



Article

Does in-prison physical and mental health impact recidivism?

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ABSTRACT

Incarceration is definitively linked to poor health, and upon release from prison, many individuals experience difficulty in maintaining good health. Given the complexity of the reentry process, one's health status, both in and out of prison, likely influences additional aspects of reentry, such as abstaining from crime or adhering to parole terms. The purpose of this study is to determine whether in-prison physical and mental health, as well as changes to an individual's health upon release from prison, are related to the likelihood of recidivating. We employ the Serious and Violent Reentry Initiative (SVORI) data, a multi-state sample of formerly incarcerated males who are followed from prison to release into the community and interviewed about a number of post-prison release issues, including health. We use hierarchical logistic and multinomial regressions, where survey waves are nested within people, to assess if in-prison physical and mental health and post-release changes to health are associated with recidivism in two ways: general re-incarceration and re-incarceration due to either a technical violation of parole or a new conviction. With right-censoring due to recidivism or "failure," our final sample size is 2180 person-periods (i.e., waves) nested within 871 respondents. We find that better physical health, both in-prison and changes in health post-release, is related to a higher likelihood of recidivating. Better mental health, both in-prison and changes to mental health post-release, is related to a decrease in the likelihood of recidivating. Individuals with poor mental health in-prison who make significant improvements after release see the largest reduction in their odds of recidivating. Finally, the combination of better mental health in-prison and increases in mental health post-release is associated with reductions in the likelihood of re-offending for both technical violations and new convictions. In sum, in-prison health continues to influence individuals after prison and is associated with their odds of recidivating, thus contributing to the churning of individuals through the prison system.

Introduction

Incarceration is associated with a considerable number of poor health outcomes (Massoglia & Pridemore, 2015), including hypertension, infectious diseases, stress-related illnesses, and mental health issues (Binswanger, Krueger, & Steiner, 2009; Dumont, Brockmann, Dickman, Alexander, & Rich, 2012; Wilper et al., 2009). Incarceration is definitively linked to poor health, and upon release from prison, many individuals experience difficulty in maintaining good health and access to care in the community (Kulkarni, Baldwin, Lightstone, Gelberg, & Diamant, 2010). Incarceration is meant to deter future criminal activity; however incarceration has a host of collateral consequences. One often-ignored factor influencing future criminality and reentry outcomes is the worsening (or even static) health (Brinkley-Rubinstein, 2013), of those who have been incarcerated.

In this paper, we consider the iatrogenic effects of incarceration in

the United States on health and future recidivism by discussing how, in the period after being released from prison, personal health is a mechanism that facilitates the churning of individuals through the prison system. Incarceration, through its very nature, restricts individual's abilities to be in control of their daily lives. The total institution of prison—one that wholly controls and regulates the conditions of daily life of its members—leaves marks on the body and mind, with the conditions of the prison often following the prisoner (Goffman, 1961; Moran, 2014). While the US is constitutionally required to provide health care to prisoners, it is under no obligation to provide the opportunity to engage in health-promoting behaviors such as exercise, proper nutrition and/or vitamins, or stress-relieving activities. As others have shown, health issues upon release are related to recidivism (Link, Ward, & Stansfield, 2019; Thomas, Spittal, Taxman, & Kinner, 2011). No one has acknowledged that deficits in prison health and mental care (Pont, Stöver, & Wolff, 2012) and the inability to protect one's health

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through healthy behaviors while in prison, may drive recidivism as well. Thus, prison does not simply facilitate a former prisoner having to deal with poor health upon release; poor health while in prison may facilitate a return to prison once released.

Theoretically linking health and recidivism

Theories from health studies, sociology, and criminology are frequently applied to health issues for individuals who were formerly incarcerated, though infrequently applied to reentry outcomes. Here, we couple stress process theory (Pearlin, 1989; Pearlin, Aneshensel, & Leblanc, 1997) with general strain theory (Agnew, 1992, 2001) to illuminate the ways that health, both in-prison and post-release, may be an important predictor for recidivism. In brief, stress process theory (Pearlin, 1989; Pearlin et al., 1997) suggests that incarceration is a stressor (Turney, Wildeman, & Schnittker, 2012) and has the potential to generate other stressors, such as poor physical or mental health, our focus in this study. Once health becomes a stressor for formerly incarcerated individuals, general strain theory suggests that stressors can be coped with in a variety of ways, including engaging in crime or through escapism through drug use, both of which contribute to recidivism. Together, these theories show how incarceration facilitates the creation of poor personal health as a stressor and how formerly incarcerated individuals may cope with that stressor. We detail these processes below.

Stress process theory (Pearlin, 1989) illuminates how incarceration can be a long-term stressor (Fahmy & Wallace, 2019), creating new stressors with multifaceted consequences. The theory suggests that stress begets more stress. More specifically, due to the interrelatedness of the multiple aspects of individuals' lives (Pearlin, 1989), a major stressor (primary stressor) such as incarceration generates other stressors (secondary stressors), such as difficulty finding employment. Incarceration can be seen as a primary stressor as the experience of incarceration itself is stressful (Turney et al., 2012). When incarcerated, individuals develop multifaceted ways of coping with the isolating, violent, and exploitative environment of prison (Sykes, 2007). Incarceration causes poor health and subsequent stress in specific ways (Fahmy & Wallace, 2018). For instance, jails and prisons are decidedly unhygienic and prone to facilitating the spread of infectious diseases given overcrowding, shared bathroom facilities, lack of protection (condoms) during sex, poor laundering of clothing, and food with poor nutritional value (Bick, 2007; Binswanger et al., 2009; Dumont et al., 2012; Massoglia & Pridemore, 2015; Polonsky et al., 1994). Also, though the provision of health care in prison is mandatory, accessing health care comes with many barriers (Hatton, Kleffel, & Fisher, 2006; Magee, Hult, Turalba, & McMillan, 2005). For example, Hatton et al. (2006) report that prisoners experienced extended wait times for treatment, decreased opportunity for work, and mandatory three dollar co-payments for treatment—more costly than one week's worth of work while in prison. In short, for most prisoners, "incarceration keeps individuals' health issues unchanged or worse" (Fahmy & Wallace, 2018).

Incarceration is not just a primary stressor, but can cause secondary stressors, particularly immediately after release. While the prison environment is certainly noxious for one's health, returning to the community may pose its own health challenges, especially when a formerly incarcerated individual is seeking to ameliorate their health issues. Health and chronic illnesses may decline or worsen if former prisoners return to the community without access to daily necessities such as food, shelter, and health care (Schnittker, 2014; Wallace & Papachristos, 2014). Individuals who have been incarcerated are often disadvantaged (Bačák & Wildeman, 2015), making access to health care financially difficult both in and out of prison. This is especially true for mental health care. Psychiatrists accept insurance at a rate that is far lower than many other medical professions (Bishop, Press, Keyhani, & Pincus, 2014), forcing psychiatric care to be an out of pocket expense. Moreover, the cost of psychiatric care has been increasing, thereby limiting

access to such care for large swaths of the general population (Rowan, McAlpine, & Blewett, 2013), especially those who are formerly incarcerated and unlikely to have economic resources. Prior incarceration is associated with later incidents of hypertension, stress-related diseases, infectious diseases, and poor self-rated health (Massoglia, 2008; Schnittker, 2014; Wang et al., 2009), making the damaging effect incarceration has on health (Massoglia & Pridemore, 2015) a secondary stressor after release from prison. Thus, addressing health needs, particularly changing one's health after incarceration, for better or worse, may also contribute to recidivism.

Upon release, formerly incarcerated individuals already experience difficulty finding employment (Uggen & Staff, 2001), housing (Clark, 2016), and re-establishing or re-building familial relationships (Naser & La Vigne, 2006). Poor health complicates these common reentry processes. As such, in line with the stress proliferation process, health issues likely generate strain/stress by influencing other arenas of life the formerly incarcerated individual faces upon exiting prison. These secondary stressors are common experiences for returning prisoners, suggesting that health issues that start in prison and continue during reentry to the community may contribute to recidivism through secondary stress and criminal coping mechanisms and may influence future outcomes including recidivism (Link, Ward, & Stansfield, 2019).

Next, we detail how the pathway between health, stress, and crime operates via general strain theory. Stressors are where health and criminal behavior are linked. According to general strain theory, when stressors¹ are present in one's life, individuals may engage in coping mechanisms to remediate negative effects (Agnew, 1992, 2001), and these coping mechanisms may be criminal or related to escapism through drug use. Poor health likely generates strain in several ways given that it impedes obtaining valued goals or stimuli. Poor health is shown to diminish individuals' ability to gain employment, have job security, and do certain types of work (Pelkowski & Berger, 2004). Poor health may be a constant or chronic stimulus—perhaps in the form of pain, nausea, or limited mobility—that is readily tied to strain and the negative emotions which accompany it (Schroeder, Hill, Haynes, & Bradley, 2011). In addition, poor health can lead to the removal of positively valued stimuli, again, bringing about strain. Individuals in poor health or with chronic illness may feel that various aspects of daily life are too difficult, lessening engagement in daily activities. Enjoyable aspects of social life, such as attending parties, church, or other social gatherings, become too challenging (Lee, 2012). Health issues can create circumstances where social interaction, a positively valued stimulus, may be compromised or removed altogether.

Consequently, individuals may turn to crime as a way of coping. When strain is chronic, negative emotions such as anger or frustration may develop, leading to a predisposition towards alleviating strain through deviant means (Agnew, 1992; Schroeder et al., 2011). Criminal coping can include financial crime to alleviate financial stress (Agnew, 2013; Felson, Osgood, Horney, & Wiernik, 2012), illicit drug use to reduce pain (Lee, 2013), seeking revenge against the perpetrator of the stressor through cyberbullying (Paez, 2018), or engaging in escapist behaviors like drug use (Agnew, 2013) to reduce the strain and associated negative emotions. The vast majority of individuals turn to legal coping mechanisms and those that do not violate parole conditions (i.e., prohibition from drinking alcohol) (Agnew, 2013). However, individuals who have used deviant means of coping in the past (Lacourse, Listwan, Reid, & Hartman, 2019) or who have been a part of non-conventional groups, like gangs, are more likely to use deviant coping mechanisms later. Thus, to the extent that poor health upon release from prison is a strain, it may be associated with recidivism

¹ General strain theory (Agnew, 1992, 2001) labels stressors as "strains." Many studies on strains in criminology use the terms interchangeable. Here, we choose to dub strains as stressors to better integrate the general strain theory with the larger body of health studies literature employed in this paper.

through deviant coping.

Above, we have primarily discussed the relationship between incarceration, health, and recidivism through the lens of new convictions on the part of the formally incarcerated individual. However, recidivism is more complex than simply being convicted of a new crime: nearly a third of individuals return to prison due to violations of the condition of their parole, also known as technical violations (Hughes, Wilson, & Beck, 2001; Jacobson, 2005). The most common conditions of parole include “comply [ing] with the law, restrictions on changing residence, prohibition on weapons possession, requirement of regular reporting, restrictions on out of state travel, allowing home and work visits by the parole officer, and restrictions on possession/use of controlled substances” (Travis & Stacey, 2010, p. 606). Many jurisdictions require parolees to maintain employment or involvement in educational programs, as well as abstaining from the use of alcohol (Travis & Stacey, 2010). Moreover, the number of parole conditions formerly incarcerated individuals are subject to has increased over the years (Travis & Stacey, 2010). Given that incarceration creates a host of secondary stressors, when individuals cope with these stressors in ways that facilitate technical violations, recidivism is also affected. On a year to year basis, 9% of all individuals on community supervision have their parole revoked (Kaeble, Maruschak, & Bonczar, 2015). Therefore, understanding how health issues contribute to these technical violations is important for facilitating successful reentry into the community.

Finally, there are two important caveats to note when considering how incarceration affects health and subsequently recidivism: (1) for some individuals, prison makes them healthier and (2) healthier individuals may be more likely to commit crime. First, due to disadvantages outside of prison, some individuals may be in better health and receive better health care while in prison than in the community, allowing incarceration to reduce the morbidity (Dumont, Allen, Brockmann, Alexander, & Rich, 2013) and mortality (Mumola, 2007; Rosen, Wohl, & Schoenbach, 2011; Spaulding et al., 2011) of some individuals. For some disadvantaged populations, prison offers health care that they previously lacked (Fahmy & Wallace, 2018). Additionally, even as violent as prison may be, for individuals exposed to extreme violence in their communities, prison is often safer. For instance, Mumola (2007) found that Black males in state prison had a mortality rate that was 57% lower than Black males in the general population. Given that the leading cause of death for young Black men in the U.S. is homicide (Sharkey & Friedson, 2019), prison appears to be a protective factor for mortality (Mumola, 2007; Rosen, Wohl, & Schoenbach, 2011; Spaulding et al., 2011) and perhaps even morbidity.

Second, engaging in crime may be an activity for primarily healthy people. Logic would dictate that unhealthy individuals are unable to commit crime given mental or physical limitations (Bauld, Toumbourou, Anderson, Coffey, & Olsson, 2005; Britto et al., 1998; Schroeder et al., 2011). Engaging in crime generally puts one at risk for health consequences related to violence and fighting (such as head injuries), and having a deviant or delinquent lifestyle is a risk factor for future accidents (related to low impulse control) and illnesses related to drug and alcohol use and smoking, for example (Farrington, 1995; Piquero, Shepherd, Shepherd, & Farrington, 2011). This point is particularly salient for life course persistent offenders (i.e., those that engage in crime throughout their life course), because these offenders engage in riskier activities compared to their peers and have a higher risk of death from both natural and unnatural causes (Laub & Vaillant, 2000). It stands to reason that the most serious types of offenders – those engaged in serious violent crime or who have been involved in crime throughout their life course – may be more likely to continue to offend if they remain in good health. This is particularly relevant for this study, given that the sample we employed includes only individuals who have committed serious and violent offenses. However, research on delinquency reveals that adolescents of poor health report more involvement in delinquency than their healthier counterparts (Jones & Lollar, 2008; Suris & Parera, 2005). Whether this applies to adults, and importantly, adults who in the

past have been engaged in serious crimes, like those in this study, remains to be seen.

Current study

Prison has the potential to leave a lasting effect on an individual's health (Moran, 2014), and subsequently may have post-release consequences for subsequent personal health and recidivism. Heeding calls to better understand the barriers and facilitators of recidivism (Visher & Travis, 2003), we consider whether in-prison health and changes in physical and mental health post-release are related to recidivism. In-prison health, whether the individual reports having good or bad health while in prison, has the potential to either reduce recidivism or be protective against recidivism. Scholarship has shown that prison can both provide much needed health care for disadvantaged individuals and damaging health for others (Massoglia & Pridemore, 2015; Mumola, 2007; Rosen, Wohl, & Schoenbach, 2011); thus health in prison can potentially impact recidivism post-release. Moreover, these processes may work differently for physical and mental health. As such, we do not specify directional hypotheses and instead ask the following two research questions:

RQ1: Is in-prison health status (physical or mental health) significantly related to recidivism?

RQ2: Do changes to one's physical and/or mental health post-release have a relationship with recidivism?

Furthermore, health issues have the possibility of being related to different types of recidivism, specifically re-incarceration due to technical violations (i.e., a violation of parole) or the commission of a new conviction. Thus, we pose two additional questions:

RQ3: Is in-prison health status (physical or mental health) significantly related to recidivism in the form of technical violations or new convictions?

RQ4: Do changes to one's physical and/or mental health post-release have a relationship with recidivism in the form of technical violations or new convictions?

To answer these questions, we utilize a unique, longitudinal dataset to assess health outcomes and recidivism for a group of serious, adult male offenders. Using discrete-time hazard modeling with controls for a number of personal and contextual characteristics of the respondents, we assess the relationship between in-prison physical and mental health using validated health scales (Ware, Kosinski, & Keller, 1996) and recidivism.

Methods

This project employs data from the Serious and Violent Offender Reentry Initiative (SVORI). SVORI was a federally funded project with the goals of enabling states to develop programs to ease the transition from prison to community and generate better reentry outcomes for men, women, and juveniles who have been incarcerated (Lattimore & Visher, 2009). At the core of the SVORI was the delivery of alternative programming in prison and upon release for the treatment group; the control group received what each prison/state would traditionally give in way of programming. The SVORI involved the following states: Iowa, Indiana, Kansas, Maryland, Maine, Missouri, Nevada, Ohio, Oklahoma, Pennsylvania, South Carolina, and Washington. Each state was allowed to construct their own intervention, and that intervention often varied in terms of who the state served: adult males or females, or juveniles. For example, in Maryland, the SVORI intervention consisted of adult men and women being given extensive “exit orientations” to prepare them for their life outside of prison, a community case manager who served more as a resource provision source than a parole officer, a formerly

incarcerated individual “advocate” who has been successful in a mentorship role, as well as training surrounding job and life skills (Lattimore & Steffey, 2009). Individuals not in the intervention group received similar pre-release services, but were not offered a community case manager or advocate once they exited prison. For a discussion of each state’s programing, see Lattimore and Steffey (2009).

The SVORI gave each state a significant amount of discretion both in creating and implementing their interventions and in selecting what characteristics of individuals determined study eligibility. For example, many states (e.g., Maryland, Iowa, and Indiana) restricted their eligibility characteristics to certain counties, zip codes, or prison facilities (Lattimore & Steffey, 2009). The one consistent requirement across states for the determination of eligibility was that all focused on serious and/or violent individuals, though states had discretion in how they identified who was a serious and/or violent offender. While Lattimore and Steffey (2009) discuss each state’s eligibility criteria in detail, commonly used criteria to determine serious or violent offender status included a score of 20 or more on the Levels of Service Inventory-Revised (LSI-R) where higher scores are generally thought to correspond with individuals who committed more serious crime (Andrews & Bonta, 2001), previous convictions for crimes involving murder, robbery, aggravated assault, burglary, theft and/or arson, the use of felony classes² to determine seriousness, or individuals with one or more felonies in their juvenile history or as a young adult. After states identified who to target for the intervention, they determined if an individual was eligible for the study. Eligible individuals were subsequently randomly assigned to intervention or control (see Lattimore & Steffey, 2009 for a state by state, in depth discussion of who states determined who were eligible for the study). Recruitment for the study differed by state (depending on the readiness of instituting and deploying their interventions), but generally took place over the years 2001–2006 (see Lattimore & Steffey, 2009 for state specific details). Each group—males, females, and juveniles—were sampled independently of each other, constituting different datasets. For this study, we employ only the male sample, because health and reentry needs of males, females, and juveniles drastically differ. The full sample of males include 1697 males, before data cleaning (discussed below).

The SVORI conducted in-person interviews one month before release from prison (in-prison interview), and 3, 9, and 15 months after release. Wave 1 documented the respondents’ in-prison experiences, their plans upon release, and their physical and mental health. Waves 2–4 were used to document post-incarceration relationships and experiences, such as employment, family, health, and crime. These interviews were conducted regardless of whether the respondent had been re-incarcerated. With listwise deletion (loss of 78 person-periods) and right-censoring of the dataset due to recidivism or “failure” (loss of 152 person-periods), our final sample size is 2180 person-periods (i.e., waves) nested within 871 male respondents.

Variables

Our first dependent variable is general recidivism, where “1” designates the respondent was re-incarcerated between waves whether through a technical violation or the commission of a new conviction and “0” designates the respondent was not re-incarcerated between waves. Information on recidivism comes from two places in the interviews. First, the respondent was asked if he had been re-incarcerated between waves. Second, the interviewer reported whether the interview took place in prison. Respondents who recidivated between waves were right-censored from subsequent waves in the analysis.

The second dependent variable is a categorical form of recidivism.

² A significant number of, though not all, states classify felonies into seriousness categories. Each state has a different classification system. For more detail, see Sheppard (2012).

Here, individuals who were re-incarcerated reported whether their current incarceration was due to a new conviction, a technical violation or both. Thus, the categorical recidivism variable is coded as “0” for no recidivism, “1” for technical violations, and “2” for new convictions. Due to their low numbers, individuals who reported having both a technical violation and a new conviction were given the category of new conviction given that new convictions are the more serious of the two. As with the general recidivism variable, respondents who recidivated between waves were right-censored from subsequent waves in the analysis.

The SVORI data were originally supplemented with recidivism information from the National Crime Information Center at the Federal Bureau of Investigation; however, this information has now been redacted (Visher, Lattimore, Barrick, & Tueller, 2017). While administrative data would be ideal for recidivism measures, conducting interviews with incarcerated respondents is a conservative means of assessing recidivism.

Our independent variables are the SF-12 short form versions of the health and mental health aspects of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) (Ware et al., 1996). The physical health variable is the SF-12 PHS which includes subscales capturing physical functioning, bodily pain, and general health (Ware et al., 1996). The mental health variable is the SF-12 MHS which encapsulates aspects of psychological well-being and distress, social and role functioning, and overall vitality (Ware et al., 1996). Both the MHS and the PHS are weighted averages of item responses with higher scores corresponding with better health (Ware et al., 1996). All health measures are standardized using the mean and standard deviation of the in-prison health and mental health scales, thus enabling us to discuss changes in health as a function of changes from their in-prison health scores. We include four types of health variables in the model: in-prison standardized physical health, in-prison standardized mental health, the difference between current physical health and in-prison physical health, and the difference between current mental health and in-prison mental health. The SF-12 items can be found in Appendix Table 1.

Next, we include several control variables known to be related to

Table 1
Weighted means and standard errors for time invariant variables from wave 1.

	Weighted Mean	Standard Error
In-Prison SF-12 Physical Health	−0.054	(0.036)
In-Prison SF-12 Mental Health	−0.017	(0.033)
White	0.361	(0.5)
Black	0.538	(0.5)
Other Race	0.101	(0.6)
Age in Years	29.2	(0.127)
Drug Offender	0.32	(1.5)
Gang Member In-Prison	0.361	(1.5)
Number of days incarcerated	915.16	(28.214)
Logged number of days incarcerated	6.428	(0.028)
Number of lifetime incarcerations	1.27	(0.056)
Logged number of lifetime incarcerations	0.601	(0.019)
SVORI Treatment Group	0.543	(1.7)
Iowa	0.08	(0.8)
Indiana	0.103	(1.0)
Kansas	0.022	(0.5)
Maryland	0.124	(1.1)
Maine	0.05	(0.6)
Missouri	0.055	(0.8)
Nevada	0.107	(1.0)
Ohio	0.055	(0.8)
Oklahoma	0.053	(0.8)
Pennsylvania	0.094	(0.9)
South Carolina	0.229	(1.4)
Washington	0.03	(0.5)
N = 864		

(Note: The sample size is taken from Wave 2 or the first wave in the analytic sample).

recidivism and health disparities. Race and ethnicity are measured by a set of three dummy variables: Black (1 = yes) or Other Race (1 = yes) with White as the reference category. Other race includes individuals who identified as Hispanic, Non-Hispanic Other Race, or Multiple Races, and were collapsed into one other race category due to low numbers in each category. Race variables are included given that mass incarceration and health disparities have disproportionately and negatively impacted minorities (Massoglia, 2008; Massoglia & Pridemore, 2015). Like race, age is related to differences in personal health, with older adults generally being less healthy or having more chronic conditions, simply due to age, than younger individuals (Kuh & Ben-Shlomo, 2004). To capture this, age is measured as age in years and is grand mean centered. Next, we include variables regarding marriage and children, because both are seen as pro-social institutions and activities that offer individuals the ability to engage in conventional norms and facilitate the distance from crime (Laub, Nagin, & Sampson, 1998; Laub & Sampson, 1993; Sampson & Laub, 2003, 1995; Sampson, Laub, & Wimer, 2006). Moreover, marriage provides social support, a critical component of reducing and coping with stress for formerly incarcerated individuals (Wallace et al., 2016). Current marital status and if the respondent has children are dummy variables indicating the respondent is currently married (1 = yes) and has children (1 = yes). Just as marriage and children are seen as “hooks for change” through embedding formerly incarcerated individuals in pro-social institutions, so are gainful employment and educational attainment (Sampson & Laub, 1995). Moreover, employment and educational programming can be conditions of parole (Travis & Stacey, 2010), making them potential stressors for formerly incarcerated individuals. Respondents’ current educational status is captured by a dummy variable signaling that they do not have a high school level education. A dummy variable indicating whether the respondent has acquired a job post-release (1 = yes) is also included. We also include the days the individual was incarcerated as a means of understanding exposure to the unhealthy environment of prison: individuals with longer prison sentences have increased exposure to the environmentally noxious conditions of a prison (Bick, 2007; Binswanger et al., 2009; Dumont et al., 2012; Massoglia & Pridemore, 2015; Polonsky et al., 1994), which may in turn affect recidivism. The number of days incarcerated is measured as a count, which was subsequently logged. Additionally, number of prior incarcerations is controlled given that the existence and extensiveness of a prior criminal history is one of the most powerful predictors of future criminality (Andrews, Bonta, & Wormith, 2006); the number of prior incarcerations variable is included as a count variable and is logged (+1 because 0 cannot be logged). Also incorporated are dummy variables that designate whether the respondent has a prior drug offense (1 = yes) and whether the respondent is currently a gang member (1 = yes), both of which are associated with greater recidivism and criminality (Andrews & Bonta, 2001; Andrews et al., 2006). Gang membership is controlled for given that having criminal and/or anti-social peers is a significant predictor of future criminality (Andrews et al., 2006). The parole status dummy shows that the respondent is currently under parole supervision (1 = yes, under supervision). Other studies have demonstrated that SVORI recipients are more likely to recidivate (Veeh, Severson, & Lee, 2017). SVORI recipients received greater release planning and post-release services; to account for this, we include a variable identifying treatment-receiving respondents. We also include fixed effects for the state the case originated in, given that states varied across what programming they provide to both the SVORI recipients and the prison population in general. Lastly, each state approached the SVORI differently, which leads to different start and stop dates for study enrollment across states. As such, we include dummy variables for each wave to control for wave-to-wave differences. Summary statistics for all time invariant variables – i.e., those from the in-prison wave, or Wave 1 – are included in Table 1. Summary statistics for all time varying variables – those from Waves 2 thru 4 – are in Table 2. All summary statistics are using post-stratification weights (see the Analysis Plan section for details).

Weighted and non-weighted summary statistics are available in Appendix Tables 2 and 3.

Analysis plan

In this study, we employ two different types of models. First, we employ discrete time-hazard models (Allison, 1982) with a binomial outcome to analyze the probability of a respondent recidivating once released from prison. For the analysis, we convert the SVORI data into a “person-period” dataset (Reardon, Brennan, & Buka, 2002), where each period is measured in discrete intervals, with each interval constituting a wave (or row) in the dataset (Reardon et al., 2002). Once the respondent recidivates, he no longer contributes to the person-period and is removed from the data. Under this modeling structure, the dependent variable is the odds of a respondent recidivating at a particular wave. A general presentation of our model is represented as:

$$\ln \frac{p_{it}}{1 - p_{it}} = \alpha + W\beta + C\lambda + S\gamma + H\varphi$$

Here, $\ln \frac{p_{it}}{1 - p_{it}}$ is the log odds of individual i at time t recidivating, α is the intercept, W is the effect of the wave variables with a set of coefficients shown as β , C represents the control variables with a set of coefficients represented by λ , S represents the state variables with a set of coefficients represented by γ , and H represents the health variables with a set of coefficients represented by φ .

Second, we employ the same modeling and data structure with a multinomial logistic outcome, otherwise known as a competing risk discrete-time hazard model using the categorical recidivism outcome, where robust standard errors were employed and were adjusted for the clustering of person-periods within respondents. Prior to estimating either type of model, we conducted multicollinearity diagnostics, which, through bivariate correlations and variance inflation factors (VIF), indicated that collinearity was not of concern.

In our final set of statistical tests, we compare the predicted probabilities of the marginal effects of levels of in-prison physical and mental health by levels of individuals’ differences in their current and in-prison physical or mental health. To examine this, we categorized in-prison physical and mental health into three categories: poor (one standard deviation below the mean), average (0), and good (one standard deviation above the mean). We similarly categorized the difference between current and in-prison physical and mental health into similar categories: worse health (one standard deviation below the mean), average (0), and better health (one standard deviation above the mean). All health variables are standardized using the in-prison health scales, making changes in health post-release relative to health in prison. Next, we estimated and compared the marginal effects (a Wald test; see Graubard & Korn, 1999) for each combination using STATA 15’s margins command with Bonferroni adjustments for multiple comparisons. The margins procedure, which works in conjunction with weighting, tests whether the predicted probabilities of in-prison health significantly differ from the predicted probabilities of changes in health post-release from prison. The null hypothesis behind the margins test is that the two values are not significantly different (Moule & Wallace, 2017).

Lastly, we employ post-stratification weighting in all of our analyses. The SVORI data include two types of missing or non-response: item non-response and unit non-response. Item non-response is less complex: respondents simply chose not to respond a question. In our analytic sample, item non-response is small. Across all units (i.e., respondents nested within waves), only 78 units out of 2180 who participated in the later waves of SVORI were not included in the final analytic sample due to missing data on items. Given low item non-response, we simply excluded the 78 cases from the final analytic sample for a total N of 2180.

Unit non-response is more complicated. Unit non-response, also known as lost to follow up or attrition, potentially biases samples towards individuals who are easy to follow. Similar to many other panel

Table 2
Weighted means and standard errors for time varying variables from waves 2 through 4.

	Wave 2 3 Months Post-Release		Wave 3 9 Months Post-Release		Wave 4 15 Months Post-Release	
	Weighted Mean	Standard Error	Weighted Mean	Standard Error	Weighted Mean	Standard Error
Recidivism	0.069	(0.8)	0.157	(1.3)	0.128	(1.3)
Technical Violation	0.036	(0.6)	0.089	(1.0)	0.062	(0.9)
New conviction	0.033	(0.6)	0.068	(0.9)	0.066	(1.0)
Difference Between Current and In-Prison Physical Health	0.001	(0.034)	-0.066	(0.040)	-0.035	(0.042)
Difference Between Current and In-Prison Mental Health	0.196	(0.038)	0.009	(0.040)	-0.031	(0.049)
Needs Health Care	0.556	(1.6)	0.515	(1.8)	0.553	(2.0)
Currently Married	0.094	(1.0)	0.115	(1.2)	0.129	(1.3)
No High School Diploma or Equivalent	0.436	(1.6)	0.426	(1.8)	0.428	(2.0)
Is Currently Employed	0.75	(1.4)	0.835	(1.4)	0.815	(1.5)
On Parole	0.762	(0.6)	0.641	(1.2)	0.55	(1.6)
	N =	864	N =	725	N =	591

Table 3
Logistic regressions predicting recidivism with in-prison physical and mental health, the difference between current and in-prison physical and mental health and controls.

	Physical Health		Mental Health	
	B	OR	B	OR
In-Prison SF-12 Health	0.210* (0.093)	1.234*	-0.459** (0.081)	0.632**
Difference between Current and In-Prison Health	0.190* (0.097)	1.209*	-0.556** (0.071)	0.573**
Currently Needs Health Care	0.450** (0.155)	1.568**	0.150 (0.156)	1.162
Black	0.327 (0.176)	1.387	0.447* (0.185)	1.564*
Other Race, Non-White	-0.055 (0.265)	0.946	0.040 (0.273)	1.041
Age in Years	-0.024 (0.014)	0.976	-0.034* (0.015)	0.967*
Currently Married	-0.480 (0.260)	0.619	-0.475 (0.255)	0.622
No High School Diploma or Equivalent	0.179 (0.157)	1.196	0.103 (0.161)	1.109
Is currently employed	-0.347 (0.186)	0.707	-0.267 (0.186)	0.766
Incarceration was for a Drug Offense	0.010 (0.168)	1.010	0.013 (0.173)	1.013
Gang Member In-Prison	0.874** (0.147)	2.396**	0.739** (0.151)	2.095**
Logged number of days incarcerated	0.154 (0.096)	1.166	0.147 (0.101)	1.158
Logged number of lifetime incarcerations	0.593** (0.134)	1.809**	0.606** (0.138)	1.834**
On Parole	-1.155** (0.178)	0.315**	-1.143** (0.184)	0.319**
SVORI Treatment Group	0.324* (0.147)	1.383*	0.401** (0.153)	1.493**
SVORI Wave = 3	0.954** (0.175)	2.596**	0.861** (0.178)	2.367**
SVORI Wave = 4	0.543** (0.195)	1.721**	0.427* (0.197)	1.533*
Constant	-3.205** (0.686)	0.041**	-2.984** (0.705)	0.051**
Person Periods	2180		2180	

Standard errors in parentheses; **p < 0.01, *p < 0.05.
(Note: State fixed effects suppressed; full models available in Appendix Table 4).

studies, especially those targeting former prisoners (Western & Wildeman, 2009), the SVORI project experienced attrition at waves 2, 3, and 4. The largest amount of attrition came between waves 1 and 2, where 60% of the initial sample was retained at wave 2 (Lattimore et al., 2004), with less substantial attrition between waves 2 and 3 and waves 3 and 4. Thus the issue of unit non-response in SVORI is focused on the loss of respondents in the first three months after prison (i.e., between the

in-prison wave, or Wave 1, and Wave 2). For this study, unit non-response is problematic in that people who remained in the sample may be more socially stable, which in turn may impact recidivism. While this is concerning, several scholars have shown that attrition in the SVORI data is random (Lattimore & Steffey, 2010; Wallace et al., 2016). The principal investigators of the SVORI have determined that those individuals who attrited from the sample at Wave 2 are not significantly different for those respondents who were interviewed at later waves (Lattimore et al., 2004). That said, given the level of unit non-response between waves 1 and 2, we correct for unit non-response in the analysis.

To do this, we employ a post-stratification weighting, a well-documented way to address non-response issues (Kalton & Flores-Cervantes, 2003). Post-stratification weighting adjusts the analytic sample to a known population; in our case, we adjust the analytic sample to the wave 1 sample, before the substantial loss experienced between waves 1 and 2. By doing this, we compensate for unit non-response, making model estimates less biased (Kalton & Flores-Cervantes, 2003) and more in line with the original sampling structure of SVORI. We constructed our post-stratification weights by first identifying which characteristics of respondents would be related to the outcome of recidivism. Based on previous research modeling recidivism using the SVORI data (Chamberlain, Gricius, Wallace, Borjas, & Ware, 2018; Link, Ward, & Stansfield, 2019; Mowen & Boman, 2018), we constructed the strata using the variables of age (categorized into the ages 18 to 25, ages 26 to 31, and ages 31 and over), race (White, Black, and other), and individuals who commit property crimes. In order to construct the strata, these data needed to be complete, therefore, any individuals who were missing on these variables (9 out of 1697) were not used to construct the post-stratification weights. Thus, the weighted sample N is 1688. There are 36 unique strata or combinations of these variables.³ The resulting weight for each case then is the total number of respondents in the analytic sample divided by the number of respondents in each stratum. As an example, if there are 50 respondents in a stratum, yet only 10 in the analytic sample due to unit non-response, then each respondent in the analytic sample is up-weighted to count as 5 respondents (i.e., 50/10 or 5 respondents). In this sense, post-stratification weighting weights respondents in the analytic sample to look like non-respondents before loss to follow up.

Results

The first model in Table 3 tests the relationship between the odds of recidivating and in-prison physical health and the difference between current physical health and in-prison health. To focus exclusively on the

³ This was done in Stata 15 using the grouping command, or “egen varname = group(varlist).”

independent variables, we refrain from a discussion of the other variables in our model. Information on the estimates and significances of control variables can be found in the accompanying tables; see Keele, Stevenson, & Elwert, 2020 for a discussion of why it is important to refrain from discussing estimates of control variables. Additionally, the fixed effects for state are not shown here; the full model can be seen in Appendix Table 4. As measured by the SF-12, in-prison physical health has a positive and significant relationship with recidivism: the better one's health while in prison, the higher their odds of recidivating ($\beta = 0.210$, OR = 1.234). The difference between current health and in-prison health also has a positive relationship ($\beta = 0.190$, OR = 1.209).

The second model in Table 3 shows the relationship between the odds of recidivating and in-prison mental health and the difference between current mental health and in-prison mental health. In-prison mental health and the difference between current mental health and in-prison mental health both have a negative and significant relationship with recidivism. In other words, the better one's mental health is in prison, the lower the odds of recidivating ($\beta = -0.459$, OR = 0.632). Improving mental health post-release also has recidivism benefits as there is a significant relationship between the two: specifically, for every one standard deviation increase in a person's mental health post-release relative to their in-prison health, there is a 44% decrease in the odds of recidivating (using the odds ratio: $0.556 - 1 = -0.444$; $-0.444 * 100 = -44.4\%$).

While the discussion of the main effects is informative, the marginal effects of these variables tell an important story about how in-prison health affects recidivism while also considering health gains or losses after release. For example, how does an individual with good mental health while in prison who makes only small gains in mental health upon exiting prison compare to someone whose mental health in prison was poor and made significant post-release mental health gains? Or, for individuals who saw a decline in physical health upon release, is their probability of recidivating higher or lower if their physical health was good while in prison? To examine this, as noted in the analysis plan section, we compare the predicted probabilities of the marginal effects of levels of in-prison physical and mental health (low, average, and high) to levels of individuals' differences in their current and in-prison physical or mental health (categorized the same way as low, average, and high). Table 4 shows the predicted probabilities of the marginal effects of levels of in-prison physical and mental health by levels of individuals' differences in their current and in-prison physical or mental health. When reading the tables, the rows can be seen as individuals' starting points—their health while in prison—while the columns are their health trajectories once they leave prison. When a predicted probability is marked as significant, it means that it is significantly

different from individuals who saw no change in health post-release.

The top portion of Table 4 shows the marginal effects for physical health. There are no significant differences of note in these analyses. The bottom of Table 4 shows the marginal effects for the relationship between mental health and recidivism. Beginning with individuals who reported poor in-prison mental health, for individuals who did not see a marked change in mental health post-release, the probability of recidivism is 0.156. For individuals seeing declines in mental health, the probability of recidivating is 0.230. For individuals seeing improvements in mental health, the probability of recidivating is 0.102. Looking at individuals with average mental health while in prison, for individuals who did not see a marked change in mental health post-release, the probability of recidivism is 0.110. For individuals seeing declines in mental health, the probability of recidivating is 0.168. For individuals seeing improvements in mental health post-release, the probability of recidivating is 0.069. Additionally, for individuals reporting good in-prison mental health, the probability of recidivating is the lowest. For individuals who did not see a marked change in mental health post-release, the probability of recidivism is 0.075. For individuals seeing declines in mental health, the probability of recidivating is 0.119. Finally, for individuals seeing improvements in mental health, the probability of recidivating is 0.046.

The predicted probabilities shown here for individuals who either declined or gained in mental health status post-release are significantly different from the predicted probabilities for individuals who saw no change in their mental health. This suggests that one's mental health is while incarcerated contextualizes the changes to mental health one makes post-release and how those changes are associated with recidivism. For instance, individuals with good mental health in prison who made gains (vs. someone who made no gains) in their mental health post-release saw nearly a 3% ($0.046 - 0.075 = -0.029$) reduction in the probability of recidivism. For individuals with average in-prison mental health, post-release gains (vs. someone who made no gains) translated to a 4.1% ($0.069 - 0.110 = -0.041$) reduction in the probability of recidivism. Most strikingly, individuals with poor mental health while in prison who made post-release gains (vs. someone who made no gains) in mental health saw a 5.5% ($0.101 - 0.156 = 0.055$) reduction in the probability of recidivism.

Next, in Table 5, we show the results of the multinomial logistic regression models where the relationship between recidivism and physical and mental health was examined by type of recidivism: new conviction or technical violation. Results are shown as both coefficients and relative risk ratios (RRRs; i.e., the risk of the focal category happening relative to the risk of the reference category happening). As shown in the first model, in-prison physical health has no association

Table 4
Predicted probabilities and 95% confidence intervals for recidivism by levels of in-prison physical or mental health and the difference between current and in-prison physical or mental health.

In-Prison Physical Health	Difference between in Current and In-Prison Physical Health					
	Worse Health (-1)		No Change (0)		Better Health (+1)	
Poor (-1)	0.087 (0.061 to 0.113)	0.102 (0.083 to 0.12)	0.118 (0.099 to 0.137)			
Average (0)	0.103 (0.084 to 0.123)	0.120 (0.107 to 0.132)	0.139 (0.115 to 0.163)			
Good (+1)	0.122 (0.103 to 0.141)	0.141 (0.117 to 0.164)	0.162 (0.12 to 0.204)			
<i>N</i> = 2180	Difference between in Current and In-Prison Mental Health					
In-Prison Mental Health	Worse Health (-1)		No Change (0)		Better Health (+1)	
Poor (-1)	0.230* (0.191 to 0.269)	0.156 (0.135 to 0.178)	0.102* (0.085 to 0.119)			
Average (0)	0.168* (0.147 to 0.189)	0.110 (0.097 to 0.123)	0.069* (0.056 to 0.083)			
Good (+1)	0.119* (0.099 to 0.138)	0.075 (0.06 to 0.091)	0.046* (0.033 to 0.06)			

N = 2180; **p* < 0.01.

(Note: Significance tests determine whether having worse or better health when released is statistically significant from no change in health post-release).

Table 5

Multinomial Logistic Regressions Predicting Categorical Recidivism with In-Prison Physical and Mental Health, the Difference between Current and In-Prison Physical and Mental Health and Controls; Coefficients and Relative Risk Ratios (RRR) shown.

	Physical Health				Mental Health			
	Technical Violations		New convictions		Technical Violations		New convictions	
	B	Relative Risk Ratio	B	Relative Risk Ratio	B	Relative Risk Ratio	B	Relative Risk Ratio
In-Prison Health	0.186 (0.131)	1.205	0.243 (0.128)	1.275	-0.408** (0.109)	0.665**	-0.516** (0.111)	0.597**
Difference between Current and In-Prison Health	0.085 (0.110)	1.089	0.320* (0.157)	1.378*	-0.395** (0.090)	0.674**	-0.743** (0.106)	0.476**
Constant	-2.811** (0.957)		-5.600** (0.865)		-2.718** (0.952)		-5.131** (0.903)	
Person Periods	2180		2180		2180		2180	

(Note: Full models available in Appendix Table 5).

with recidivism, whether that recidivism is due to a technical violation or a new conviction. However, for new convictions, there is an associated between gains in physical health and recidivating: individuals who made gains in physical health had an increased risk of recidivating due to a new conviction relative to not recidivating.

Also, in Table 5, mental health while in-prison and changes post-release show an association with the various types of recidivism. Beginning with technical violations, individuals with better mental health in prison have a lower relative risk for recidivating due to a technical violation over not recidivating ($\beta = -0.408$, RRR = 0.665). Moreover, improving mental health post-release also serves to lower the risk of recidivating due to a technical violation relative to not recidivating ($\beta = -0.395$, RRR = 0.674). Similar results are found for new convictions. Relative to not recidivating, better mental health in prison corresponds with a lower risk of recidivism due to a new conviction ($\beta = -0.516$, RRR = 0.597). Improving mental health post-release also serves to lower the risk of recidivating due to a new conviction ($\beta = -0.743$, RRR = 0.476).

As we have done with previous models, we examine the predicted probabilities of the marginal effects, this time for the categorical outcome of recidivism. Because there is not a relationship between in-prison physical health and categorical recidivism, we do not model these marginal effects. Table 6 shows the predicted probabilities of recidivism due to technical violations and new convictions by levels of in-prison mental health and the difference between current and in-prison mental health. We begin with discussing the relationships between mental health and technical violations. For individuals reporting poor in-prison mental health and who did not see a marked change in mental health post-release (average), the probability of recidivism for technical violations is 0.081. For individuals who saw declines in mental health, the probability of recidivating through a technical violation is 0.107. For individuals seeing improvements in mental health, the probability of recidivating through a technical violation is 0.065. Next, for individuals with average mental health while in prison, if the individual saw no change in mental health post-release, the probability of recidivism for technical violations is 0.064. For individuals who saw declines in mental health, the probability of recidivating through a technical violation is 0.083. For individuals seeing improvements in mental health, the probability of recidivating through a technical violation is 0.047. Moreover, for individuals reporting good mental health in prison, individuals with no change in mental health post-release, the probability of recidivism for technical violations is 0.046. For individuals who saw declines in mental health, the probability of recidivating through a technical violation is 0.062. Finally, for individuals seeing improvements in mental health, their probability of recidivating through a technical violation is 0.033. All marginal effects for technical violations are significantly different from the reference category of no recidivism.

The predicted probabilities for recidivism via new convictions are

very similar to the predicted probabilities associated with technical violations. Beginning with individuals reporting poor in-prison mental health, for individuals with no change in mental health post-release, the probability of recidivism for new convictions is 0.069. For individuals who saw declines in mental health, their probability of recidivating through a new conviction is 0.123. For individuals seeing improvements in mental health, their probability of recidivating through a new conviction is 0.037. Next, for individuals with average mental health while in prison and who did not see a marked change in mental health post-release, the probability of recidivism for new convictions is 0.045. For individuals who saw declines in mental health, the probability of committing a new conviction is 0.084. For individuals seeing improvements in mental health, the probability of recidivating through a new conviction is 0.024. Furthermore, for individuals reporting good mental health in prison, for no changes in mental health post-release, individuals' probability of recidivism for new convictions is 0.029. For individuals who saw declines in mental health, their probability of recidivating through a new conviction is 0.056. Finally, for individuals seeing improvements in mental health, their probability of committing a new conviction is 0.015. The marginal effects for new convictions are significantly different from the reference category of no recidivism.

Note that there are differences in the probability of recidivism due to technical violations versus new convictions. For example, individuals with good in-prison health who also made large gains in mental health post-release had a probability of recidivating due to a technical violation of 0.033 and a new conviction of 0.015. However, while these marginal effects are significantly different from the reference category of no recidivism, they are not significantly different from each other. In other words, in-prison mental health seems to impact the general likelihood of recidivism rather than a specific type of recidivism.

Discussion

Incarceration has a number of collateral consequences, including damage to personal health. In this study, we ask if recidivism be seen as a collateral consequence of in-prison health. While a significant body of work exists showing a clear relationship between incarceration and poor health (see Brinkley-Rubinstein, 2013; Fahmy & Wallace, 2018 for summations of this literature), little research has linked health—whether good or bad—with recidivism (for exceptions see Link et al., 2019; Thomas et al., 2011). As we demonstrate, in-prison and post-release health are related to recidivism, though in different ways for physical and mental health. We find that better physical health while in prison as well as gains in physical health post-release are associated with a higher odds of recidivating in general. For mental health, conversely, better health in prison is related to lower recidivism odds outside of prison. Moreover, when individuals make significant improvements on their in-prison mental health once released, their likelihood of recidivating drops even lower. When looking at the different types of recidivism,

Table 6
 Predicted probabilities and 95% confidence intervals for recidivism by levels of in-prison mental health and the difference between current and in-prison physical or mental health.

In-Prison Mental Health	Technical violations				New convictions				
	Difference between in Current & In-Prison Mental Health		Difference between in Current & In-Prison Mental Health		Difference between in Current & In-Prison Mental Health		Difference between in Current & In-Prison Mental Health		
	Worse Health (-1)	No Change (0)	Better Health (+1)	Worse Health (-1)	No Change (0)	Better Health (+1)	Worse Health (-1)	No Change (0)	Better Health (+1)
Poor (-1)	0.107 (0.079 to 0.136)	0.085 (0.069 to 0.102)	0.065 (0.051 to 0.079)	0.123 (0.09 to 0.156)	0.069 (0.053 to 0.085)	0.037 (0.025 to 0.048)	0.084 (0.068 to 0.1)	0.045 (0.036 to 0.055)	0.024 (0.015 to 0.032)
Average (0)	0.083 (0.068 to 0.098)	0.064 (0.054 to 0.073)	0.047 (0.036 to 0.059)	0.084 (0.068 to 0.1)	0.045 (0.036 to 0.055)	0.024 (0.015 to 0.032)	0.084 (0.068 to 0.1)	0.045 (0.036 to 0.055)	0.024 (0.015 to 0.032)
Good (+1)	0.062 (0.048 to 0.076)	0.046 (0.034 to 0.059)	0.033 (0.02 to 0.046)	0.056 (0.041 to 0.07)	0.029 (0.019 to 0.039)	0.015 (0.007 to 0.022)	0.056 (0.041 to 0.07)	0.029 (0.019 to 0.039)	0.015 (0.007 to 0.022)

N = 2180; *p < 0.01.

mental health—whether in prison or changes post-release—is not associated with recidivism due to technical violations or new convictions differently. Below we contextualize our results and discuss the limitations of our study and the ramifications of our findings.

In this research, we argued that the relationship between incarceration, in-prison health, and recidivism was related to thinking about personal health as a stressor (stress process theory; Pearlman, 1989; Pearlman et al., 1997), which can lead to deviant means of coping with stress (general strain theory; Agnew, 1992, 2001). We find support for this link, but only for in-prison and post-release mental health. Individuals with worse mental health are known to be more likely to recidivate (Abracen et al., 2014; Houser, Saum, & Hiller, 2019; Listwan, Sullivan, Agnew, Cullen, & Colvin, 2013). Skeem and Loudon (2006) discuss the direct and indirect reasons for high rates of recidivism among formerly incarcerated individuals who are mentally ill. Direct reasons for recidivism include criminal behavior during active psychosis or illegal drug use, for example (Skeem & Loudon, 2006). Approximately 75% of individuals who have been incarcerated and have a mental illness also have substance abuse problems (a.k.a., co-occurring disorder; Drake, Mueser, Clark, & Wallach, 1996; Skeem & Loudon, 2006). Importantly, the use of illicit drugs often makes the symptoms of mental illness, particularly psychosis, more pronounced (Drake et al., 1996). Indirect reasons for recidivism include the inability to comply with parole requirements such as working or education due to impairment by mental illness, higher rates of criminal victimization which brings out contact with the criminal justice system (Harrell, 2008), and individuals with mental illness tending to be more closely monitored by agents of the criminal justice system, such as the police or parole officers (Skeem & Loudon, 2006; Solomon, Draine, & Marcus, 2002). Reducing recidivism among individuals with mental illness is predicated on both treating the mental illness and substance abuse disorder (if needed) while simultaneously understanding that parole failure may be related to health needs, rather than criminality (Skeem & Loudon, 2006).

For formerly incarcerated individuals, maintaining good mental health while in the community is a critical component of avoiding re-incarceration, and community corrections policies should be reflective of this need. To some extent, this is already in place for individuals with moderate to several mental illness diagnoses. Many parole agencies embed rehabilitative elements – such as drug treatment or psychological programs – into parole conditions (Travis & Stacey, 2010). Additionally, mental health courts are specialized court and parole systems that sit parallel to existing courts with the purpose of facilitating the adoption of and participation in mental health programming for formerly incarcerated individuals. Mental health courts are effective at reducing re-arrest and churning through the criminal justice system (McNiel & Binder, 2007; Moore & Hiday, 2006; Trupin & Richards, 2003). However, mental health courts – and most programming both in an out of prison – apply to individuals with moderate to severe mental illness, leaving many formerly incarcerated individuals suffering from more mildly diminished mental health without support.

While counterintuitive to our theoretical argument, the finding that better in-prison physical health is related to increased recidivism may lend support to the healthy prisoner hypothesis (Bačák & Wildeman, 2015; Rosen, Wohl, & Schoenbach, 2011a; Spaulding et al., 2011) or the idea that in order to commit crimes and become incarcerated, one needs to be relatively healthy. This suggests that healthier individuals are selected into jails and prison by their ability to commit crime. While Bačák and Wildeman (2015) find little evidence to support the healthy prisoner hypothesis, their analysis was limited to a longitudinal, general population sample of youth. Our sample includes serious and violent offenders who arguably may need to be in better health and free from debilitating chronic conditions to commit more serious crime. Coupled with the fact that individuals who have committed serious and/or violent offenses in the past are the least likely to desist from crime (Andrews et al., 2006), our findings may be indicative of a selection bias towards physically health, non-desisting individuals.

Relatedly, incarceration may serve to better the health of some individuals. There are two ways this may happen. First, while in prison, individuals may have been engaged in physical activity and exercise; this alone could generate differences in health between individuals who are and are not physically active (Mannocci et al., 2015; Woods, Breslin, & Hassan, 2017). Mannocci et al. (2015) found that exercise in prison in an Italian sample led to decreased smoking behavior and a reduction in BMI. In a systematic review, Woods et al. (2017) found that exercise programs in prison increased quality of life, but little research has examined changes to health behaviors for incarcerated individuals. A second explanation for improved health in prison stems from the fact that, before incarceration, many people are disadvantaged and have little access to health care or even stable room and board. Thus, being incarcerated potentially helps disadvantaged prisoners have better health (Schnittker & John, 2007). For example, individuals with a physical or mental health condition are more likely to report an injury while incarcerated than similar individuals who are not incarcerated (Schnittker & John, 2007). Individuals who were homeless prior to being incarcerated are more likely than their counterparts to report a new illness once incarcerated (Beck & Maruschak, 2001). For individuals who seek care during incarceration, they may leave prison in better health than when they entered, and this may affect recidivism.

The association between better health, both in prison and post-release, and recidivism also hints at a programmatic issue, namely the possibility that healthy prisoners are being passed over for programming given that they appear to have fewer needs than their less healthy counterparts. Effective interventions begin with good estimations of risk (Gendreau, 1996) and if physical health is not seen as a risk for recidivism, then the rehabilitative needs of current and formerly incarcerated individuals in good physical health are likely not being fully met. Notably, researchers are still learning about health and health outcomes in carceral settings and most of that research focuses on the damaging effect of prison on health or the relationship between mental health needs and recidivism. Although the focus on the damaging elements of prison on health – both physical and mental – is insightful, our findings related to physical health suggest that such a focus alone may not adequately assess true recidivism risk among a group of serious and violent offenders. Indeed, good physical health, in many ways, is a necessary condition for rejoining society upon release; it also is likely a necessary condition for engaging in crime. We encourage researchers, policy makers, and stakeholders in correctional programming to be more expansive when thinking about health as a risk factor for recidivism and to consider healthy individuals' needs in correctional programming.

There are important limitations to our study and data. First, all respondents in the SVORI data are serious and/or violent offenders; our findings may not be generalizable to less criminogenic populations. Second, as discussed previously, SVORI experienced attrition across waves; while many researchers have suggested this attrition is random (Lattimore & Steffey, 2010, p. 230424; Wallace et al., 2016), there is still a potential for it to influence our results. Post-stratification weighting, however, largely mitigates the effect of attrition on the findings. Third, there may be circumstances of compassionate release (when individuals are released because the cost of treating their health issues is prohibitive), which would skew the sample towards individuals in poor health. Most states in the SVORI program excluded individuals from being eligible to participate if they had severe medical problems (Lattimore & Steffey, 2009), though it is important to acknowledge this possibility. Fourth, our recidivism measures are very conservative estimates of re-offending, given that they capture only re-incarceration and not lesser forms of recidivism such as arrest or contact with the criminal justice system. It is plausible that in-prison health and changes in health post-release have differing effects on other forms of re-offending including arrest, drug use, or deviant activity. Fifth, the SVORI data were collected over 10 years ago, though they remain some of the best data on the health of prisoners and life post-release. Additionally, while

SVORI may not be current, the prison medicine and health care has not seen many changes since SVORI was conducted, mitigating some concern over the age of the data. Sixth, our sample is of only men, and therefore, our results and implications apply to men. While we restricted our sample to men because of differences in health concerns for men and women (an example being female reproductive health issues), future research should examine if and how in-prison health is associated with recidivism for women.

Perhaps the most important limitation of this study is that we do not have a good perspective on why or how some individuals were able to change their health post-release and how those behaviors are related to recidivism. The SVORI data set does not include variables asking about post-release health behaviors, such as frequency of seeing a doctor and the quality of care received, and how health behaviors affect other areas of the respondents' lives. Future studies should examine these mechanisms as a means to creating high quality in-prison and post-release health-promoting policies to lower the risk of recidivism.

Limitations notwithstanding, our results show something intensely important: in-prison health follows individuals after being released and is related to their odds of recidivating. The strong association with better in-prison mental health and lower likelihood of recidivism suggests the need for correctional reform surrounding the treatment of mental health and mental illness *in prison*. Currently, the bulk of mental health programming in corrections happens once individuals are released from prison. There are a host of community corrections programs, such as rehabilitative elements of parole (Travis & Stacey, 2010), mental health courts (McNiel & Binder, 2007; Moore & Hiday, 2006; Trupin & Richards, 2003), and co-responder models (i.e., a mental health professional who responds to calls with the police; see Shapiro et al., 2015 for a review) that serve to reduce and prevent the churning of individuals with mental illness through the criminal justice system. In short, community corrections programs abound in multiple arms of the criminal justice system to help formerly incarcerated individuals cope with their mental health. While health outside of prison is certainly important, our findings also show that gains and losses in mental health are contextualized by an individual's in-prison mental health. Thus, gains to mental health and potentially the success of community correctional programs aimed at bettering the mental health of formerly incarcerated individuals is contingent upon in-prison mental health.

However, prison-based programming that focuses exclusively on mental health is in short supply. More specifically, the vast majority of correctional programming is related to mental illness (not general mental health), substance abuse, or when these issues co-occur. Mental wellness seems to be a missing component of correctional programming. Prisoners cannot reduce their risk of mental health problems in prison in the way someone in the community can. There have been previous calls to increase prisoners' ability to self-care (Marshall, Simpson, & Stevens, 1979). Prisoners have limited access to mental health care, professionals, and treatment outside of medicine. Moreover, their restricted freedom leaves prisoners with little ability to engage in behaviors or patterns that enhance mental health; indeed, the prison environment itself generate mental illness (Haney, 2003). Beyond pharmacological treatment, what programs do address mental health problems focus on recidivism reduction through the treatment of co-occurring disorders (i.e., substance abuse and mental illness), reentry preparation programming (i.e., life skills, employment readiness, and parenting skills), and educational, academic and vocational training. Tripodi, Bledsoe, Kim, and Bender (2011) found that, for incarcerated women, programming aimed at bettering mental health in general improved mental health and lowered rates of recidivism. The widespread adoption of programs such as these could greatly benefit individuals' mental health, particularly for those that suffer from specific mental illness. These in-prison programs could then set individuals up for better mental health outcomes and mental health well-being upon release.

The abundance of information and scholarship, including the contribution of this study, showing the link between incarceration and

health, and now recidivism, suggests that if we are to lower the high rates of recidivism, we can no longer ignore the health of justice-involved individuals, whether these individuals are incarcerated or have been released. These findings relate most saliently to the provision of mental health care to incarcerated populations. Prisoners in need of mental health care are common: nearly 40% of all prisoners (including federal and state prisoners and local jails) have a chronic mental health disease (Wilper et al., 2009). Given the large population of prisoners with a chronic mental health condition (Wilper et al., 2009) and the now established link between poor mental health in prison and recidivism, the provision of high quality mental health care—both in and out of the community—is critical to reducing recidivism.

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Appendix U. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2020.100569>.

Appendix

Table 1
SF-12 Scale Items

Question	Answer Choices	Physical or Mental Health Scale
In general, would you say your health is:	Excellent, Very Good, Good, Fair, Poor	Physical
Does your health now limit you in moderate activities—such as moving a table or playing basketball—a lot, a little, or not at all?	A lot, A little, Not at all	Physical
Does your health now limit you a lot, a little, or not at all when climbing several flights of stairs?	A lot, A little, Not at all	Physical
During the past 30 days, have you accomplished less than you would like to have accomplished as a result of your physical health?	Yes, No	Physical
During the past 30 days, were you limited in the kind of work or other regular activities you do as a result of your physical health?	Yes, No	Physical
During the past 30 days, how much did pain interfere with your normal work?	Not at all, Slightly, Moderately, Quite a bit, Extremely	Physical
During the past 30 days, have you accomplished less than you would like to have accomplished as a result of any emotional problems, such as feeling depressed or anxious?	Yes, No	Mental
During the past 30 days, did you not do work or other regular activities as carefully as usual as a result of any emotional problems, such as feeling depressed or anxious?	Yes, No	Mental
How much time during the past 30 days have you felt calm and peaceful?	All of the time, Most of the time, A good bit of the time, Some of the time, A little of the time, None of the time	Mental
How much time during the past 30 days did you have a lot of energy?	All of the time, Most of the time, A good bit of the time, Some of the time, A little of the time, None of the time	Mental
How much time during the past 30 days have you felt down?	All of the time, Most of the time, A good bit of the time, Some of the time, A little of the time, None of the time	Mental
During the past 30 days, how much of the time has your physical health or emotional problems interfered with your social activities like visiting with friends, relatives, etc.?	All of the time, Most of the time, A good bit of the time, Some of the time, A little of the time, None of the time	Mental

Table 2
Observed and Weighted Means and Standard Errors for Time Invariant Variables from Wave 1

	Observed Mean	Standard Deviation	Weighted Mean	Standard Error
<i>Time Invariant</i>				
In-Prison SF-12 Physical Health	-0.050	(1.039)	-0.044	(0.035)
In-Prison SF-12 Mental Health	-0.007	(1.002)	-0.015	(0.034)
White	0.347	(0.476)	34.9%	(0.4)
Black	0.547	(0.498)	55.3%	(0.5)
Other Race	0.106	(0.308)	9.8%	(0.6)
Age in Years	29.317	(7.291)	29.112	(0.124)
Drug Offender	0.308	(0.462)	31.0%	(1.5)
Gang Member In-Prison	0.384	(0.487)	38.4%	(1.6)
Number of days incarcerated	955.528	(954.681)	952.243	(30.892)
Logged number of days incarcerated	6.475	(0.891)	6.476	(0.029)
Number of lifetime incarcerations	1.247	(1.798)	1.240	(0.056)

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Declaration of competing interest

None.

CRedit authorship contribution statement

Danielle Wallace: Conceptualization, Methodology, Formal analysis, Writing - original draft. **Xia Wang:** Conceptualization, Writing - review & editing.

Table 2 (continued)

	Observed Mean	Standard Deviation	Weighted Mean	Standard Error
Logged number of lifetime incarcerations	-0.680	(1.540)	0.589	(0.019)
SVORI Treatment Group	0.544	(0.498)	54.6%	(1.7)
Iowa	0.087	(0.281)	8.8%	(0.9)
Indiana	0.106	(0.308)	10.6%	(1.0)
Kansas	0.024	(0.153)	2.2%	(0.5)
Maryland	0.116	(0.321)	11.5%	(1.0)
Maine	0.042	(0.201)	4.4%	(0.6)
Missouri	0.055	(0.227)	5.5%	(0.8)
Nevada	0.116	(0.321)	11.2%	(1.0)
Ohio	0.055	(0.227)	5.6%	(0.8)
Oklahoma	0.039	(0.193)	4.0%	(0.7)
Pennsylvania	0.097	(0.296)	9.6%	(1.0)
South Carolina	0.231	(0.422)	23.5%	(1.4)
Washington	0.033	(0.179)	3.1%	(0.6)
	N = 864		N = 1688	

(Note: The sample size is taken from Wave 2 or the first wave in the analytic sample).

Table 3

Observed and Weighted Means and Standard Errors for Time Varying Variables from Waves 2 through 4

	Wave 2 3 Months Post-Release				Wave 3 9 Months Post-Release				Wave 4 15 Months Post-Release			
	Observed Mean	SD	Weighted Mean	SE	Observed Mean	SD	Weighted Mean	SE	Observed Mean	SD	Weighted Mean	SE
<i>Time Varying</i>												
Recidivism	0.071	(0.256)	7.0%	(0.9)	0.166	(0.372)	16.6%	(1.4)	0.130	(0.337)	13.4%	(1.4)
Technical Violation	0.037	(0.189)	3.6%	(0.6)	0.095	(0.294)	9.6%	(1.1)	0.069	(0.254)	7.0%	(1.0)
New Crime	0.034	(0.180)	3.4%	(0.6)	0.070	(0.256)	7.0%	(0.9)	0.061	(0.239)	6.4%	(1.0)
Difference Between Current and In-Prison Physical Health	-0.007	(0.981)	-0.005	(0.033)	-0.061	(1.064)	-0.052	(0.039)	-0.056	(1.057)	-0.043	(0.043)
Difference Between Current and In-Prison Mental Health	0.191	(1.084)	0.199	(0.036)	-0.007	(1.106)	-0.000	(0.040)	-0.031	(1.123)	-0.040	(0.047)
Needs Health Care	0.544	(0.498)	54.3%	(1.7)	0.514	(0.500)	51.2%	(1.8)	0.547	(0.498)	54.6%	(2.0)
Currently Married	0.093	(0.290)	9.2%	(1.0)	0.114	(0.319)	11.2%	(1.1)	0.132	(0.339)	12.7%	(1.3)
No High School Diploma or Equivalent	0.439	(0.497)	44.2%	(1.6)	0.423	(0.494)	43.1%	(1.8)	0.420	(0.494)	43.0%	(1.9)
Is Currently Employed	0.753	(0.431)	75.3%	(1.4)	0.846	(0.362)	84.6%	(1.3)	0.821	(0.384)	82.1%	(1.5)
On Parole	0.836	(0.371)	83.7%	(1.2)	0.717	(0.451)	71.5%	(1.7)	0.607	(0.489)	60.7%	(2.0)
	N =	864	N =	1688	N =	725	N =	1688	N =	591	N =	1688

Table 4

Logistic Regressions Predicting Recidivism with In-Prison Physical and Mental Health, the Difference between Current and In-Prison Physical and Mental Health and All Controls

	Physical Health		Mental Health	
	B	OR	B	OR
In-Prison SF-12 Health	0.210*	1.234*	-0.459**	0.632**
	(0.093)		(0.081)	
Difference between Current and In-Prison Health	0.190*	1.209*	-0.556**	0.573**
	(0.097)		(0.071)	
Currently Needs Health Care	0.450**	1.568**	0.150	1.162
	(0.155)		(0.156)	
Black	0.327	1.387	0.447*	1.564*
	(0.176)		(0.185)	
Other Race, Non-White	-0.055	0.946	0.040	1.041
	(0.265)		(0.273)	
Age in Years	-0.024	0.976	-0.034*	0.967*
	(0.014)		(0.015)	
Currently Married	-0.480	0.619	-0.475	0.622
	(0.260)		(0.255)	
No High School Diploma or Equivalent	0.179	1.196	0.103	1.109
	(0.157)		(0.161)	
Is currently employed	-0.347	0.707	-0.267	0.766
	(0.186)		(0.186)	
Incarceration was for a Drug Offense	0.010	1.010	0.013	1.013
	(0.168)		(0.173)	
Gang Member In-Prison	0.874**	2.396**	0.739**	2.095**
	(0.147)		(0.151)	

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Table 4 (continued)

	Physical Health		Mental Health	
	B	OR	B	OR
Logged number of days incarcerated	0.154 (0.096)	1.166	0.147 (0.101)	1.158
Logged number of lifetime incarcerations	0.593** (0.134)	1.809**	0.606** (0.138)	1.834**
On Parole	-1.155** (0.178)	0.315**	-1.143** (0.184)	0.319**
SVORI Treatment Group	0.324* (0.147)	1.383*	0.401** (0.153)	1.493**
SVORI Wave = 3	0.954** (0.175)	2.596**	0.861** (0.178)	2.367**
SVORI Wave = 4	0.543** (0.195)	1.721**	0.427* (0.197)	1.533*
Indiana	-1.571** (0.366)	0.208**	-1.760** (0.377)	0.172**
Kansas	-0.285 (0.438)	0.752	-0.376 (0.508)	0.686
Maryland	-1.791** (0.366)	0.167**	-1.936** (0.373)	0.144**
Maine	0.008 (0.348)	1.008	-0.367 (0.362)	0.693
Missouri	-1.308** (0.401)	0.270**	-1.594** (0.419)	0.203**
Nevada	-0.335 (0.292)	0.715	-0.513 (0.300)	0.599
Ohio	-1.170** (0.372)	0.310**	-1.221** (0.369)	0.295**
Oklahoma	-1.987** (0.459)	0.137**	-2.407** (0.457)	0.090**
Pennsylvania	0.219 (0.275)	1.245	0.186 (0.276)	1.205
South Carolina	-0.808** (0.264)	0.446**	-0.961** (0.263)	0.382**
Washington	-0.836 (0.452)	0.433	-1.128* (0.487)	0.324*
Constant	-3.205** (0.686)	0.041**	-2.984** (0.705)	0.051**
Person Periods	2180		2180	

Standard errors in parentheses; **p < 0.01, *p < 0.05.

Table 5

Multinomial Logistic Regressions Predicting Categorical Recidivism with In-Prison Physical and Mental Health, the Difference between Current and In-Prison Physical and Mental Health and Controls; Coefficients and Relative Risk Ratios (RRR) shown

	Physical Health				Mental Health			
	Technical Violations		New Crimes		Technical Violations		New Crimes	
	B	RRR	B	RRR	B	RRR	B	RRR
In-Prison Health	0.186 (0.131)	0.243	0.243 (0.128)	1.275	-0.408** (0.109)	0.665**	-0.516** (0.111)	0.597**
Difference between Current and In-Prison Health	0.085 (0.110)	0.320*	0.320* (0.157)	1.378*	-0.395** (0.090)	0.674**	-0.743** (0.106)	0.476**
Currently Needs Health Care	0.402* (0.198)	0.482*	0.482* (0.226)	1.620*	0.174 (0.200)	1.190	0.087 (0.226)	1.090
Black	0.470* (0.223)	0.127	0.127 (0.269)	1.135	0.552* (0.228)	1.736*	0.313 (0.276)	1.367
Other Race, Non-White	-0.095 (0.340)	-0.029	-0.029 (0.401)	0.972	-0.025 (0.341)	0.975	0.109 (0.426)	1.115
Age in Years	-0.017 (0.020)	-0.032	-0.032 (0.018)	0.969	-0.023 (0.021)	0.977	-0.044* (0.019)	0.957*
Currently Married	-0.399 (0.341)	-0.584	-0.584 (0.393)	0.558	-0.413 (0.328)	0.662	-0.506 (0.389)	0.603
No High School Diploma or Equivalent	0.041 (0.209)	0.349	0.349 (0.226)	1.418	-0.011 (0.210)	0.989	0.251 (0.232)	1.286
Is currently employed	-0.141 (0.273)	-0.520*	-0.520* (0.237)	0.595*	-0.090 (0.271)	0.914	-0.385 (0.237)	0.680
Incarceration was for a Drug Offense	-0.148 (0.227)	0.176	0.176 (0.222)	1.193	-0.129 (0.228)	0.879	0.172 (0.239)	1.188
Gang Member In-Prison	1.103** (0.196)	0.584**	0.584** (0.214)	1.793**	1.004** (0.197)	2.730**	0.393 (0.225)	1.481
Logged number of days incarcerated	0.086 (0.132)	0.247*	0.247* (0.121)	1.280*	0.096 (0.133)	1.101	0.203 (0.132)	1.225
Logged number of lifetime incarcerations	0.343	0.899**	0.899**	2.456**	0.348	1.417	0.895**	2.448**

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Table 5 (continued)

	Physical Health				Mental Health			
	Technical Violations		New Crimes		Technical Violations		New Crimes	
	B	RRR	B	RRR	B	RRR	B	RRR
On Parole	(0.187) -1.475** (0.236)	-0.756**	(0.178) -0.756** (0.247)	0.470**	(0.192) -1.466** (0.241)	0.231**	(0.185) -0.756** (0.248)	0.470**
SVORI Treatment Group	0.144 (0.192)	0.581**	0.581** (0.204)	1.788**	0.217 (0.196)	1.243	0.662** (0.216)	1.938**
SVORI Wave = 3	0.971** (0.226)	0.925**	0.925** (0.254)	2.523**	0.899** (0.228)	2.457**	0.801** (0.256)	2.227**
SVORI Wave = 4	0.411 (0.275)	0.682*	0.682* (0.273)	1.979*	0.342 (0.274)	1.408	0.501 (0.276)	1.650
Illinois	-1.957** (0.478)	-0.929	-0.929 (0.583)	0.395	-2.104** (0.496)	0.122**	-1.173* (0.574)	0.310*
Kansas	-0.567 (0.611)	0.237	0.237 (0.645)	1.268	-0.628 (0.636)	0.534	0.148 (0.713)	1.160
Maryland	-2.843** (0.618)	-0.754	-0.754 (0.517)	0.470	-2.950** (0.617)	0.052**	-0.957 (0.524)	0.384
Maine	-0.861 (0.476)	1.043*	1.043* (0.514)	2.838*	-1.122* (0.501)	0.326*	0.544 (0.532)	1.722
Missouri	-0.948* (0.422)	-17.556**	-17.556** (0.461)	0.000**	-1.213** (0.434)	0.297**	-17.650** (0.469)	0.000**
Nevada	-0.501 (0.347)	-0.038	-0.038 (0.484)	0.963	-0.627 (0.349)	0.534	-0.301 (0.493)	0.740
Ohio	-2.556** (0.754)	-0.157	-0.157 (0.517)	0.855	-2.603** (0.749)	0.074**	-0.169 (0.504)	0.845
Oklahoma	-18.832** (0.394)	-0.469	-0.469 (0.567)	0.626	-19.207** (0.409)	0.000**	-0.946 (0.562)	0.388
Pennsylvania	0.143 (0.323)	0.380	0.380 (0.473)	1.462	0.130 (0.313)	1.139	0.301 (0.488)	1.351
South Carolina	-1.194** (0.315)	-0.173	-0.173 (0.440)	0.841	-1.337** (0.322)	0.263**	-0.332 (0.430)	0.717
Washington	-1.911* (0.803)	0.224	0.224 (0.529)	1.251	-2.133** (0.808)	0.119**	-0.084 (0.568)	0.919
Constant	-2.811** (0.957)		-5.600** (0.865)		-2.718** (0.952)		-5.131** (0.903)	
Observations	2180		2180		2180		2180	

Indiana is the reference state; Robust standard errors in parentheses; **p < 0.01, *p < 0.05.

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