (Inequality in) Population Health

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ABSTRACT

This article considers the effects of imprisonment on population health using state-level panel data (1980-2005). Results support a number of conclusions. First, the imprisonment rate is negatively associated with population health for the total, White, and Black populations of American states. Second, though effects tend to be statistically significant, they are generally quite small. For example, none of the groups considered here would have experienced more than a 0.5 year gain in life expectancy at birth in 2005 had the imprisonment rate remained at the 1980 level instead of increasing to the 2005 level. The one outcome for which this is not the case is the Black infant mortality rate, which would have been 0.9 per 1,000 lower in 2005 had the American imprisonment rate not grown to its 2005 level. This represents nearly a 10 percent decline in the Black infant mortality rate in 2005. Finally, though point estimates are generally larger for Blacks than Whites, results provide no evidence that the imprisonment rate is associated with greater racial inequality in health, suggesting that any consequences of mass imprisonment for racial health inequities are unlikely to manifest themselves immediately.

For the first three-quarters of the 20th century, the American imprisonment rate was around 100 per 100,000 (Blumstein and Cohen 1973). Starting in 1973, however, American imprisonment rapidly increased. By 2005, it had risen to 500 per 100,000. Today, America's incarceration rate is closer to that of South Africa than to those of the UK, Canada, and other wealthy democracies. Dramatic levels of imprisonment among young black men who did not complete high school also distinguish American imprisonment from its democratic counterparts (Pettit and Western 2004; Wacquant 2001). For these men, the accumulation of high daily risks of imprisonment leads to astounding lifetime risks of imprisonment; 60 percent of them can expect to have been imprisoned by their mid-30s (Pettit and Western 2004; Western and Wildeman 2009: 231). In light of the growing imprisonment rate and vast racial disparities in imprisonment, researchers have become interested in the consequences of mass imprisonment. Most of this research considers the deterrence effects of imprisonment (Levitt 1996; Nagin 1998), but a growing body of research considers the broader effects of imprisonment on society and social stratification.

Unfortunately, little is known about the effects of imprisonment on population health (but see Johnson and Raphael 2009; Wildeman 2009b). This inattention is regrettable for a number of reasons. First, population health—measured as life expectancy at birth and the infant mortality rate—and racial inequality in population health are vital measures of population wellbeing (Beckfield 2004; Hall and Lamont 2009). Second, the health effects of imprisonment may be substantial. At the very least, research shows that release from prison is associated with elevated mortality risk (Binswanger et al. 2007) and that having ever been imprisoned increases the risk of contracting infectious and stress-related diseases (Massoglia 2008a) and suffering from severe functional limitations (Schnittker and John 2007). Third, research on the broader effects of imprisonment provides insight into mechanisms through which connections to the ever-

imprisoned might compromise the health not only of family members, but also community members. Finally, recent research on the budgetary consequences of mass imprisonment suggests that high rates of imprisonment may affect the health not only of those coming into contact with the penal system, but of all those expected to help pay the costs of maintaining the penal system (Ellwood and Guetzkow 2009). Thus, contemporary research suggests not only that mass imprisonment may grow racial inequalities in health, but also that it may contribute to poorer population health even for those never coming into contact with the penal system.

This article takes a step toward considering the consequences of mass imprisonment for population health and inequality in population health using state-level panel data from the United States, 1980-2005. Although mass imprisonment is often discussed as a monolithic phenomenon affecting all American states in a similar way, research highlights that there is substantial state-level variation in imprisonment rates (see the discussion of Wakefield and Uggen *Forthcoming*). Results from GLS regression models with state and year fixed effects, random effects, and an AR(1) adjustment for serial correlation support a number of conclusions. First, the imprisonment rate is negatively associated with population health for the total, White, and Black populations of American states. Second, though effects tend to be statistically significant, they are generally quite small. For example, none of the groups considered here would have experienced more than a 0.5 year gain in life expectancy at birth in 2005 had the imprisonment rate remained at the 1980 level instead of increasing to the 2005 level. The one outcome for which this is not the case is the Black infant mortality rate, which would have been 0.9 per 1,000 lower in 2005 had the American imprisonment rate not grown to its 2005 level. Finally, though point estimates are generally larger for Blacks than Whites, results provide no evidence that the imprisonment rate is

associated with greater racial inequality in health, suggesting that any effects of mass imprisonment on racial health inequities are unlikely to manifest themselves immediately.

THE SOCIAL PATTERNING OF MASS IMPRISONMENT

As the American imprisonment rate has increased from a relatively modest 100 per 100,000 to an extraordinary 500 per 100,000 (Western 2006), the social patterning of imprisonment has become an intriguing area of study for scholars of American society—especially for scholars of American stratification. Research in this area has dedicated some attention to estimating the lifetime risk of imprisonment for American men (Bonczar 2003), although more research has focused on estimating the changing magnitude of racial and class disparities in the lifetime risk of imprisonment for adult men (Pettit and Western 2004; Western and Wildeman 2009).

Research in these areas reaches a number of conclusions that may be relevant for scholars of health. First, 11.3 percent of all American men can expect to experience imprisonment at some point in their lives—a huge increase over the 3.6 percent who could expect to have ever gone to prison in the mid-1970s (Bonczar 2003). Thus, though imprisonment certainly is not a normal experience for the average American male, it is becoming an increasingly common experience in the life-course of American men. Second, somewhere between 20 and 25 percent of African American men from recent birth cohorts can expect to be imprisoned at some point in their lives (Pettit and Western 2004; Western and Wildeman 2009). The risk for White men pales in comparison; only around three percent of them can expect to ever go to prison. Finally, imprisonment is now a modal experience in the life-course of Black men who did not finish high school (Pettit and Western 2004; Western and Wildeman 2009). Therefore, if having ever gone

to prison influences health, the penal system may have an important influence on exacerbating or diminishing racial and class health inequities (Massoglia and Schnittker 2009; Massoglia 2008b).

Although mass imprisonment could have substantial effects on racial and class inequities in the health of adult men, we might expect the consequences of mass imprisonment to end there. If ever-imprisoned men have little to do with family life—or harm it when they do—then the consequences of mass imprisonment for inequality likely end with them. Contemporary research on the consequences of mass imprisonment for family life suggests, however, that men who go to prison at some point not only have children, but also tend to be engaged in family life—at least some of the time. Research suggests, for instance, that the risks of paternal imprisonment have grown for children as they have for adult men (Wildeman 2009a). Though some of these men may have been absent from their children's lives long before going to prison, research also suggests that many men who cycle in and out of prison do want to be involved in family life (Braman 2004; Comfort 2008) and see their involvement with the criminal justice system as getting in the way of their attempts to stay involved with their parents, wives and girlfriends, and children (Goffman 2009). Thus, based on research on the social patterning of mass imprisonment and the social connections of ever-imprisoned men, we might expect that mass imprisonment could have substantial macro-level effects on health and health inequities—provided having ever gone to prison affects health and having a family member go to prison affects health.

MASS IMPRISONMENT, POPULATION HEALTH, AND INEQUITIES IN HEALTH

In this section, I consider the health consequences of imprisonment for individuals who have ever been imprisoned, those connected to them, and the broader society—including inequities in health at the societal level. I do so in two waves. In the first, I review existing research on the

effects of imprisonment on men's health. I focus on this area of research first because it is where the lion's share of research to date has been done. In the second, I focus on the broader health consequences of mass imprisonment. By considering the direct and indirect health effects of having a social tie who has ever been imprisoned, living in a community where imprisonment is endemic, and living in a state with a high imprisonment rate, I suggest that mass imprisonment likely compromises total population health—and may grow health inequities as well.

Direct Health Effects of Imprisonment on Adult Men

Researchers have long had interest in the health effects of incarceration and release. Most research in this area has focused on the consequences of incarceration and release for mortality (Binswanger et al. 2007; Clavel, Benhamou, and Flamant 1987; Farrell and Marsden 2007; Mumola 2007; Rosen et al. 2008). In general, research in this area finds that individuals have lower mortality while incarcerated than those on the outside (Clavel et al. 1987; Mumola 2007) but higher risks upon release, especially immediately upon release (Binswanger et al. 2007; Farrell and Marsden 2007; Rosen et al. 2008). Unfortunately, it remains unclear based on these studies whether incarceration or release are responsible for these differences in mortality rates—in large part because prisoners are matched with controls only on age, race, and sex. As such, it is very difficult to ascertain based on these studies whether imprisonment and release actually *cause* the higher and lower mortality risks shown in any of these studies. Because of this—and the fact that the effects work in the opposite direction—it seems reasonable to assume that the process of cycling in and out of prisons probably has little short-term effect on mortality risk.

Research on the broader health consequences of having ever been incarcerated, however, provides more robust estimates of the effects of incarceration on health. A number of studies

show, for instance, that having ever been incarcerated not only increases the risk of having infectious or stress-related diseases (Massoglia 2008a; Massoglia and Schnittker 2009), but also increases the risk of having severe functional limitations (Schnittker and John 2007). Since these health problems elevate mortality risk, this research suggests that once prisoners have been released from penal institutions for some time, they are likely at greater mortality risk than comparable individuals and that their status as ex-prisoners is partially responsible for this elevated risk. Thus, based on these studies on the broader health effects of having ever been imprisoned, we might expect imprisonment to be associated with diminished health for men. Since Black men are so much more likely than White men to ever experience imprisonment, we might also expect that these effects would grow racial inequality in health among men.

Though having ever been imprisoned might elevate mortality risk somewhat, these mortality costs may be relatively small in light of the likely substantial immediate benefits of prison admission. Thus, based on existing research on the health consequences of imprisonment, I suggest that the effects of having ever been imprisoned on subsequent mortality risk may be rather small, even if having ever been imprisoned does increase the burden of disease. Since imprisonment has relatively small effects on the mortality risk of adult men, it is unclear how large consequences of mass imprisonment for population health and inequality in population health will be if imprisonment only influences population health directly through these men.

Imprisonment and (Inequality in) Population Health

Regardless of the magnitude of the effects of imprisonment and release on health, if the penal system only affects population health through the ever-imprisoned, then it is unlikely to have large effects on population health. Since only 11 percent of American men ever go to prison

(Bonczar 2003), for the penal system to have large effects on population health, effects of imprisonment would need to extend beyond these men. Little research considers such population health effects (but see Johnson and Raphael 2009; Wildeman 2009b), but research on the effects of incarceration on families, communities, and populations suggest that the consequences of high imprisonment rates for population health and inequality in population health may be substantial.

In this section, I argue that mass imprisonment compromises population health in the United States through two primary avenues. First, and probably most importantly, incarceration compromises the health of family members both directly (via infectious disease) and indirectly (via lower rates of health insurance and higher levels of family instability and poverty). Effects might also spill out into the community, though findings in this area are tentative (Clear 2007). Second, and possibly more importantly, spending on corrections may diminish the resources available for spending on social welfare programs that promote population health. Since welfare state spending influences population health, this tradeoff may compromise the wellbeing not only of those directly connected to prisoners or former prisoners, but also the entire population.

Probably the most transparent channel through which imprisonment could decrease the health and wellbeing of a population—and increase inequality in health and wellbeing—is by increasing the burden of disease of the romantic partners of ever-incarcerated men. Research is replete with accounts of men who have gone into prison testing negative for a range of infectious and stress-related diseases only to leave prison with a host of such diseases (Massoglia 2008a; Massoglia and Schnittker 2009). When these men leave prison, they generally return home to their wives, partners, and girlfriends. Though a long list of practices may diminish the risk of transmitting infectious diseases to partners, many recently reunited couples will not attempt to do so for two reasons. First, they may not know that the formerly-incarcerated man is carrying an

infectious disease. Second, they may want to conceive a child—and hence not be able to engage in many of the practices that would inhibit infectious disease transmission. This is especially the case for couples who have stayed together for the duration of the imprisonment and may be desperate to have a child together (Comfort 2008 provides one excellent discussion). Although little research directly on point tests whether having an ever-incarcerated partner increases the risk of contracting an infectious disease, state-level research suggests that increases in the imprisonment rate are associated not only with substantial increases in the HIV/AIDS prevalence rates for men, but also women (Johnson and Raphael 2009; see also Thomas and Torrone 2006). It is also worth noting that effects on racial inequality in HIV/AIDS for women were substantial.

Thus, prior research on the direct health consequences of having a partner incarcerated suggests that mass imprisonment might compromise population health and grow racial inequities in health. In addition to these direct channels, mass imprisonment might also compromise health through a host of indirect pathways related to both having a family member imprisoned and poor health. Research on the effects of imprisonment on families suggests that having a family member imprisoned generally has negative consequences (see the review of Comfort 2007). One important consequence of having a family member imprisoned is diminished income. The labor market consequences of imprisonment are well-known (Pager 2003; Western 2002), but effects of imprisonment on the resources available to families—romantic partners and children—have only recently been documented (Geller, Garfinkel, and Western *Forthcoming*). And though researchers of social stratification have tended to focus on the pecuniary costs of the negative effects of a prison record on employment, the non-pecuniary costs of these difficulties—most importantly in the form of poor or nonexistent health insurance—might be even more crucial for

future health. Furthermore, by diminishing the stability of marriages (Lopoo and Western 2005), having a family member incarcerated could also harm health through altered family structure

The stigma of having a family member imprisoned also diminishes social support (Braman 2004), which may compromise mental health (Green et al. 2006). And since many families have grown accustomed to one family member cycling in and out of prison, the negative consequences of imprisonment may contribute to chronic stress, which has well-known consequences for health and health inequalities (Geronimus 1992).[2] This is not to say that having a family member incarcerated harms the health and wellbeing of all families, however. Though relatively little research considers how the effects of parental incarceration vary based on the characteristics of the incarcerated individual, at least some research suggests that negative effects of parental incarceration on child wellbeing are concentrated among families in which the parent was neither abusive nor incarcerated for a violent crime (Wildeman 2009b, *Forthcoming*). Thus, if researchers are able to identify the quality of family life before the incarceration and the type of offense committed, they may be able to more precisely estimate the magnitude of effects.

The mechanisms discussed thus far have tended to yield insight only into the health effects of being incarcerated, having a family member incarcerated, or living in a community in which incarceration is endemic. As such, they mainly point toward the population-level effects of imprisonment on the health of the marginal groups most likely to come into contact with the penal system and racial inequities in health. Yet imprisonment may have important effects on the health of individuals who have not had contact with the penal system as well. How could this be the case? As the incarceration rate has grown, so has state spending on corrections—both

[2] Research on the effects of imprisonment on neighborhoods paints a similar picture. Although it is assumed that imprisonment improves communities by enhancing public safety, high rates of imprisonment may diminish community-level social controls, thereby compromising not only public safety, but also public health (Clear 2007).

absolutely and as a percentage of expenditures (Ellwood and Guetzkow 2009). Since high imprisonment rates sap public resources, they may diminish spending that promotes health. Little research considers the effects of imprisonment on welfare state spending, but by diminishing state expenditures on health, investment in penal institutions may compromise population health. Mass imprisonment may also have indirect effects on the health of those who have never come into contact with the penal system by increasing the prevalence of a disease in the population—or maybe even helping create stronger strands of a disease. Though little research considers this possibility, research shows that mass imprisonment explains not only increases in TB prevalence rates but also the robustness of strands in TB in the Eastern European and Central Asian nations that have also experienced tremendous growth in the imprisonment rate (Stuckler et al. 2008).

Prior research on the consequences of imprisonment for the health of prisoners and former prisoners and the consequences of mass imprisonment for the wellbeing of American families provides support for a number of hypotheses. First, increases in the imprisonment rate should compromise population health for both men and women. Second, although effects may be larger for Blacks than Whites (because of their greater contact with the penal system), it may be reasonable to assume that imprisonment would harm the health of both of these populations. Finally, it would be reasonable to expect that imprisonment rates would grow racial inequality in population health—though this is by far the most tentative of the three hypotheses tested here.

DATA AND ANALYTIC STRATEGY

Data

I use an unbalanced panel dataset of American states covering the years 1980-2005 to test my hypotheses (N=721). In constructing this dataset, I had two exclusion criteria. First, any year in

which a state was missing on the dependent or independent variables was dropped. Second, any year that did not produce stable estimates of the infant mortality rate and life expectancy at birth for all groups was not included in the dataset. This resulted in 18 states and the District of Columbia being dropped from the analysis—generally because of unstable estimates of population health among Blacks for all years (Table A1 lists state-years used). After applying these exclusion criteria, the sample was still large. In supplementary analyses, I tested the effects of imprisonment on population health in all states regardless of whether they produced unstable race-specific estimates. These analyses generally produced similar results to those shown here, although estimated effects on infant mortality rates were somewhat smaller.[3]

Dependent Variables. I use two sets of dependent variables: Measures of life expectancy at birth and the infant mortality rate. Life expectancy at birth provides a broad overview of the health and wellbeing of a population (Beckfield 2004; Hall and Lamont 2009). Since the associations between imprisonment and health may vary by sex, I consider not only total life expectancy, but also male and female life expectancies. Since state-level estimates of life expectancy at birth for the total, Black, and White populations are available only during Census years, I constructed estimates of life expectancy at birth using life table methods and data on deaths (by age, race, and sex) and population size (by age, race, and sex). These estimates tended to line up closely with estimates produced by the Census Bureau. In supplementary analyses, I used life expectancy at age one as an outcome since life expectancy at birth is also influenced by the infant mortality rate. Doing so did not substantially alter results presented here. The infant mortality rate is generally thought to be an excellent indicator of the health of women of

[3] I chose not to dwell on the finding that effects of the imprisonment rate on the infant mortality rate were less pronounced in these states for two reasons. First, these states tend to have very small populations, so they do little to shape the total infant mortality rate in America. Second, a population-weighted regression model provided comparable results to those shown in the body of the paper, further suggesting the robustness of the results.

childbearing age and their infants (Conley and Springer 2001; LaVeist 1992). I use measures of life expectancy at birth and the infant mortality rate for the total population, Blacks, and Whites.

Explanatory Variable. The explanatory variable is the imprisonment rate in the previous year and is measured per 1,000 individuals in the population. So if life expectancy at birth in 1990 is the dependent variable, then the 1989 imprisonment rate is the explanatory variable. I choose to use the imprisonment rate in the previous year as the explanatory variable because my estimates of the imprisonment rate are based on year-end estimates of the penal population. Thus, a more contemporaneous measure would not have established appropriate time-order. By using the imprisonment rate in the previous year to predict population health in the current year, I provide insight only into the immediate effects of imprisonment on population health. Future research should consider the long-term effects of imprisonment on population health. Although I use a measure of imprisonment, which only counts prisoners, a measure of incarceration, which also counts those detained in jails, likely would have produced similar results. Though I could have used race-specific imprisonment rates or other measures of the criminal justice system (such as admission, release, and probation rates), I chose to focus on the total imprisonment rate since this is the first paper to consider the consequences of mass imprisonment for population health and doing so provided a more general perspective on this relationship. Nonetheless, future research in this area should incorporate more race-specific measures of contact with the criminal justice system and more nuanced measures of rates of contact with the criminal justice system.

Control Variables. This analysis also includes a host of controls. These include the percent of the population residing in urban areas, the percent of the population that is foreign-born, the percent of the population that is Hispanic, per capita earnings in constant 2000 dollars, the unemployment rate, the number of AFDC cases per 1,000 population, the monthly AFDC

plus food stamp benefit for a family of four in constant 2000 dollars, the number of doctors per 100,000 population, and the percent of births in the current year that were nonmarital, premature, or low birthweight (see Table A2 for sources). All of these control variables are potentially associated with both population health and the imprisonment rate. Some early models also included the percent of the population that was Black, the percent of the population that was living in poverty, and the Gini, but they did not improve model fit or alter the estimated effects of the imprisonment rate on population health, so I excluded them from the final models.

In addition to these standard controls, the analyses also control for the crime rate and the homicide rate. Although changes in the incarceration rate do not correspond closely with changes in the crime rate in the United States over this period (Western and Wildeman 2009), I still include controls for crime for a number of reasons. First, homicide is both a crime and a cause of death. Thus, it is likely associated with the dependent variables regardless of whether it is associated with the imprisonment rate or not. Second, since the total crime rate may yield insight not only into the levels of crime, but also the level of marginalization in any given state, I also include that measure. Some models also included controls for the violent crime rate and the probation rate, but neither of these controls significantly altered the estimated effects of the imprisonment rate or improved model fit, so they were not included in the final models.

For all descriptive statistics, see Table 1. For all data sources, see Table A2.

[Insert Table 1 about here.]

Analytic Strategy

The method is a GLS regression model with state and year fixed effects, random effects, and an AR(1) adjustment. This method is appropriate when the data show significant autocorrelation,

which they do in this case, and models including both random and fixed effects do not produce significantly different estimates than models including only fixed effects according to a Hausman test (Halaby 2004; see also Beckfield 2006). I used state fixed effects because they diminish concerns about unobserved differences between states driving the results, year fixed effects because they diminish concerns about nonlinear changes in the dependent variables over time, and random effects because they improve efficiency. Since some have suggested that including an AR(1) adjustment may significantly bias standard errors in panel analyses like the one I am conducting (Bertrand, Duflo, and Mullainathan 2004), I also ran the models with clustered standard errors rather than an AR(1) adjustment. Doing so did not significantly alter the effects of the imprisonment rate on population health, so I chose to use the more conventional strategy of diminishing concerns about serial correlation using an AR(1) adjustment.

In the first stage of the analysis, I predict four measures of total population health, three related to life expectancy—total, male, and female life expectancy at birth—and the infant mortality rate (Table 2). The goal in this stage of the analysis is to consider how imprisonment rates associate with total population health. In the second stage of the analysis, I predict the effects of the imprisonment rate on the same four measures of population health for Whites and Blacks using the limited sample (Table 3). Based on point estimates from the analyses in Tables 2 and 3, I predict how different male and female life expectancy at birth would be for the total sample, Whites, and Blacks had the American imprisonment rate not increased to the 2005 level in Figure 1. I then run a similar set of predictions for the infant mortality rate in Figure 2.

RESULTS

Results from Models Predicting Total Population Health

In Table 2, I present estimates of the association between the imprisonment rate and population health in the United States over the 1980-2005 period. Each of the models controls for state and year fixed effects and other covariates likely associated with both the imprisonment rate and population health. All models also include random effects and an AR(1) adjustment. In the first three models, the outcomes considered are total, male, and female life expectancy at birth. In each of these models, the imprisonment rate is associated with significant declines (at the .01 and .001 levels) in life expectancy at birth. The magnitude of the effects is largest for female life expectancy. According to these estimates, each additional prisoner per 1,000 population decreases life expectancy at birth between .09 and .13 years. Results from these three models provide initial support for the negative effects of imprisonment on population health.

[Insert Table 2 about here.]

The final model in Table 2 considers the association between the imprisonment rate and the infant mortality rate. Since there is a positive association between imprisonment and infant mortality rates between 1990 and 2003 (Wildeman 2009b), I would expect to find a positive association in these analyses. As expected, results show that the imprisonment rate is positively and significantly (at the .05 level) associated with the infant mortality rate. Furthermore, the magnitude of the association is comparable to previous estimates (Wildeman 2009b). Taken together, results show that the imprisonment rate is negatively associated with population health.

Results from Models Predicting Population Health for Whites and Blacks

Results from Table 2, which considered the relationship between the imprisonment rate and total population health, showed that the imprisonment rate was negatively and significantly associated with life expectancy at birth for both men and women and positively and significantly associated

with the infant mortality rate. Thus, results from these models showed broadly negative effects of the imprisonment rate on population health. In Table 3, I extend the analyses to consider race-specific effects of imprisonment on population health. In so doing, I provide insight into whether the effects of mass imprisonment on population health are comparable for Whites and Blacks.

In the first four models presented in Table 3, I consider the associations between the total imprisonment rate in a state and population health among Whites. Results from Model 1, which considers total White life expectancy at birth, suggest that the imprisonment rate is negatively and significantly associated with White life expectancy at birth. Although the magnitude of this association is much larger for women than men (-.12 to -.06), effects are statistically significant for both men and women (Models 2 and 3). This suggests that although effects may be somewhat greater for White women than men, the imprisonment rate is associated with poorer health for the White population in a given state—even if the effects are not overwhelmingly large. In Model 4 in Table 3, I consider the association between the imprisonment rate and the White infant mortality rate. Results show that the imprisonment rate is positively associated with the White infant mortality rate and that these effects are statistically significant. Thus, results suggest that increases in imprisonment may compromise the wellbeing of White infants.

[Insert Table 3 about here.]

Results from the first four models in Table 3 suggest that the imprisonment rate is negatively associated with population health for Whites. Will the same be the case for Blacks? Given the disproportionate share of the penal population composed of African Americans, we might expect that effects on Blacks would be more substantial than they are for Whites. In the final four models of Table 3, I consider the effects of the imprisonment rate on population health for Blacks. As was the case for Whites, the imprisonment rate is significantly and negatively

associated with Black life expectancy at birth. Nonetheless, the relationship between the imprisonment rate and life expectancy differs for Blacks and Whites in two important ways. First, the magnitude of the association is larger for Blacks (-.17) than for Whites (-.09), which may suggest that imprisonment increases racial inequality in life expectancy at birth. Analyses not shown here but available upon request, however, suggest that this is not the case. Based on these results, the imprisonment rate is not associated with a statistically significant increase in racial disparities in life expectancy at birth, though the relationship is in the expected direction. Second, it appears that the negative effects of imprisonment on population health are shared much more equally for Black men and women than they are for White men and women. Though the relationship is only marginally significant for Black men, the point estimates are quite similar for Black men and women. According to estimates from these models, each prisoner increase in the imprisonment rate is associated with a .13 year decrease in life expectancy at birth for Black men and a .15 year decrease in life expectancy at birth for Black women. Thus, results provide support for the negative effects of increases in the imprisonment rate on the health of Blacks.

In the final model in Table 3, I present estimates of the relationship between the imprisonment rate and the Black infant mortality rate. Although the relationship between the two is only marginally significant, results nonetheless suggest a substantial relationship. Each one prisoner increase (per 1,000) is associated with a .26 increase (per 1,000) in the Black infant mortality rate. Although these effects are somewhat smaller than those documented elsewhere, results from the more limited period considered in previous analyses suggest that this may be because the relationship between the imprisonment rate and the Black infant mortality rate is stronger after the early 1980s (Wildeman 2009b). And while these effects are smaller than those shown previously, the estimated effects of the imprisonment rate on the Black infant mortality

rate are nearly twice as large as the estimated effects on the White infant mortality rate. Thus, while effects of the imprisonment rate on the White infant mortality rate may be more significant, effects on the Black infant mortality rate may be more substantively important.

Estimating the Magnitude of the Effects of Mass Imprisonment on Population Health

Although results from Tables 2 and 3 tended to suggest negative effects of increases in the imprisonment rate on population health, they provided only very limited insight into the magnitude of the effects of the imprisonment rate on population health—and maybe even inequality in population health. In order to provide a better sense of the magnitude of these effects, I present estimates of the change in population health for the total, White, and Black populations based on two scenarios. In the first scenario, I allow all covariates to change as they did over 1980-2005 and predict population health based on the observed changes and point estimates from the models shown in Tables 2 and 3. In the second scenario, I allow all covariates to change as they did over 1980-2005 but hold the imprisonment rate at its 1980 level. I then predict population health based on the same point estimates and observed changes, but assume no change in the imprisonment rate. This is a simple way to predict how the counterfactual scenario in which mass imprisonment had not happened would have influenced population health—and inequality in population health. I show these estimates in Figure 1, which predicts life expectancy (for men and women), and Figure 2, which predicts the infant mortality rate.

Results from Figure 1 suggest, perhaps not surprisingly, that life expectancy at birth would not have been dramatically different for any of the six groups shown here had the imprisonment rate stayed at the 1980 level. Increases in life expectancy at birth in 2005 based on the counterfactual scenario in which the imprisonment rate had not increased to its 2005 level

ranged from a low of 0.3 years (for all males, all females, and White males) to a high of 0.5 years (for Black females). For those groups gaining the most in terms of life expectancy under the counterfactual scenario—Black men and women—estimates presented here suggest that their gains in life expectancy over the 1980-2005 period would have been slightly less than 10 percent greater in the absence of the observed increase in the imprisonment rate. Thus, while these effects are not huge, they also are not so small as to be dismissed without further thought.

[Insert Figure 1 about here.]

Results from Figure 2, which considers the total, White, and Black infant mortality rates under the same two scenarios as considered in Figure 1, paints a similar picture. For the total and White populations, the difference between the counterfactual estimates and the observed change is relatively small. For the total population, no change in the imprisonment rate would have led to about a 0.3 per 1,000 greater decrease in the infant mortality rate; for Whites, it would have led to about a 0.5 per 1,000 greater decrease in the infant mortality rate. Not surprisingly, effects are somewhat larger for Blacks. Had the imprisonment rate remained at the 1980 level, results from Figure 2 suggest that the Black infant mortality rate would have been about 0.9 per 1,000 smaller. This amounts to a Black infant mortality rate that would be nearly 10 percent lower than the current rate. Thus, although the effects are certainly not overwhelming for the Black infant mortality rate, they are also much more substantively important than are effects for Whites.

[Insert Figure 2 about here.]

DISCUSSION, IMPLICATIONS, AND LIMITATIONS

Drastic increases in the American imprisonment rate over the last 35 years have produced not only comparatively and historically novel lifetime risks of imprisonment for all American men

(Bonczar 2003), but also vast racial and class disparities in these risks (Pettit and Western 2004; Western and Wildeman 2009). Given what is already known about the consequences of having ever been imprisoned for the health of prisoners and the broadly negative effects of mass imprisonment on American society—and inequality in American society—it seems reasonable to expect that mass imprisonment might have also compromised population health in America and even contributed to greater racial health inequities. The goal of this paper was to consider these research questions using state-level data from the United States covering the 1980-2005 period.

Results from GLS regression models with state and year fixed effects, random effects, and an AR(1) adjustment for serial correlation provided support for a number of conclusions. First, the imprisonment rate is negatively associated with population health for the total, White, and Black populations of American states. Second, though effects tend to be statistically significant, they are generally quite small. For example, none of the groups considered here would have experienced more than a 0.5 year gain in life expectancy at birth in 2005 had the imprisonment rate remained at the 1980 level instead of increasing to the 2005 level. The one outcome for which this is not the case is the Black infant mortality rate, which would have been 0.9 per 1,000 lower in 2005 had the American imprisonment rate not grown to its 2005 level. This represents nearly a 10 percent decline in the Black infant mortality rate in 2005. Finally, though point estimates are generally larger for Blacks than Whites, results provide no evidence that the imprisonment rate grows racial inequality in health, suggesting that any consequences of mass imprisonment for racial health inequities are unlikely to manifest themselves immediately.

If the associations presented here represent causal relationships, they have a number of important implications. Maybe most importantly, they suggest that mass imprisonment has health costs in America that extend to the population-level. Other studies have pointed in this

direction (Johnson and Raphael 2009; Massoglia 2008a, 2008b; Massoglia and Schnittker 2009; Wildeman 2009b), but this is the first study to estimate the size of these effects on life expectancy, which is generally considered the best of the many measures of population health (Beckfield 2004; Hall and Lamont 2009). Though the effects uncovered here are not huge—generally in the range of about one-half year change in life expectancy at birth—they do suggest that population health in America would be somewhat improved had the prison boom not taken place. Second, though the general consensus is that the prison boom should have larger consequences for inequality than the total population, results imply that this may not be the case—at least over the period considered. On the one hand, this could be reassuring. If the consequences of mass imprisonment for Americans are shared equally, then mass imprisonment does not grow racial health inequality. Yet this finding might be distressing for those who are unconcerned with health inequities since it suggests that mass imprisonment may have more negative effects on total population health than inequality in population health.

Despite these potentially interesting implications, this study has a number of limitations that merit attention. First, and probably most importantly, the measure of imprisonment used yielded insight only into the immediate consequences of imprisonment for population health and inequality in population health. Given that some research suggests that the total population-level health costs of imprisonment may not be known until many years after prisoners return to society (Johnson and Raphael 2009), it is possible that this study underestimated the effects of imprisonment on population health—and maybe even inequality in population health. Thus, future research should consider using measures that adequately measure the long-term effects of imprisonment on population health. Second, though I used a modeling strategy that attempted to rule out concerns about unobserved heterogeneity or spuriousness driving results, it is difficult to

ever fully rule out these concerns—especially in the absence of a natural experiment. Though some have used exogenous shocks in imprisonment to identify a causal effect of imprisonment on some outcome (Levitt 1996), these efforts have been roundly criticized. Third, though the outcomes considered are generally thought to be excellent measures of population health, future research should attempt to yield insight not only into the consequences for broad measures of population wellbeing likes the ones considered here, but also specific diseases and, possibly even more importantly, the mental health consequences of imprisonment. Finally, since the cost of the drastic increase in the American imprisonment rate over this period was absorbed not only by state governments but also by the federal government, estimates presented here my actually substantially underestimate the relationships considered in this article. Future research should consider how to better incorporate these effects into the analysis. Although the effects found in this analysis are not overwhelmingly large, drastic changes and racial disproportionality in the American imprisonment rate suggest that future research should continue to consider the effects of the prison boom on health—and inequality in health—in the contemporary United States.

REFERENCES

Beckfield, Jason. 2004. "Does Income Inequality Harm Health? New Cross-National Evidence." *Journal of Health and Social Behavior* 45:231-248.

-----. 2006. "European Integration and Income Inequality." *American Sociological Review* 71:964-985.

Bertrand, Marianne, Esther Duflo, and Sendhill Mullainathan. 2004. "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics* 119:249-275.

Binswanger, Ingrid A., Marc F. Stern, Richard A. Deyo, Patrick J. Heagerty, Allen Cheadle, Joann G. Elmore, and Thomas D. Koepsell. 2007. "Release from Prison—A High Risk of Death for Former Inmates." *The New England Journal of Medicine* 356:157-165.

Blumstein, Alfred, and Jacqueline Cohen. 1973. "A Theory of the Stability of Punishment." *Journal of Criminal Law and Criminology* 64:198-207.

Bonczar, Thomas P. 2003. *Prevalence of Imprisonment in the U.S. Population, 1974-2001*. Bureau of Justice Statistics Special Report. Washington, DC: United States Department of Justice.

Braman, Donald. 2004. *Doing Time on the Outside: Incarceration and Family Life in Urban America*. Ann Arbor: University of Michigan Press.

Clavel, Francoise, Simone Benhamou, and Robert Flamant. 1987. "Decreased Mortality among Male Prisoners." *Lancet* 330:1012-1014.

Clear, Todd R. 2007. *Imprisoning Communities: How Mass Incarceration Makes Disadvantaged Communities Worse*. New York: Oxford University Press.

Comfort, Megan. 2007. "Punishment Beyond the Legal Offender." *Annual Review of Law and Social Science* 3:271-296.

-----. 2008. *Doing Time Together: Love and Family in the Shadow of the Prison*. Chicago, IL: University of Chicago Press.

Conley, Dalton, and Kristen W. Springer. 2001. "Welfare State and Infant Mortality." *The American Journal of Sociology* 107:768-807.

Ellwood, John W., and Joshua Guetzkow. 2009. "Footing the Bill: Causes and Budgetary Consequences of State Spending on Corrections." Pp. 207-238 in *Do Prisons Make Us Safer? The Benefits and Costs of the Prison Boom*, edited by Steven Raphael and Michael

A. Stoll. New York: Russell Sage Press.

Farrell, Michael, and John Marsden. 2008. "Acute Risk of Drug-Related Death among Newly Released Prisoners in England and Wales." *Addiction* 103:251-255.

Geller, Amanda, Irwin Garfinkel, and Bruce Western. *Forthcoming*. "Incarceration and Support for Children in Fragile Families." *Demography*.

Geronimus, Arline T. 1992. "The Weathering Hypothesis and the Health of African American Women and Infants: Evidence and Speculations." *Ethnicity and Disease* 2:207-221.

Goffman, Alice. 2009. "On the Run: Wanted Men in a Philadelphia Ghetto." *American Sociological Review* 74:339-357.

Green, Kerry M., Margaret E. Ensminger, Judith A. Robertson, and Hee-Soon Juon. 2006. "Impact of Adult Sons' Incarceration on African American Mothers' Psychological Distress." *Journal of Marriage and Family* 68:430-441.

Halaby, Charles. 2004. "Panel Models in Sociological Research: Theory into Practice." *Annual Review of Sociology* 30:507-544.

Hall, Peter A., and Michelle Lamont. 2009. *Successful Societies: How Institutions and Culture Affect Health*. New York, NY: Cambridge University Press.

Johnson, Rucker, and Steven Raphael. 2009. "The Effects of Male Incarceration Dynamics on Acquired Immune Deficiency Syndrome Infection Rates among African American Women and Men." *Journal of Law and Economics* 52:251-293.

LaVeist, Thomas A. 1992. "The Political Empowerment and Health Status of African-Americans: Mapping a New Territory." *American Journal of Sociology* 97:1080-1095.

Levitt, Steven D. 1996. "The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation." *Quarterly Journal of Economics* 111:319-351.

Lopoo, Leonard M., and Bruce Western. 2005. "Incarceration and the Formation and Stability of Marital Unions." *Journal of Marriage and Family* 67:721-734.

Massoglia, Michael. 2008a. "Incarceration as Exposure: The Prison, Infectious Disease, and Other Stress-Related Illnesses." *Journal of Health and Social Behavior* 49:56-71.

-----. 2008b. "Incarceration, Health, and Racial Disparities in Health." *Law & Society Review* 42:275-306.

Massoglia, Michael, and Jason Schnittker. 2009. "No Real Release." *Contexts* 8:38-42.

Mumola, Christopher J. 2007. *Medical Causes of Death in State Prisons, 2001-2004.* Bureau of Justice Statistics Data Brief. U.S. Department of Justice, Washington: DC.

Nagin, Daniel. 1998. "Criminal Deterrence Research at the Outset of the Twenty-First Century." *Crime and Justice* 23:1-42.

Pager, Devah. 2003. "The Mark of a Criminal Record." *American Journal of Sociology* 108:937-975.

Pettit, Becky, and Bruce Western. 2004. "Mass Imprisonment and the Life Course: Race and Class Inequality in U.S. Incarceration." *American Sociological Review* 69:151-169.

Rosen, David L., Victor J. Schoenbach, and David A. Wohl. 2008. "All-Cause and Cause-Specific Mortality among Men Released from State Prison, 1980-2005." *American Journal of Public Health* 98:2278-2284.

Schnittker, Jason, and Andrea John. 2007. "Enduring Stigma: The Long-Term Effects of Incarceration on Health." *Journal of Health and Social Behavior* 48:115-130.

Stuckler, David, Sanjay Basu, Martin McKee, and Lawrence King. 2008. "Mass Incarceration Can Explain Population Increases in TB and Multidrug-Resistant TB in European and Central Asian Countries." *Proceedings of the National Academy of Sciences* 105:13280-

13285.

Thomas, James C., and Elizabeth Torrone. 2006. "Incarceration as Forced Migration: Effects on Selected Community Health Outcomes." *American Journal of Public Health* 96:1762-1765.

Wakefield, Sara, and Christopher Uggen. Forthcoming. "Incarceration and Stratification." *Annual Review of Sociology*.

Western, Bruce. 2002. "The Impact of Incarceration on Wage Mobility and Inequality." *American Sociological Review* 67:477-498.

-----. 2006. *Punishment and Inequality in America*. New York: Russell Sage Press.

Western, Bruce, and Christopher Wildeman. 2009. "The Black Family and Mass Incarceration." *Annals of the American Academy of Political and Social Science* 621:221-242.

Wildeman, Christopher. 2009a. "Parental Imprisonment, the Prison Boom, and the Concentration of Childhood Disadvantage." *Demography* 46:265-280.

----. 2009b. "Imprisonment and Infant Mortality." PSC Research Report No. 09-692.

----. Forthcoming. "Paternal Incarceration and Children's Physically Aggressive Behaviors: Evidence from the Fragile Families and Child Wellbeing Study." *Social Forces*.

Table 1. Descriptive Statistics

Variable	Mean	(SD)	Min	Max
Dependent Variables (Total)				
Life Expectancy at Birth (in Years)	74.6	(1.6)	70.9	79.4
Male Life Expectancy at Birth (in Years)	71.2	(2.0)	66.5	76.9
Female Life Expectancy at Birth (in Years)	77.9	(1.2)	75.2	81.8
Infant Mortality Rate (per 1,000)	9.3	(2.2)	4.7	16.8
Dependent Variables (Whites)				
White Life Expectancy at Birth (in Years)	75.3	(1.4)	72.3	79.7
White Male Life Expectancy at Birth (in Years)	72.0	(1.8)	68.2	77.2
White Female Life Expectancy at Birth (in Years)	78.6	(1.0)	76.5	82.0
White Infant Mortality Rate (per 1,000)	7.6	(1.7)	4.1	12.2
Dependent Variables (Blacks)				
Black Life Expectancy at Birth (in Years)	69.8	(1.8)	66.4	76.7
Black Male Life Expectancy at Birth (in Years)	65.6	(2.3)	61.4	73.5
Black Female Life Expectancy at Birth (in Years)	73.8	(1.4)	70.9	79.9
Black Infant Mortality Rate (per 1,000)	16.4	(3.4)	6.7	27.7
Explanatory Variable				
Imprisonment Rate in Previous Year (per 1,000)	3.3	(1.6)	0.5	9.0
Control Variables				
Total Crime Rate (per 100,000)	568.7	(218.1)	182.6	1244.3
Homicide Rate (per 100,000)	7.9	(3.2)	1.9	20.3
Percent Urban	73.2	(12.8)	47.3	94.9
Percent Foreign-Born	6.4	(5.7)	0.8	27.2
Percent Hispanic	6.3	(7.6)	0.6	35.2
Per Capita Earnings (in 2000 dollars)	28229.5	(6322.8)	15609.0	52736.0
Unemployment Rate	6.1	(2.1)	2.4	15.6
AFDC Cases (per 1,000)	13.0	(5.8)	1.3	29.2
Monthly AFDC + Food Stamp for a Family of Four (in 2000 dollars)	873.3	(163.4)	581.0	1569.0
Doctors (per 100,000)	219.6	(61.9)	107.0	443.0
Percent Nonmarital Births	29.5	(7.3)	12.7	49.4
Percent Premature Births	11.3	(1.9)	7.0	18.8
Percent Low Birthweight Births	7.7	(1.1)	4.8	11.8

Sources: See Table A2. (*N*=721)

Table 2. Results from GLS Regression Models with State and Year Fixed Effects, Random Effects, and an AR(1) Adjustment for the Total Population, 1980-2005

Covariate	M1: Total LEB	M2: Male LEB	M3: Female LEB	M4: Total IMR
Imprisonment Rate	-.11***	-.09**	-.13**	.10*
Crime Rate	-.00**	-.00***	-.00**	.00
Homicide Rate	-.03***	-.03**	-.02#	.07**
Percent Urban	.07***	.08***	.05*	-.02
Percent Foreign-Born	.17***	.17***	.16**	-.13*
Percent Hispanic	-.03	-.03	-.02	.10#
GSP per Capita	-.00	-.00	.00	.00
Unemployment Rate	.03**	.04**	.03*	-.02
AFDC Caseloads	-.02*	-.01#	-.02**	.01
AFDC + Food Stamp Benefit	-.00	-.00	-.00	-.00
Doctors	-.00	-.00	.00	-.00
Percent Nonmarital Births	-.01	-.02#	-.01	.03
Percent Premature Births	.02	.00	.02	.07
Percent Low Birthweight	-.13**	-.13*	-.12*	.42***
Intercept	69.56***	65.20***	74.55***	10.04***
R^2	.94	.97	.85	.94
p	.83	.77	.77	.49
N	721	721	721	721

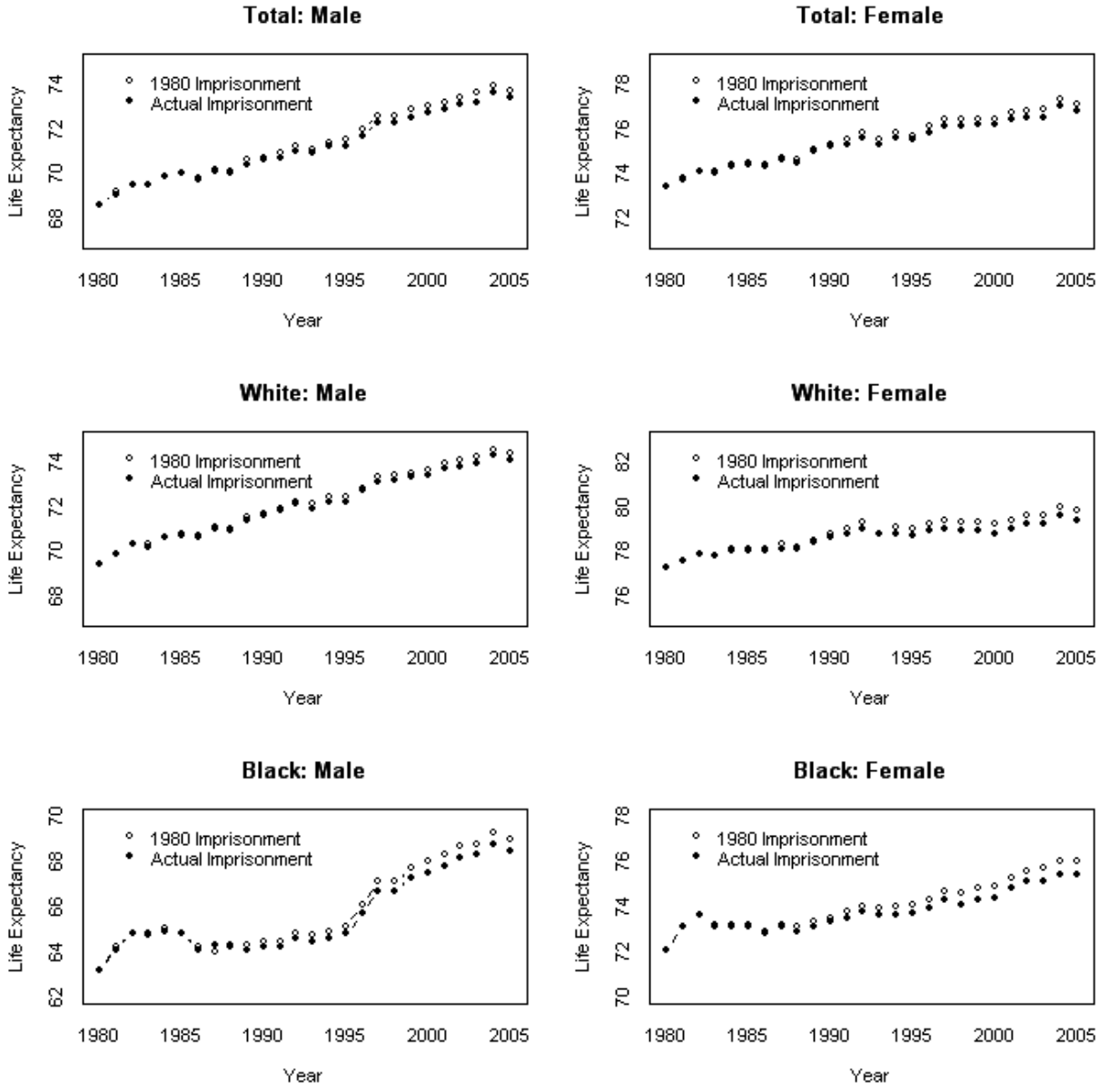
Notes: Significance levels are: *** <.001; ** <.01; * <.05; #<.10. All t-tests are one-sided for imprisonment and two-sided for other variables. Standard errors are omitted to conserve space.

Table 3. Results from GLS Regression Models with State and Year Fixed Effects, Random Effects, and an AR(1) Adjustment for Blacks and Whites, 1980-2005

	Whites				Blacks			
Covariate	M1: Total LEB	M2: Male LEB	M3: Female LEB	M4: IMR	M5: Total LEB	M6: Male LEB	M7: Female LEB	M8: IMR
Imprisonment Rate	-.09**	-.06*	-.12**	.14**	-.17*	-.13#	-.15*	.26#
Crime Rate	-.00*	-.00***	-.00*	.00	-.00***	-.00***	-.00***	.00#
Homicide Rate	-.01	-.00	-.01	.04*	-.09***	-.14***	-.03	.02
Percent Urban	.07***	.08***	.07**	-.04	.05	.06	.02	-.13
Percent Foreign-Born	.14***	.14**	.14**	-.07	.28***	.35**	.16#	.11
Percent Hispanic	-.00	-.03	.06	.03	-.20**	-.25**	-.12#	-.06
GSP per Capita	-.00	-.00	.01	.00	.00	.00#	.00	-.00
Unemployment Rate	.03*	.03*	.03#	-.00	.04	.07*	.01	-.09
AFDC Caseloads	-.02*	-.02*	-.03**	.01	.02	.02	.03#	-.07
AFDC + Food Stamp Benefit	-.00	-.00	-.00	-.00	-.00	-.00	-.00	.00
Doctors	-.01	-.00	.00	-.00	.00	-.00	.00	.00
Percent Nonmarital Births	-.01#	-.02*	-.02	-.01	.02	.02	.00	.05
Percent Premature Births	.02	-.00	.04	.02	.05	.04	-.00	-.13
Percent Low Birthweight	-.09*	-.09#	-.10#	.35**	-.43***	-.46**	-.35*	1.02*
Intercept	69.97***	65.80***	74.64***	10.22***	68.08***	63.77***	73.91***	19.90***
R^2	.94	.97	.82	.92	.87	.89	.74	.74
P	.81	.72	.78	.48	.67	.67	.49	.48
N	721	721	721	721	721	721	721	721

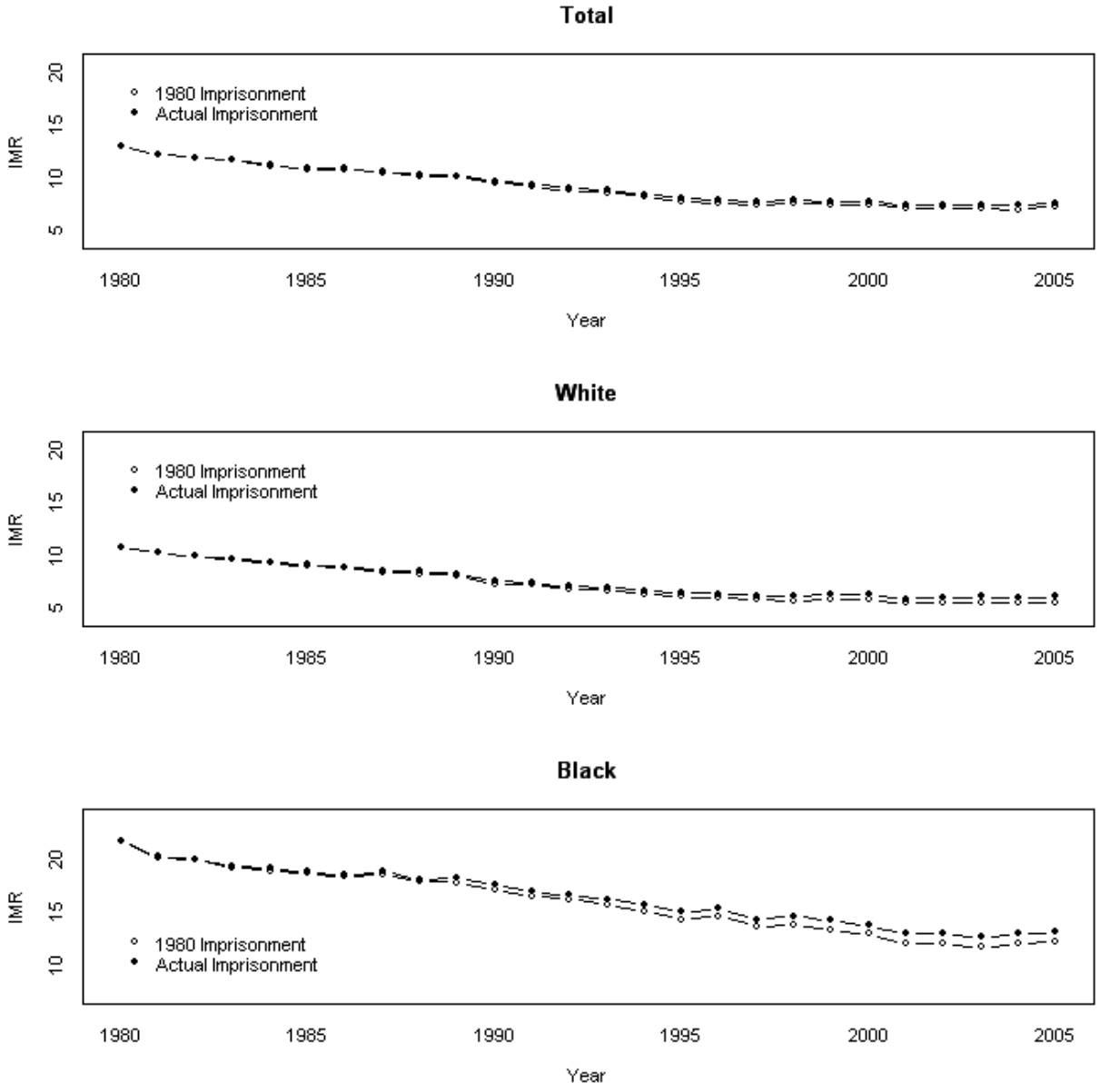
Notes: Significance levels are: *** <.001; ** <.01; * <.05; #<.10. All t-tests are one-sided for imprisonment and two-sided for other variables. Standard errors are omitted to conserve space.

Figure 1. Predicted Life Expectancy by Sex for the Total, White, and Black Populations Based on Zero and Actual Change in Imprisonment, 1980-2005



Note: Predictions based on Models 2 and 3 in Table 2 and Models 2, 3, 5, and 6 in Table 3.

Figure 2. Predicted Infant Mortality Rate for the Total, White, and Black Populations Based on Zero and Actual Change in Imprisonment, 1980-2005



Note: Predictions based on Model 4 in Table 2 and Models 4 and 8 in Table 3.

Table A1. Availability of Data by State and Year (* = Data Available)

State	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Alabama	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Arizona									*	*			*	*	*	*	*	*		*			*	*	*	
Arkansas	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
California	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Colorado	*		*			*		*		*	*			*		*				*				*		
Connecticut		*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Delaware	*	*			*		*	*		*	*							*			*					
Florida	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Georgia	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Illinois	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Indiana	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Kansas		*			*			*	*			*	*		*		*	*	*		*	*			*	*
Kentucky	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Louisiana	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Maryland	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Massachusetts	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Michigan	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Minnesota						*									*			*			*	*	*		*	
Mississippi	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Missouri	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
New Jersey	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
New York	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
North Carolina	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ohio	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Oklahoma	*	*	*	*	*				*	*				*	*	*	*	*	*	*	*	*		*	*	*
Pennsylvania	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
South Carolina	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Tennessee	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Texas	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Virginia	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Washington		*	*		*	*				*		*		*	*		*	*		*	*		*	*		*
Wisconsin	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Note: The following states were not used in the limited sample because they contained too few Whites or Blacks to consistently produce stable estimates: Alaska, the District of Columbia, Hawaii, Idaho, Iowa, Maine, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oregon, Rhode Island, South Dakota, Utah, Vermont, West Virginia, and Wyoming.

Table A2. Data Sources by Variable

Variable	Sources
Incarceration Rate	U.S. Bureau of Justice Statistics
Life Expectancy at Birth	Author's calculations using CDC data
Infant Mortality Rate	Author's calculations using CDC data
Unemployment Rate	Bureau of Labor Statistics
Gross State Product	Bureau of Economic Analysis
AFDC/TANF Caseload	U.S. Department of Health and Human Services
AFDC/TANF + Food Stamp	U.S. House of Representative *Green Books*
Number of Doctors	Statistical Abstract of the United States
Percent Nonmarital Births	National Vital Statistics Reports
Percent Premature Births	National Vital Statistics Reports
Percent Low Birth Weight	National Vital Statistics Reports
Crime Rate	U.S. Bureau of Justice Statistics
Homicide Rate	U.S. Bureau of Justice Statistics
Percent Urban	Decennial Census
Percent Foreign Born	Decennial Census
Percent Hispanic	Decennial Census

Notes: Life expectancy at birth and infant mortality rates were calculated by constructing life tables for each state for all groups for each year. Linear interpolation was used to generate intercensal estimates for all variables only available through the Decennial Census.