**ARTICLE**

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# Mental health disparities in solitary confinement

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## Abstract

Harsh prison conditions have been widely examined for their effects on the mental health of incarcerated people, but few studies have examined whether mental health status exposes individuals to harsh treatment in the penal system. With prisoners confined to their cells for up to 23 hours each day, often being denied visitors or phone calls, solitary confinement is an important case for studying harsh treatment in prisons. Routinely used as punishment for prison infractions, solitary confinement may be subject to the same forces that criminalize the mentally ill in community settings. Analyzing a large administrative data set showing admissions to solitary confinement in state prison, we find high rates of punitive isolation among those with serious mental illness. Disparities by mental health status result from the cumulative effects of prison misconduct charges and disciplinary hearings. We estimate that those with serious mental illness spend three times longer in solitary confinement than similar incarcerated people with no mental health problems. The evidence suggests the stigma of dangerousness follows people into prison, and the criminalization of mental illness accompanies greater severity of incarceration.

**KEYWORDS**
cumulative disadvantage, mental health, prisons, solitary confinement

## 1 | INTRODUCTION

Although researchers have widely analyzed the mental health effects of police stops, arrest, and incarceration (Geller et al., 2014; Rhodes, 2004; Schnittker et al., 2012; Sewell et al., 2016; Sugie & Turney, 2017; Toch, 1977; Travis et al., 2014, ch. 7), fewer studies have examined how the criminalization of mental health status may contribute to harsh treatment in the criminal justice system (Wildeman, 2011). Stigma, harmful behavior, and cumulative disadvantage in criminal processing each contribute to the criminalization and more punitive treatment of people with serious mental health problems.

Solitary confinement is a vivid indicator of harsh U.S. prison conditions and offers an important case for examining cumulative disadvantage in the criminal justice system. Markedly more severe than norms established by other liberal democracies and the United Nations, solitary confinement in the United States typically involves incarcerating people in a prison cell for 23 hours each day, often for months at a time, with strict limits on visits, phone calls, rehabilitative programming, and physical activity (Liman Program & ASCA, 2018; United Nations General Assembly, 2011). These conditions have been found to be psychologically painful, perhaps causing long-term damage to mental health (Grassian, 2006; Haney, 2006, 2018; Reiter et al., 2020). Incarceration in solitary confinement has been associated with reincarceration, poor labor market outcomes, and elevated risks of mortality (Brinkley-Rubinstein et al., 2019; Wildeman & Anderson, 2020). These effects are felt broadly through the prison population. Approximately 4 to 5 percent of people in state prisons are estimated to be incarcerated in solitary confinement on any given day, and 20 percent of those in state prison report a period of solitary confinement during their incarceration (Beck, 2015).

This article extends research on disparities in the criminal justice system by analyzing inequalities in the incidence and duration of solitary confinement by mental health status. People with mental illness confront stereotypes of criminality and dangerousness that may increase the likelihood of solitary confinement. The analysis of criminal justice disparities often appeals to stigma to explain biased decision-making by officials, with the remaining disparity explained by offending behavior (Blumstein, 1982; Spohn & Holleran, 2000; Steffensmeier & Demuth, 2001; Tonry & Melewski, 2008). Empirical analysis, however, often neglects the process of criminalization of different social groups that is woven into policy and practice prior to discretionary decisions by judges or line officers. A recent review of cumulative disadvantage in the criminal justice system provided the following summary: "[T]he overwhelming focus has been on episodic disparity in isolated stages of criminal case processing" (Kurlychek & Johnson, 2019, p. 291). Drawing on theories of cumulative disadvantage in a broad array of social institutions including the criminal courts (DiPrete & Eirich, 2006; Sutton, 2013), we analyze solitary confinement as a case of the sequence of stages comprising cumulative criminalized disadvantage.

Our empirical strategy examines mental health disparities in solitary confinement with a large administrative data set showing all prison admissions and discharges from 2007 to 2016 in Pennsylvania. Pennsylvania has the sixth largest state prison population in the country and is demographically similar to the national prison population (Carson, 2020). To study the criminalization of mental illness in prison, we analyze a mental health classification that indicates the mental health history and treatment needs of Pennsylvania prisoners at their first admission. With data on prison misconduct charges and admissions to solitary confinement that result from a charge, we model solitary confinement through the three stages of receiving a misconduct ticket, being sent to solitary confinement, and then sentenced for a given duration. We estimate

disparities by mental health status at each stage of the disciplinary process and decompose the analysis to indicate which stage of prison discipline contributes most to overall disparity.

The analysis reveals high levels of solitary confinement among incarcerated men and women with serious mental illness. The results are consistent with a process of cumulative disadvantage operating within prisons in which the stigma of mental illness affects decisions at each stage of the prison discipline process. These results are robust to a sensitivity analysis that explores changes in estimated disparities in the presence of confounding. The findings indicate that mental illness—a risk factor for involvement in the criminal justice system—also amplifies the intensity of criminal punishment.

## 2 | THE CRIMINALIZATION OF MENTAL ILLNESS

Research on the criminalization of mental illness burgeoned in the early 1970s with the widespread closure of state psychiatric hospitals (Rothman, 2002). In this context, people who were perceived as too dangerous for community-based treatment were instead committed to prison, which became "the system that can't say no" (Teplin, 1983, p. 55). The history of deinstitutionalization foreshadowed the current period in which "correctional facilities in the United States" have become the "primary mental health institutions in the nation" (Adams & Ferrandino, 2008). Deinstitutionalization was not the main driver of mass incarceration, but a "sizable portion of the mentally ill behind bars would not have been incarcerated" without historic growth in the prison population (Raphael & Stoll, 2013, p. 187). By 2014, the number of people with mental health problems in prisons and jails was 10 times those in state hospitals (Torrey et al., 2014).

The implications of high rates of mental illness in the prison population for the conditions and functioning of U.S. prisons remain underexplored by research on punishment and social inequality (Wildeman, 2011). Researchers and activists have drawn attention to the mental health effects of solitary confinement and the elevated risks of solitary confinement for people with mental illness (Cloud et al., 2015; Haney, 2003, 2017; Kaba et al., 2014; National Institute of Justice, 2016; Reiter, 2016; Reiter & Blair, 2015; Rembis, 2014). A recent meta-analysis of the predictors of solitary confinement (Labrecque, 2018), however, identified only two studies of U.S. prisons that directly estimate the prevalence of solitary confinement among people with mental illness (Lovell et al., 2007; O'Keefe, 2007).

The modern use of extreme isolation expanded rapidly in the period of rising incarceration from the 1970s (Pizarro & Stenius, 2004). Solitary confinement was increasingly used as a means of penal control for a prison population that was becoming younger, more overcrowded, and facing greater restrictions on parole release (Pizarro & Stenius, 2004; Reiter, 2016). The Census of State and Federal Adult Correctional Facilities indicates that the number of U.S. supermaximum security ("supermax") prisons— dedicated to 23-hour lockdown—grew from just 1 in 1980 to 12 by 2012 (Bureau of Justice Statistics, 2012).

Our analysis studies mental illness in prison as a type of criminal stigma, subject to the prison disciplinary process. Solitary confinement is used both for punishment, sometimes called "disciplinary" or "punitive" segregation, and to manage the prison population, sometimes called "administrative" segregation. The official purposes of administrative segregation include protecting the vulnerable and controlling conflicts among prisoners (Kaba et al., 2014; Mears & Castro, 2006; National Institute of Justice, 2016; Reiter, 2016). Sharp distinctions between punitive and administrative solitary confinement can be difficult to make where authorities use administrative segregation to circumvent disciplinary procedure (Reiter & Blair, 2015). Prisons, however,

divide punitive and administrative segregation in their administrative records, and we focus analysis on punitive segregation and the process of prison discipline that precedes it. Our analysis, which examines only punitive solitary confinement, will tend to underestimate mental health disparities if nonpunitive, administrative segregation is also used disproportionately in response to problem behaviors by incarcerated people with mental illness. Any additional mental health disparity associated with administrative segregation falls outside our analysis. With our focus on the criminalization of mental illness, two main explanations have been used to explain disproportionate policing and punishment: stigma and harmful behaviors among people with mental health problems.

## 2.1 | Mental Illness and the Stigma of Dangerousness

People with serious mental health problems face discrimination, stereotyping, and the stigma of dangerousness that affect a broad range of outcomes, including in the criminal justice system. Stigma confers discredit, rendering people "bad, or dangerous, or weak" in the eyes of their community (Goffman, 1963, p. 3). Stigmatized people are seen as "not quite human" and subject to "varieties of discrimination, through which we effectively, if often unthinkingly, reduce [their] life chances" (Goffman, 1963, p. 5). Link and Phelan (2001, p. 367) described how power relations draw together several distinct processes: "Elements of labeling, stereotyping, separation, status loss, and discrimination co-occur in a power situation that allows the components of stigma to unfold." Dangerousness is often ascribed to individuals diagnosed with mental illness (Douglas, 2009; Teplin, 1983). Vignette studies have shown that depression, substance use disorder, and schizophrenia have all been linked to perceived dangerousness (Link et al., 1999). In these studies, the "mental patient" label activated stereotyped beliefs about dangerousness (Link & Phelan, 2001, p. 369).

Beyond attributions of dangerousness attached to the label of mental illness, prison "requires conformity to rigidly enforced rules and highly regimented procedures" (Haney, 2003, p. 142). Those who fail to adapt are seen by prison authorities as troublesome and inconvenient for institutional routines. Serious mental illness can involve illogical thinking, hallucinations, and mood swings that diminish the capacity to follow rules and obey orders (Link & Phelan, 2001; Teplin, 1984). Verbal commands that are commonly used in policing or corrections can be ineffective with people with mental health problems (Borum, 2000; Watson et al., 2008). Nonconforming behaviors—such as talking to oneself or ignoring orders and social cues—may disrupt the routinized life inside prisons and can be disturbing for others.

Thus, the mechanism of stigma encompasses both attributions of dangerousness to the mental illness label and to accompanying nonconforming behavior. In the power relations of the prison, nonconforming behaviors that are simply idiosyncratic rather than harmful may be treated as wrongdoing. Thus, mental illness in maximum security has been described as a fundamental threat to prison order: "[T]he most obvious cases of psychosis … represent a rupture in the foundation of lawfulness on which an offender can be brought into account" (Rhodes, 2004, p. 105). Difficult behavior diagnosed as mental illness is often suffused with moral judgment, designating incarcerated people as "presumptively sleazy, unsavory, repugnant and dangerous" (Toch, 1998, p. 151).

Social institutions reproduce stigma-based inequality in their everyday operations in three key ways. First, in a context of intense power relations, the label of "mental illness" and its behavioral markers may lead to stereotyping, discrimination, and segregation. In prisons, mental health

classification is regularly used for decision-making and is readily available to frontline workers and prison staff in the prison record (Rembis, 2014). Similar to tracking in schools (DiPrete & Eirich, 2006; Gamoran, 1992; Holm et al., 2013), being placed under a particular mental health classification may reinforce inequality and influence attitudes of prison staff. Second, stigma varies by context and social interaction. For example, in community-based criminal processing, police make momentary assessments of individual demeanor and dangerousness, whereas prosecutors and judges have more time to deliberate and review evidence to determine culpability and deservedness of punishment (Kurlychek & Johnson, 2019; Spohn, 2008; Sutton, 2013). In prisons, correctional officers are positioned similarly to police (Logan et al., 2017) and hearing examiners are in a similar position to court officials (Steiner & Cain, 2017, p. 73). Third, official assessments, perhaps influenced by bias and stereotypes, send signals to other officials—setting off a sequential process of increasing disadvantage (DiPrete & Eirich, 2006; Kurlychek & Johnson, 2019). When labels and behavior influence successive stages of adjudicating misconduct, we hypothesize that inequality will grow as the process unfolds.

## 2.2 | Harmful Behavior

Whereas the process of stigma emphasizes the official response to the mentally ill, serious mental illness has also been associated with harmful behavior, including violence. A review of more than 200 studies across community, hospital, and correctional settings found psychosis was associated with a 49–68 percent increase in the odds of violence, but associations were small in correctional settings (Douglas, 2009, p. 688). In prison, mental health crises may precipitate "throwing body wastes or erupting in unpredictable displays of violence" (Rhodes, 2004, p. 107). Thus, one rival explanation for the association between mental health and prison discipline is that incarcerated people with mental illness are more likely to present harmful behaviors that are subject to prison discipline.

We aim to distinguish harmful behaviors from the differential treatment of the mentally ill by prison authorities. Research on mental illness acknowledges behavioral differences that contribute to stigmatizing beliefs alongside labeling and classification (Link & Phelan, 2001; Teplin, 1983, 1984). Harmful behaviors, however, are readily classified as misconduct and go beyond idiosyncratic behavior. A review of research on punitive solitary confinement finds only one prior study that examined mental health disparities in punitive solitary confinement (Labrecque, 2018). In a retrospective self-report survey of prisoners in England and Wales, Coid et al. (2003) found no evidence that prisoners with severe mental illness were more likely to report punitive solitary confinement. Other research on police arrests has found after controlling for factors such as drug use and disrespect, police were no more likely to arrest people with mental health problems (Engel & Silver, 2001; Novak & Engel, 2005). The current study provides another test, with U.S. prison data across multiple stages of criminalization, by estimating mental health disparities while controlling for behavioral measures often used in studies of solitary confinement (Labrecque, 2018; Mears & Bales, 2010; National Institute of Justice, 2016).

## 2.3 | A Sequential Perspective on Institutionalized Disparities

Studies of disparities in criminal processing have often distinguished behavior from differential treatment as the "warranted" and "unwarranted" components of disproportionate punishment

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(e.g., Blumstein, 1982; Spohn & Holleran, 2000; Steffensmeier & Demuth, 2001). Typical in studies of racial disparity, warranted disparities relate to differential involvement in crime. Unwarranted disparities are interpreted as the result of bias in discretionary decision-making in which disfavored groups are treated more harshly. A common empirical strategy uses official measures of offending, such as arrest statistics, to identify the warranted component of disparate punishment (Blumstein, 1982; Tonry & Melewski, 2008). Following this approach, the stigma of mental illness could be described by a data analysis that controls for behavioral differences and interprets residual differences in punishment as differential treatment.

A limitation of this analysis of disparity is that discretionary decision-making is assumed to be the sole source of disparity for which authorities are responsible. For instance, the policies and routines of criminal justice agencies may punish some social contexts or conduct more harshly than others. Thus, a legal framework that places few constraints on police discretion, or sentencing guidelines that punish criminal history, each might foster disparities (Engel et al., 2019; Frase & Roberts, 2019; Reiter, 2015; Skogan & Frydl, 2004). Criminalization shaped by the institutional context is poorly described by a framework that focuses only on official discretion. Institutional context is often excluded from analysis because research is limited to a single stage of the process of criminalization. Despite a large literature on disparities of punishment, criminalization, and solitary confinement specifically, few studies have analyzed how inequalities might accumulate across stages of the punishment process (Cochran et al., 2018; Kurlychek & Johnson, 2019; Spohn, 2015).

Deficiencies of single-stage analyses of disparity can be addressed by considering the sequence of stages in the punishment process and assessing cumulative criminalized disadvantage. Analyzing a multistage process indicates where the largest inequalities are created. From arrest to conviction to sentencing, criminal processing involves discretionary decision-making in a context of formal rules and routinized practices. Hagan (1974, p. 379) described this dynamic perspective, writing that racial disparities result from "transit through the criminal justice system" that operates "cumulatively to the disadvantage of minority group defendants." Researchers have thus examined cumulative racial disadvantage in criminal court processing and sentencing (Baumer, 2013; Kutateladze et al., 2014; Schlesinger, 2005; Spohn, 2008; Sutton, 2013; Ulmer, 2012; Wooldredge et al., 2015). We extend this research to consider disparities in prison discipline by mental health classification. Instead of just dividing disparities into components related to behavior and differential treatment, the sequential perspective on criminalization and punishment also aims to determine where disparities arise and how they are amplified or attenuated with the institutional context.

Like other processes of punishment, discipline within prisons is shaped by policy and institutional context, marked by points of discretionary decision-making. Prison discipline begins with correctional officers who write tickets for misconduct. Misconduct charges may be referred to a disciplinary hearing, where a sanction of solitary confinement might be delivered by a hearing examiner, similar to a sentencing judge in a criminal court. Correctional officers have wide discretion in issuing tickets. In our sequential perspective, misconduct charges can be seen not simply as reflecting the behavior of incarcerated people, but they are also the point in the disciplinary process in which the scope for bias is widest. The prison disciplinary process provides significantly weaker procedural protections than courts. It can operate as a "rubber stamp" for misconduct charges, but hearing examiners are more constrained than line officers by the due process of prison regulations that allow testimony and specify the sanctions for charges (Armstrong, 2015; National Institute of Justice, 2016, p. 52; Pennsylvania Department of Corrections, 2015). In the final stage that determines the duration of solitary confinement, discretion is

constrained further as sentences to solitary confinement are prescribed by regulation depending on charge and misconduct history.

The institutionalized stages of prison discipline invite disparity in at least two ways. First, discretion is built into the disciplinary process to varying degrees at different stages. Second, an official history of misconduct influences the severity of the sanction, and such a history may itself be the product of biased discretion. Because official misconduct history is weighed by the sanctions scheme, disparity will likely increase in hearings that determine punishment and its severity.

The sequential process of institutionalized disparities is likely to operate differently for men and women. First, women have a higher mental illness burden than men, both in the community and in prisons (Binswanger et al., 2010; McLean et al., 2011; Rembis, 2014). Serious mental illness is thus a less selective characteristic of the women's prison population. Second, public sentiment views women as less violent or dangerous than men, and fear of people with mental health problems is associated with men and masculinity (Boysen, 2017; Russell, 2012). Survey data and police reports indicate women engage in violence far less than men and are less likely to be incarcerated for serious violence (Schwartz et al., 2009). Third, men's and women's prisons differ by level of security, the number of female staff, and the general organization of prison life (Britton, 2003). Although we expect both discretion and harmful behaviors to generate disparities for all incarcerated people, processes of imprisonment and mental health diagnoses are deeply gendered and should be analyzed separately for men and women. In particular, a high rate of solitary confinement among women with mental illness may be a clearer signal of the effects of stigma and less likely to reflect harmful behaviors.

## 2.4 | Control Variables

In assessing disparity at each stage of prison discipline, what case characteristics should be controlled? Controlling for compliance with prison rules provides estimates of differential treatment for cases that are observably similar in misconduct behavior. To distinguish treatment by staff from prisoner behavior, researchers have controlled for criminal record, the conviction offense, and demographic variables like age, race and ethnicity, marital status, and education (Labrecque, 2018). Criminal history, severity of the conviction offense, and youth have all been widely found to be associated with misconduct and solitary confinement and interpreted as measures of the propensity for compliance with prison rules (Cochran et al., 2018; Labrecque, 2018; National Institute of Justice, 2016, pp. 176–77; Steiner et al., 2014).

Similar to earlier research, we try to capture behavioral differences in the prison population with controls for the severity and type of charged misconduct, governing offense severity, risk assessments, and demographic characteristics (Butler et al., 2017; Lovell et al., 2007; Mears & Bales, 2010). Although we use risk assessment scores as proxies for behavioral risks of prison misconduct, numeric scores themselves may reflect mental health stigma (Brayne & Christin, 2021). To the extent that risk scores are measuring stigma and not behavior, we will tend to underestimate the mental health disparities related to stigma. We use prison and year fixed effects to control for the prison environment that varies in its response to misconduct and use of sanctions (Butler & Steiner, 2017; Steiner et al., 2014).

This empirical strategy aims to estimate differential treatment of people with mental health problems. Controlling for behavior at each stage of the punishment process provides an empirical indication of institutionalized variation in the effect of stigma.

## 3 | DATA AND METHOD

To study mental health disparities in solitary confinement, we analyze a detailed administrative data set of prison admissions in Pennsylvania. At the end of 2018, 47,370 people were incarcerated in Pennsylvania prisons, yielding an imprisonment rate of 366 per 100,000, which was just below the national rate (Carson, 2020). Similar to the national average, 4 percent of the total Pennsylvania prison population on an average day was incarcerated in solitary confinement (Beck, 2015; Browne et al., 2015; Liman Program & ASCA, 2018).

### 3.1 | Administrative Data on Solitary Confinement

To analyze prison experiences and sanctioning, we obtained under a data sharing agreement between the authors and the Pennsylvania Department of Corrections a series of data sets that included records on all admissions to Pennsylvania prisons between January 1, 2007 and December 31, 2016. These data provide information on incarceration and prison experiences for the admission cohort through March 1, 2018, allowing for some lag in observing solitary confinement experiences following an admission in 2016. We analyze data for 90,364 individuals admitted to prison between 2007 and 2016 who have complete records for the regression variables (89 percent of the total recorded admissions). Notably, the current study takes place during a period of federal investigations and litigation involving the Pennsylvania Department of Corrections—beginning in 2012—that focused on the treatment of people with disabilities and serious mental illness in solitary confinement (U.S. Department of Justice, 2013).

The key predictor for the analysis of disparities is the prison mental health classification. All those entering Pennsylvania prisons for the first time are given a mental health screening at intake, which thus predates any later experience of solitary confinement. For men and women admitted to Pennsylvania prisons, the 4-day screening takes place at the reception prison through which all newly admitted prisoners are processed for intake. The screening is conducted by Psychology Department staff of the prison system, and it involves multiple instruments. First, a semistructured clinical interview is conducted, followed by the Personality Assessment Inventory (PAI), which has demonstrated high construct validity (Slavin-Mulford et al., 2012). Staff then assess intellectual functioning using the Beta-4, a common intelligence test in correctional settings (van Esch et al., 2018). In addition to these assessments, there is a review of prison records and consultation with psychiatry staff.

The mental health screening assigns all people admitted to prison to one of four categories: (A) no prior diagnosis of mental illness, (B) a prior diagnosis but no current treatment, (C) current treatment with medication or counseling for mental illness, and (D) current treatment for serious mental illness or an intellectual disability. Serious mental illness includes major depression, bipolar disorder, schizophrenia, or other psychotic disorders. Individuals designated with a C or D category are reviewed and potentially recategorized every 6 months to 1 year, and they may receive a new status after a clinical encounter or other events (e.g., self-injury or presentation of a mental health complaint). A limitation of the current study is that we only observe the mental health category assigned at intake, and thus, our analysis does not account for changes in mental health status over time. This baseline measure of mental health status, however, cannot be influenced by subsequent solitary confinement. A time-varying measure of mental health may lead to overestimates of mental health disparities where solitary confinement causes mental illness.

**TABLE 1** Percentage distribution of demographic characteristics, risk scores, and criminal history by mental health category, Pennsylvania prisoners, 2007–2016

| Variable | Mental Health Classification | | | | |
| | (A) | (B) | (C) | (D) | All |
|---|---|---|---|---|---|
| **Men** | 50.86 | 26.28 | 20.81 | 2.05 | 100.00 |
| Demographic Characteristics | | | | | |
| White | 33.21 | 53.13 | 56.66 | 52.10 | 43.71 |
| Hispanic | 12.61 | 11.31 | 8.73 | 9.58 | 11.40 |
| Black | 53.42 | 35.11 | 34.16 | 37.79 | 44.28 |
| Age 21 and under | 13.07 | 15.65 | 11.43 | 6.80 | 13.28 |
| Age 22–25 | 18.63 | 19.06 | 15.86 | 10.11 | 17.99 |
| Age 26–30 | 19.71 | 19.71 | 17.65 | 15.49 | 19.19 |
| Age 31–40 | 25.94 | 23.93 | 25.83 | 26.43 | 25.40 |
| >40 | 22.65 | 21.65 | 29.23 | 41.16 | 24.13 |
| Unmarried | 85.74 | 86.34 | 85.69 | 87.76 | 85.93 |
| Risk and Offense Severity Scores (Mean) | | | | | |
| Recidivism risk (0–11) | 5.50 | 5.85 | 5.78 | 5.68 | 5.65 |
| Substance use risk (0–9) | 3.39 | 4.26 | 4.45 | 4.21 | 3.86 |
| Governing offense severity (1–15) | 9.73 | 9.10 | 8.67 | 7.78 | 9.31 |
| *n* | 41,953 | 21,675 | 17,165 | 1,691 | 82,484 |
| **Women** | 17.75 | 18.53 | 52.49 | 11.23 | 100.0 |
| Demographic Characteristics | | | | | |
| White | 57.18 | 67.81 | 74.20 | 68.70 | 69.38 |
| Hispanic | 7.58 | 7.74 | 5.25 | 7.91 | 6.42 |
| Black | 34.17 | 23.36 | 19.71 | 22.49 | 23.26 |
| Age 21 and under | 7.72 | 6.92 | 6.67 | 5.20 | 6.74 |
| Age 22–25 | 16.15 | 18.63 | 16.37 | 12.32 | 16.29 |
| Age 26–30 | 20.51 | 20.68 | 21.69 | 20.68 | 21.18 |
| Age 31–40 | 26.52 | 27.74 | 28.84 | 28.02 | 28.13 |
| >40 | 29.09 | 26.03 | 26.43 | 33.79 | 27.65 |
| Unmarried | 84.99 | 84.52 | 85.18 | 84.52 | 84.95 |
| Risk and Offense Severity Scores (Mean) | | | | | |
| Recidivism risk (0–11) | 4.23 | 4.98 | 5.25 | 5.34 | 5.03 |
| Substance use risk (0–9) | 3.43 | 4.31 | 5.17 | 4.80 | 4.66 |
| Governing offense severity (1–15) | 8.00 | 8.05 | 7.37 | 6.34 | 7.49 |
| *n* | 1,399 | 1,460 | 4,136 | 885 | 7,880 |

*Note*: A = no history of mental illness; B = prior diagnosis; C = other mental illness; D = serious mental illness. Does not include frequencies for other race and marital statuses.

In sum, the mental health categories should not be interpreted as current diagnoses but instead represent a coarse measure periodically reviewed by shift commanders and used by prison staff to assess housing and treatment needs (Pennsylvania Department of Corrections, 2015).

Descriptive statistics for our analysis are reported in table 1. More than half (51 percent) of men have no history of mental illness compared with just 18 percent of women. More than half

(53 percent) of women admitted to prison have active diagnoses requiring treatment for mental illness compared with 21 percent of men. Approximately 11 percent of women have been diagnosed with serious mental illness or an intellectual disability. In contrast, 2 percent of men have been diagnosed with serious mental illness.

Similar to national figures, the Pennsylvania prison population is greater than 90 percent male, with a median age of 31. People with serious mental illness tend to be older and are more likely to be non-Hispanic White. More than half of those imprisoned in Pennsylvania are either Black or Hispanic, although the overrepresentation of people of color is much greater for men than for women.

Among the covariates, we control for risk assessment scores and the governing offense severity. The first risk score is intended to measure the likelihood of returning to prison for a new crime or parole violation. The Risk Screen Tool (RST) was developed by research staff at the Pennsylvania Department of Corrections and is administered during prison intake. The RST includes information on age at first arrest, current age, convictions, prior sanctions in an institutional setting, prior violations of community supervision, high school dropout, and a history of drug problems. Scores are added together across these questions, and on a scale from 0 to 11, the sample averages a recidivism risk score of 5.6, with a slightly higher score for prisoners with serious mental illness (D) compared with those with no history of mental illness (A). The Texas Christian University (TCU) Drug Screen 5, a validated screener administered during prison intake, provides a second score intended to measure the risk of substance use. On a scale from 0 to 9, the sample averages a score of 3.9, with men and women with serious mental illness (D) scoring higher than those with no mental illness history (A).

Similar to prior research, we also account for criminal history by controlling for governing offense severity—defined as an ordinal measure of offenses described by the Pennsylvania Criminal Code Offense Gravity Score (see Commonwealth of Pennsylvania Code Chapter 303.3), where 1 is the least severe (e.g., traffic violations) and 15 is the most severe (e.g., homicide). Male and female prisoners with serious mental illness (D) have lower average offense severity than those with no mental illness history (A). Finally, in models estimating the probability of solitary confinement and length of stay in solitary, we control for the level of misconduct severity, using a code from the Pennsylvania Department of Corrections that indicates misconduct charges requiring a formal disciplinary hearing (Pennsylvania Department of Corrections, 2015).

Do administrative data produced for prison operations adequately measure inequalities in conditions of incarceration? Assessments of the reliability and validity of prison records, including data on misconduct and solitary confinement, show consistency between administrative records and the direct reports of incarcerated people in survey interviews (Daggett & Camp, 2009; Pyrooz et al., 2020; Steiner & Wooldredge, 2014). States, however, have also been found to report incorrectly the extent of supermax confinement and solitary confinement (Naday et al., 2008). Administrative data that record only disciplinary or administrative custody may underreport solitary confinement if the prison uses different official designations for the same forms of confinement. Moreover, official designations of solitary confinement—whether they are called "restrictive housing," "administrative segregation," or a "special housing units"—provide little information about actual conditions of confinement (Western et al., 2022). In sum, our use of prison administrative records likely captures the experiences of those officially given misconduct tickets and disciplinary custody but misses the punitive use of administrative custody and other processes of intensive incarceration that are not captured in the official record.

## 3.2 | Measuring the Process of Solitary Confinement

The two main forms of solitary confinement in prisons are disciplinary or punitive segregation and administrative segregation. In Pennsylvania, conditions of confinement do not differ greatly for these two forms of custody (Western et al., 2022), but each results from a distinct pathway. Administrative segregation has a wide variety of origins from decisions to separate those who threaten "orderly prison operations" to procedures for housing those who are transferring to other prisons (Metcalf et al., 2013). The prison disciplinary process that culminates in punitive segregation is recorded in administrative data through information on disciplinary charges that describe type of misconduct, as well as disciplinary hearings that result in sanctions.

*Misconduct charges.* A misconduct ticket often lists several charges—parallel to charging by police officers in free society. Charges include infractions that are specific to the penal context as well as violations that might be charged as criminal offenses outside prison.

In the 10-year observation period, 296,831 prison misconduct charges were recorded on 139,824 tickets (table 2). Pennsylvania specifies 52 unique misconduct charges that carry a schedule of penalties. Disciplinary hearings must specify written misconduct charges (Pennsylvania Department of Corrections, 2015). Misconduct charges were recoded into categories reported in table 2. We provide specific charges used to create our misconduct charge categories in table A.2 in appendix A at the end of this article. Nearly two thirds of misconduct tickets contained charges for defiance not associated with a violent act. Refusing to participate in prison head counts, lying, and refusing to obey an order were the most common forms of defiance. Nearly a quarter of misconduct tickets contained a charge of a verbal threat, most commonly, "threatening an employee or their family." Only 13 percent of all misconduct tickets contained any charges of violence. The most common violence charges are assault and fighting and include body punching, horseplay, kidnapping, rape, murder, rioting, and unlawful restraint.

Misconduct varies by mental health status. For men with serious mental illness, 19 percent of tickets contain a charge of violence compared with 11 percent for men without mental illness. Both men and women with serious mental illness receive a greater percentage of misconduct tickets containing charges of verbal threats (10–12 percent more) compared with those without mental illness. Women with serious mental illness were more likely to receive a charge of making a verbal threat than women with no mental illness.

*Solitary confinement, misconduct tickets, sanctions, and length of stay*. Table 3 reports the percentage distribution of solitary confinement in Pennsylvania and the dependent variables for the regression analysis. The table shows that 22 percent of prisoners spend time in punitive segregation (called "disciplinary custody" in Pennsylvania) at some point in a prison sentence, compared with 26 percent who are held in administrative segregation (or "administrative custody"). We observe similar levels of mental health disparity for each form of custody. Those with serious mental illness are approximately 1.8 times more likely to be in solitary confinement than those with no history of mental illness. Despite similar disparities, we focus on punitive segregation because it is a documented, multistage process that is informative about the criminalizing stigma of mental illness across the stages of prison discipline. Our analysis thus only includes part of the experience of solitary confinement (punitive not administrative), and mental health disparities may be underestimated as a result. Still, in the analysis of length of stay, prisoners sent to solitary after misconduct charges are formally in administrative custody pending a disciplinary sanction. In these cases, short periods of administrative custody contiguous with disciplinary custody are counted in the duration of solitary confinement.

**TABLE 2**  Percentage distribution of charges in prison misconduct tickets by gender and mental health classification in Pennsylvania, 2007–2018

| Variable | Violence | Drugs | Threats | Defiance | Number of Tickets |
|---|---|---|---|---|---|
| All | 12.98 | 20.38 | 22.65 | 62.52 | 139,824 |
| **Men (N = 82,484)** | 12.83 | 20.61 | 22.94 | 62.02 | 130,536 |
| Mental Health Classification | | | | | |
| (A) No history | 11.01 | 20.77 | 20.82 | 64.27 | 43,818 |
| (B) Prior diagnosis | 12.30 | 21.76 | 21.68 | 62.01 | 37,299 |
| (C) Other mental illness | 14.51 | 20.19 | 25.28 | 59.99 | 45,790 |
| (D) Serious mental illness | 19.32 | 12.15 | 32.07 | 60.62 | 3,629 |
| **Women (N = 7,880)** | 15.07 | 17.15 | 18.54 | 69.56 | 9,288 |
| Mental Health Classification | | | | | |
| (A) No history | 11.13 | 19.47 | 14.53 | 72.18 | 647 |
| (B) Prior diagnosis | 12.52 | 19.94 | 12.52 | 70.94 | 1,294 |
| (C) Other mental illness | 16.18 | 17.11 | 18.79 | 68.23 | 5,845 |
| (D) Serious mental illness | 14.65 | 13.91 | 24.50 | 72.44 | 1,502 |

*Note*: Misconduct categories do not sum to 100% because misconduct tickets include up to 11 separate charges.

**TABLE 3** Descriptive statistics for misconduct tickets and solitary confinement by gender and mental health classification in Pennsylvania, 2007–2018

| Variable | Any Solitary Confinement | | Regression Dependent Variables | | |
|---|---|---|---|---|---|
| | Disciplinary Custody (%) | Administrative Custody (%) | Misconducts Per Year | Disciplinary Custody Given Misconduct (%) | Median Days of Solitary Confinement |
| | (1) | (2) | (3) | (4) | (5) |
| All | 22.15 | 26.24 | .41 | 48.55 | 31.00 |
| **Men (N = 82,484)** | 22.63 | 27.44 | .41 | 48.95 | 31.00 |
| Mental Health Classification | | | | | |
| (A) No history | 16.96 | 22.32 | .31 | 42.58 | 32.00 |
| (B) Prior diagnosis | 24.92 | 28.98 | .42 | 47.91 | 35.00 |
| (C) Other mental illness | 32.19 | 36.18 | .62 | 55.14 | 30.00 |
| (D) Serious mental illness | 31.37 | 40.86 | .58 | 58.50 | 30.00 |
| **Women (N = 7,880)** | 17.05 | 13.30 | .42 | 43.10 | 30.00 |
| Mental Health Classification | | | | | |
| (A) No history | 9.30 | 9.13 | .22 | 36.48 | 32.00 |
| (B) Prior diagnosis | 13.50 | 11.05 | .32 | 35.16 | 30.00 |
| (C) Other mental illness | 19.71 | 14.68 | .48 | 43.80 | 35.00 |
| (D) Serious mental illness | 22.66 | 17.06 | .60 | 50.07 | 30.00 |

*Note:* (1) The percentage of prison terms in which any disciplinary custody occurred; (2) the percentage of prison terms in which any administrative custody occurred; (3) the average number of misconduct tickets received per year in a given prison term; (4) the percentage of misconduct tickets that received the sanction of disciplinary solitary confinement; and (5) the median days in solitary confinement conditional on receiving a solitary sanction (combines contiguous disciplinary and administrative custody days).

Incarcerated people on average receive .4 misconduct tickets in a given year (table 3, column 3). Misconduct tickets were most common among prisoners classified at the highest levels of mental illness. Those with serious mental illness on average received nearly .6 misconduct tickets a year in a given prison term, compared with an average of .2 to .3 misconducts a year for those reporting no history of mental illness.

Data on the disciplinary hearing also show variation by mental health status (table 3, columns 4 and 5). There are a variety of possible sanctions after a guilty verdict is decided at the disciplinary hearing, but nearly half (49 percent) of misconduct tickets resulted in solitary confinement. Solitary confinement was most likely for those classified at the highest level of mental illness. The median length of stay in solitary confinement after receiving a solitary sanction, including any additional administrative custody immediately after the disciplinary sanction time—was 1 month. For example, if someone spends 2 weeks in disciplinary custody, but the following day begins a stay in administrative custody for an additional week, the total length of stay for that individual is 3 weeks.

## 3.3 | Analytic Strategy

Incarceration in solitary confinement for prison misconduct is a three-stage process: 1) A correctional officer charges a prisoner with misconduct and writes a ticket for the charge; 2) an examiner at a disciplinary hearing may prescribe the sanction of solitary confinement; and finally, 3) the examiner assigns the length of stay in solitary confinement. In a prison term, $t$, person $i$ may receive several misconduct tickets, and the expected count of the number of tickets, $\lambda_{it}$, can be written in a Poisson regression, as follows:

$$\log \lambda_{it} = \alpha_0 + \alpha_{1m} + \boldsymbol{x}_{it}' \alpha_2 \tag{1}$$

where $\alpha_{1m}$ are the coefficients for the four-point mental health classification ($m$ = prior diagnosis, other mental illness, or serious mental illness, with no history in the reference category yielding coefficients that provide a contrast with the modal prisoner). Covariates in the vector $\boldsymbol{x}_{it}$ include fixed effects for the year of prison admission and prison facility, dummy variables for governing offense severity, risk scores for recidivism and substance use, race/ethnicity, age, and marital status. We also include an offset for the log number of years in prison, so the coefficients describe effects of covariates on misconduct tickets per year.

For each misconduct ticket, $j$ (suppressing the index $t$ for each prison term), we have a binary variable that scores 1 for a sanction of solitary confinement, and 0 otherwise. The second-stage analysis estimates the probability of being sent to solitary confinement given a misconduct ticket, $p_{ij}$,

$$\log \left( \frac{p_{ij}}{1 - p_{ij}} \right) = \beta_0 + \beta_{1m} + \boldsymbol{x}_{ij}' \beta_2 \tag{2}$$

where $\beta_{1m}$ are the mental health effects. In addition to the risk scores, demographics, and prison and year fixed effects, $\boldsymbol{x}_{ij}$ also includes dummy variables for the charges listed on the ticket. These dummy variables indicate whether a ticket contains a charge that requires a formal hearing (a measure of misconduct severity), and the type of charge coded as separate categories for violence, threats, defiance, or possession of drugs or other contraband.

Next, each commitment to solitary confinement results in a length of stay. The hearing examiner commonly sentences to solitary confinement for 14, 30, or 60 days, but occasionally length of stay is reduced through a review process or lengthened for later misconduct charges issued in solitary confinement. Being a count of the number of days spent in solitary confinement after a sanction, we assume that length of stay follows a Poisson distribution:

$$\log \mu_{ij} = \gamma_0 + \gamma_{1m} + x'_{ij}\gamma_2 \tag{3}$$

where $\mu_{ij}$ is the expected count of the number of days spent in solitary confinement and $\gamma_{1m}$ are the mental health effects. Covariates are the same as those in equation 2 plus a dummy variable indicating if additional misconduct charges were issued while in solitary. (See table A.1 for a complete list of covariates in equations 1–3.) The regressions are estimated separately for men and women. We also study the robustness of the results by first controlling only for demographics and then by adding other covariates.

If all relevant behavioral differences correlated with mental illness can be controlled, and outcomes at each stage are independent conditional on covariates, then estimates of mental health effects reflect differential treatment by prison officials. The analysis goes further than previous research by controlling for prison effects and multiple risk and severity scores, but unobserved behaviors associated with mental health and misconduct may still bias estimates of differential treatment. Even if unobserved behavior confounds the analysis, however, the results can still be interpreted as empirical mental health disparities in prison discipline experienced by incarcerated people, from a given admission cohort, in a given prison, with the same observed characteristics.

The models imply that the marginal length of stay in solitary confinement for a person with covariate characteristics, $\bar{x}$, and mental health group, $m$, is given as follows:

$$E(S_m|\bar{x}) \equiv \widehat{S}_m = \widehat{\lambda}_m \times \widehat{p}_m \times \widehat{\mu}_m$$

where $\widehat{\lambda}_m$ is the predicted number of misconduct tickets in a prison spell, $\widehat{p}_m$ is the predicted probability of solitary confinement given misconduct, and $\widehat{\mu}_m$ is the predicted length of stay given a sanction of solitary confinement. By accounting for the probability of solitary confinement, $\widehat{S}_m$ is the marginal time in solitary confinement for someone entering prison with covariate characteristics, $\bar{x}$. For example, a hypothetical prisoner with one expected misconduct charge, $\widehat{\lambda}_m = 1$, a 50 percent chance of solitary given misconduct, $\widehat{p}_m = .5$, and a 1-month length of stay if sanctioned to solitary, $\widehat{\mu}_m = 30$, is expected to spend 15 days in solitary, $\widehat{S}_m = 1 \times .50 \times 30 = 15$. Standard errors for the marginal length of stay can be simulated by calculating predicted values from random draws from the normal distributions of the coefficient estimates.

Finally, we decompose the total disparity in the marginal length of stay into components related to the number of misconduct tickets, the probability of solitary confinement, and the days in solitary confinement given a sanction. For example, for mental health group $m$ ($m = A, B, C,$ or $D$) with given covariate characteristics, the expected number of days in solitary can be written in the log scale:

$$\log \widehat{S}_m = \log \widehat{\lambda}_m + \log \widehat{p}_m + \log \widehat{\mu}_m$$

Disparity between incarcerated people with no history mental illness (A) or serious mental illness (D), for example, can be measured as the difference in the log expected number of days in

**TABLE 4** Regression analysis of misconduct tickets and solitary confinement for men in Pennsylvania prisons, 2007–2018. (Absolute $t$ statistics in parentheses.)

| Variable | Misconduct Tickets | | Solitary Sanction | | Days of Solitary | |
| --- | --- | --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Mental Health Classification** | | | | | | |
| (B) Prior diagnosis | .43** | .34** | .20** | .15** | .05** | .03 |
| | (32.08) | (25.67) | (11.83) | (8.50) | (2.59) | (1.66) |
| (C) Other mental illness | .94** | .81** | .49** | .39** | −.00 | .06** |
| | (70.90) | (60.82) | (28.43) | (21.82) | (.07) | (3.68) |
| (D) Serious mental illness | .93** | .86** | .62** | .40** | .24** | .16** |
| | (27.97) | (26.40) | (14.28) | (8.47) | (5.11) | (3.79) |
| Constant | −.80** | −1.50** | −.235** | −1.13** | 3.72** | 3.90** |
| | (46.88) | (34.03) | (10.52) | (14.29) | (149.99) | (40.41) |
| **Controls** | | | | | | |
| Demographics | Yes | Yes | Yes | Yes | Yes | Yes |
| Governing offense severity | No | Yes | No | Yes | No | Yes |
| Risk scores | No | Yes | No | Yes | No | Yes |
| Misconduct severity | - | - | No | Yes | No | Yes |
| Prison/year effects | No | Yes | No | Yes | No | Yes |
| Pseudo $R^2$ | .13 | .16 | .01 | .17 | .24 | .35 |
| No. individuals | 82,833 | 82,833 | 38,962 | 38,962 | 26,596 | 26,596 |
| No. observations | 122,646 | 122,646 | 130,536 | 130,536 | 63,895 | 63,895 |

*Notes*: Misconduct severity includes a dummy if the ticket contains a charge that requires a formal hearing, and dummy variables for charge categories (violence, threats, defiance, drugs, other contraband). Results for additional covariates are reported in table A.3.
*$p < .05$; **$p < .01$.

solitary:

$$\log\widehat{S}_D - \log\widehat{S}_A = \left(\log\widehat{\lambda}_D - \log\widehat{\lambda}_A\right) + (\log\widehat{p}_D - \log\widehat{p}_A) + (\log\widehat{\mu}_D - \log\widehat{\mu}_A)$$

On the natural scale, the disparity is the ratio of the expected length of stay in solitary for those with serious mental illness (D) compared with those with no mental illness (A). The disparity for the number of misconduct tickets, the probability of solitary confinement, and the length of stay in solitary confinement each contribute to the overall disparity.

## 4 | RESULTS

Poisson regression estimates for men indicate large mental health disparities in the annual number of misconduct tickets even when controlling for risk scores, the governing offense, and prison and year effects (table 4, models 1 and 2). Men diagnosed with serious mental illness receive more than twice as many misconduct tickets each year than observably similar men with no diagnosis of mental illness [exp(.861) = 2.37].

**TABLE 5** Regression analysis of misconduct tickets and solitary confinement for women in Pennsylvania prisons, 2007–2018 (Absolute *t* statistics in parentheses)

| Variable | Misconduct Tickets | | Solitary Sanction | | Days of Solitary | |
| --- | --- | --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Mental Health Classification** | | | | | | |
| (B) Prior diagnosis | .47** | .26** | −.00 | −.11 | .02 | .02 |
| | (5.63) | (3.27) | (.03) | (.93) | (.12) | (.19) |
| (C) Other mental illness | 1.08** | .81** | .37** | .13 | −.14 | .00 |
| | (15.04) | (11.53) | (4.05) | (1.30) | (1.34) | (.02) |
| (D) Serious mental illness | 1.37** | .95** | .62** | .39** | .04 | −.01 |
| | (16.10) | (11.09) | (5.64) | (3.24) | (.33) | (.11) |
| Constant | −1.17** | −1.77** | −.63** | −1.90** | 3.85** | 3.90** |
| | (12.84) | (11.47) | (5.46) | (7.00) | (30.80) | (12.71) |
| **Controls** | | | | | | |
| Demographics | Yes | Yes | Yes | Yes | Yes | Yes |
| Governing offense severity | No | Yes | No | Yes | No | Yes |
| Risk scores | No | Yes | No | Yes | No | Yes |
| Misconduct severity | — | — | No | Yes | No | Yes |
| Prison/year effects | No | Yes | No | Yes | No | Yes |
| Pseudo $R^2$ | .12 | .21 | .01 | .18 | .24 | .35 |
| No. individuals | 7,923 | 7,923 | 2,929 | 2,929 | 1,832 | 1,832 |
| No. observations | 11,047 | 11,047 | 9,288 | 9,288 | 4,033 | 4,003 |

*Notes*: Misconduct severity includes a dummy if the ticket contains a charge that requires a formal hearing, and dummy variables for charge categories (violence, threats, defiance, drugs, other contraband). Results for additional covariates are reported in table A.4.

*p < .05; **p < .01.

Logistic regressions on the odds of solitary confinement following a disciplinary hearing (table 4, models 3 and 4) show that, consistent with the hypothesis of criminalized cumulative disadvantage, mental health disparities at the hearing stage are large. The odds of ending up in solitary confinement after receiving a misconduct ticket are 50 percent higher for men with serious or other mental illness compared with those without mental illness [exp(.394) = 1.48], even controlling for the type and severity of misconduct. A final set of Poisson regressions analyze the number of days in solitary confinement, conditional on being sanctioned to solitary confinement at a disciplinary hearing (table 4, models 5 and 6). Similar to the earlier stages of prison discipline, the disparities are large across mental health categories. Men with serious mental illness are locked in solitary confinement for 18 percent longer than similar men with no history of mental illness [exp(.164) = 1.18]. At the median length of stay, men with serious mental illness are estimated to spend an additional 6 days in solitary confinement compared with those with no history of mental illness.

For women, the number of misconduct tickets and commitments to solitary confinement drive mental health disparities (table 5). Women classified as having serious mental illness are estimated to receive greater than two and a half times more misconduct charges each year than similar women with no history of mental illness [exp(.946) = 2.58]. Women diagnosed with serious mental illness have 48 percent higher odds of receiving a solitary sanction, controlling for misconduct
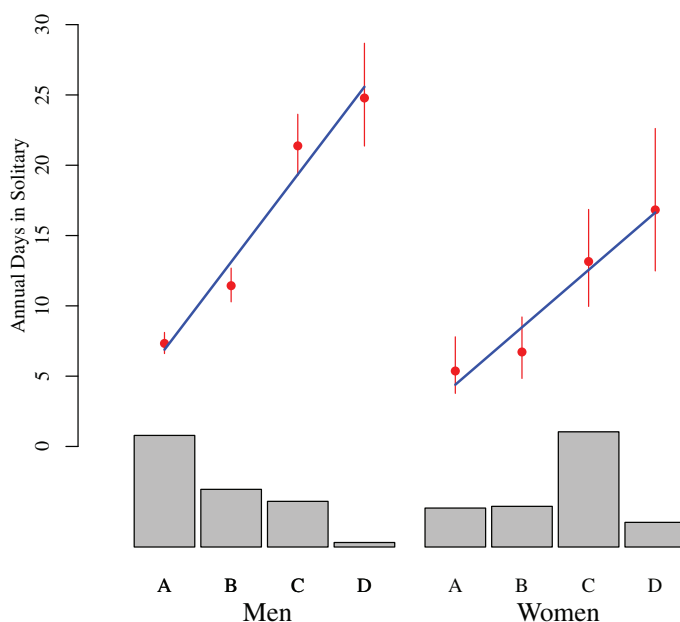
**FIGURE 1**  Unconditional expected annual days in solitary confinement by mental health status, Pennsylvania prisons, 2007–2018 [Color figure can be viewed at wileyonlinelibrary.com]

*Notes*: The lower panel of the figure shows the relative distribution of the prison population by mental health classification for men and women. (A = no history of mental illness; B = prior diagnosis; C = other mental illness; D = serious mental illness.) The top panel shows the estimated annual rate of admission to solitary confinement for all incarcerated men and women with fixed covariate characteristics by mental health classification. $N = 90,364$.

severity and type, risk scores, and other offense and demographic characteristics [exp(.389) = 1.47]. Similar to men, the inclusion of controls for offense, misconduct, and risk scores reduces the disparity by approximately one third.

Mental health disparities at each stage of the disciplinary process combine to produce significant periods of solitary confinement for people with mental illness. We calculate the marginal length of stay in solitary confinement at the four levels of classified mental health status for men and women with average covariate characteristics (figure 1). The lower panel of figure 1 shows the relative numbers of all men and women classified to each mental health category in prison. In the top panel, men and women show a steep mental health gradient in solitary confinement. Men classified at the highest level of mental illness (C and D in figure 1) are expected to spend 22 to 26 days in solitary confinement each year, compared with 8 days for men with no history of mental illness (A). The long marginal length of stay expected upon entering prison for men with serious mental illness reflects the number of misconduct tickets received, the high probability of a solitary confinement punishment, and the lengthy duration of solitary incarceration given the punishment.

Women entering prison with current treatment needs or serious mental illness are expected to spend between 18 and 23 days in solitary confinement compared with 7 days for women with no mental illness. As for men, there are large mental health differences in solitary confinement for women, and these differences remain even after controlling for detailed measures of criminal offense, misconduct, and criminal or substance use risk.

**TABLE 6** Decomposition of mental health disparity by the number of misconduct tickets, the probability of solitary confinement, and the duration of solitary confinement

| Variable | Men | | Women | |
|---|---|---|---|---|
| | Difference of Logs | Percentage | Difference of Logs | Percentage |
| **B to A Disparity** | | | | |
| Tickets | .34 | 76.09% | .26 | 118.81% |
| Solitary Sanction | .08 | 17.57 | −.06 | −29.97 |
| Days of Solitary | .03 | 6.34 | .02 | 11.16 |
| Total | .44 | 100.00 | .22 | 100.00 |
| **C to A Disparity** | | | | |
| Tickets | .81 | 76.20 | .81 | 91.56 |
| Solitary Sanction | .19 | 17.79 | .07 | 8.27 |
| Days of Solitary | .06 | 6.01 | .00 | .17 |
| Total | 1.07 | 100.00 | .89 | 100.00 |
| **D to A Disparity** | | | | |
| Tickets | .86 | 70.66 | .95 | 83.30 |
| Solitary Sanction | .19 | 15.90 | .20 | 17.83 |
| Days of Solitary | .16 | 13.43 | −.01 | −1.13 |
| Total | 1.22 | 100.00 | 1.14 | 100.00 |

*Note*: A = no history of mental illness; B = prior diagnosis; C = other mental illness; D = serious mental illness. Disparity is defined as the difference in the log expected number of misconduct tickets, probability of solitary confinement, and days of solitary confinement for a prisoner, aged 31 to 40, with average risk assessment and drug screen scores, median offense severity, and mean level of misconduct in solitary confinement. $N = 90,364$.

Decomposing the disparities in solitary confinement by mental health status reveals a strong pattern of cumulative disadvantage (table 6). The largest differences between mental health classifications for men were found between those with no history of mental illness and those with a current mental illness diagnosis (C or D categories). A man entering prison with serious mental illness is expected to stay in solitary confinement more than three times longer than a similar man with no history of mental health problems [exp(1.22) = 3.39]. A woman with serious mental illness is estimated to stay in solitary confinement more than three times longer than a woman with no history of mental illness [exp(1.14) = 3.13]. Between 70 and 83 percent of the difference in days of solitary confinement is related to the large number of misconduct tickets received by those men and women classified to the highest level of mental illness. Another 20 to 30 percent of the mental health disparity is accrued at the disciplinary hearing, where those with serious mental illness face high probabilities of being sanctioned to solitary confinement. The stages of the prison discipline process show ever-widening disparities at all three stages of the process for men, as well as in the first two stages for women.

## 5 | SENSITIVITY ANALYSIS

We estimate differences in prison sanctions across mental health categories conditional on covariates, but mental health disparities in sanctions can only be interpreted as differential treatment if we assume that unobserved behavior affecting solitary confinement is uncorrelated with mental health status. Additional analysis, not shown here, suggests a portion of estimated mental

health disparities may result from unobserved behavioral differences across the mental health groups. Prisoners with a classification of serious mental illness have a large relative risk of solitary confinement if they faced charges of violence, defiance, or making threats, but not if they were charged for drugs or other contraband. If the estimated disparities reflected only differential treatment, we might expect them to be similar across types of misconduct. The large disparity for violent, defiant, and threatening misconduct may be consistent with unmeasured violent behavior among those with serious mental illness. More generally, because administrative records are subject to bias and incompleteness, unmeasured circumstances of the alleged misconduct may explain the observed pattern of results.

We can further explore the effects of omitted variables in a sensitivity analysis that maps changes in estimated mental health disparities in the presence of a confounding covariate. Such sensitivity analyses have been used for causal estimation (Harding, 2003; Rosenbaum, 2002; Winship & Western, 2016), and we apply these ideas to the estimation of differential treatment.

The influence of unobserved behavior on estimated mental health disparities is a type of omitted variable bias that depends on the correlation of unobserved behavior with both mental health classification and prison sanctions. The key source of possible confounding in this analysis arises at the first stage of the prison disciplinary process: The underlying misconduct that gives rise to a ticket may not be completely captured by the observed covariates. We construct a confounding variable, we call a "pseudo-predictor," that is correlated both with mental health status and the number of misconduct tickets. We then reestimate mental health disparities, varying the level confounding correlation in the pseudo-predictor.

Following a proposal by Imbens and Rubin (2015), we calibrate the level of confounding correlation to the pattern of correlations in the observed data. The strongest correlation between mental health status and observed covariates is approximately .15, with the substance use risk score. The correlation between mental health status and the number of misconduct tickets is approximately .30. We thus construct a pseudo-predictor that correlates at $r$ with the number of misconduct tickets, and $r/2$ with mental health status, varying the level of confounding correlation from $r = 0$ (no confounding) to $r = .6$ (twice the level of confounding correlation in the observed data). Variation in mental health disparities with $r$ indicates the dependence of inferences of differential treatment on the assumption of uncorrelated unobserved behavior.

Figure 2 reports the estimated mental health disparities for men in the first equation for the number of tickets. In the absence of unobserved confounding, $r = 0$, the estimates are identical to those reported above. If confounding is equal to the pattern of correlation in the observed data, $r = .3$, point estimates for those with other or serious mental illness are approximately one third smaller than under the assumption of no confounding. If confounding correlation is twice as high as observed in the sample data, the estimated disparities are only a quarter as large. For example, with extreme confounding at $r = .6$, the estimated disparity in log misconduct tickets falls from .86 to .20. Although point estimates are sensitive to confounding correlation, the estimated disparities are highly significant even at extreme confounding at $r = .6$. Additional analysis shows the estimates for the probability and duration of solitary confinement are not sensitive to confounding correlations at the first stage (see appendix B).

The women's sample shows a similar pattern of sensitivity (figure 3). At the highest level of confounding correlation, $r = .6$, estimated mental disparities in the number of misconduct tickets are approximately 25 percent as large as estimates obtained under the assumption of no confounding, but the estimates remain highly statistically significant.

In sum, when the assumption of uncorrelated omitted variables is relaxed, estimated mental health disparities are reduced but only at the first stage of the prison discipline process, and dis-
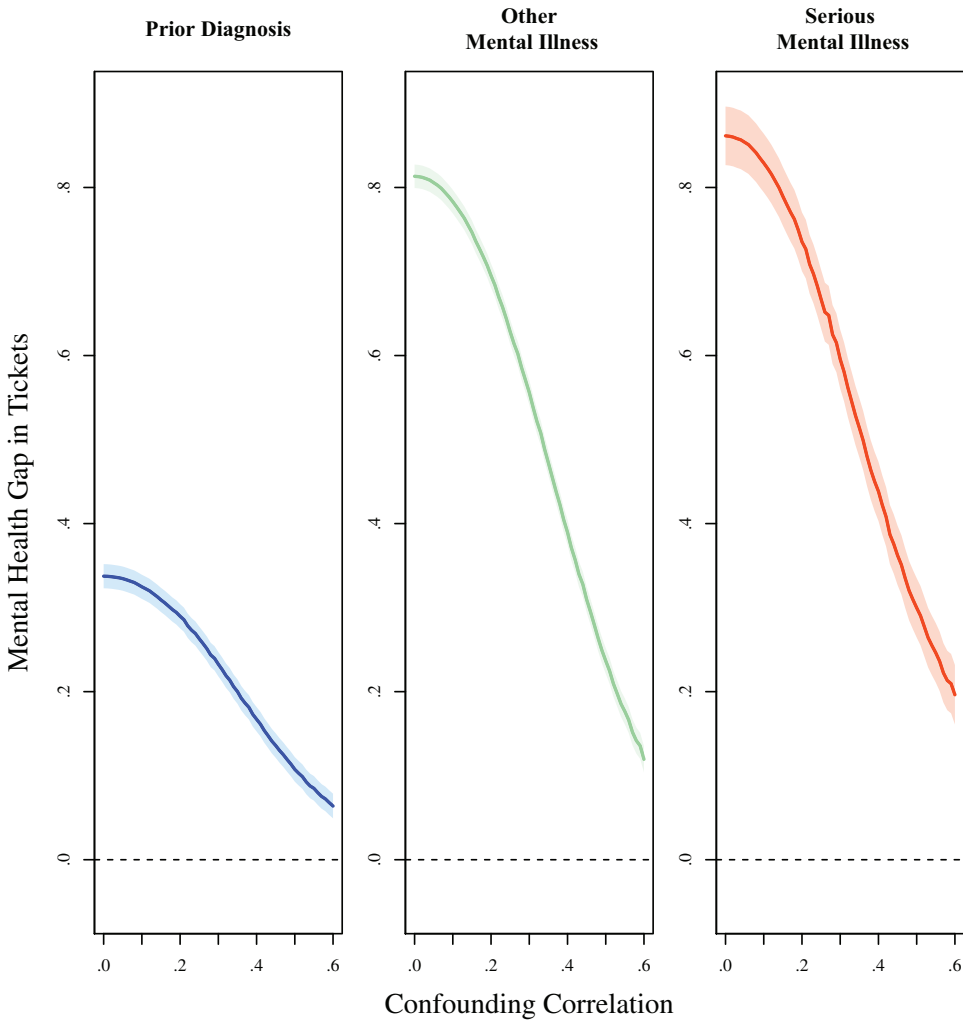
**FIGURE 2**  Sensitivity analysis showing men's estimated mental health disparities in the number of misconduct tickets, given confounding correlation [Color figure can be viewed at wileyonlinelibrary.com]
*Note: N = 82,484.*

parities remain strongly significant. Prisoners with mental illness are adversely ticketed—even assuming confounding that is twice the observed pattern of correlation in the data.

## 6 | DISCUSSION

The analysis yields three main findings. First, controlling for crime and misconduct histories, we find that people with serious mental illness experience frequent and lengthy periods of solitary confinement. We estimate that the average male prisoner with serious mental illness will spend three times longer in solitary confinement compared with a similar man with no history of mental illness. Second, disproportionate solitary confinement results mostly from the large number of
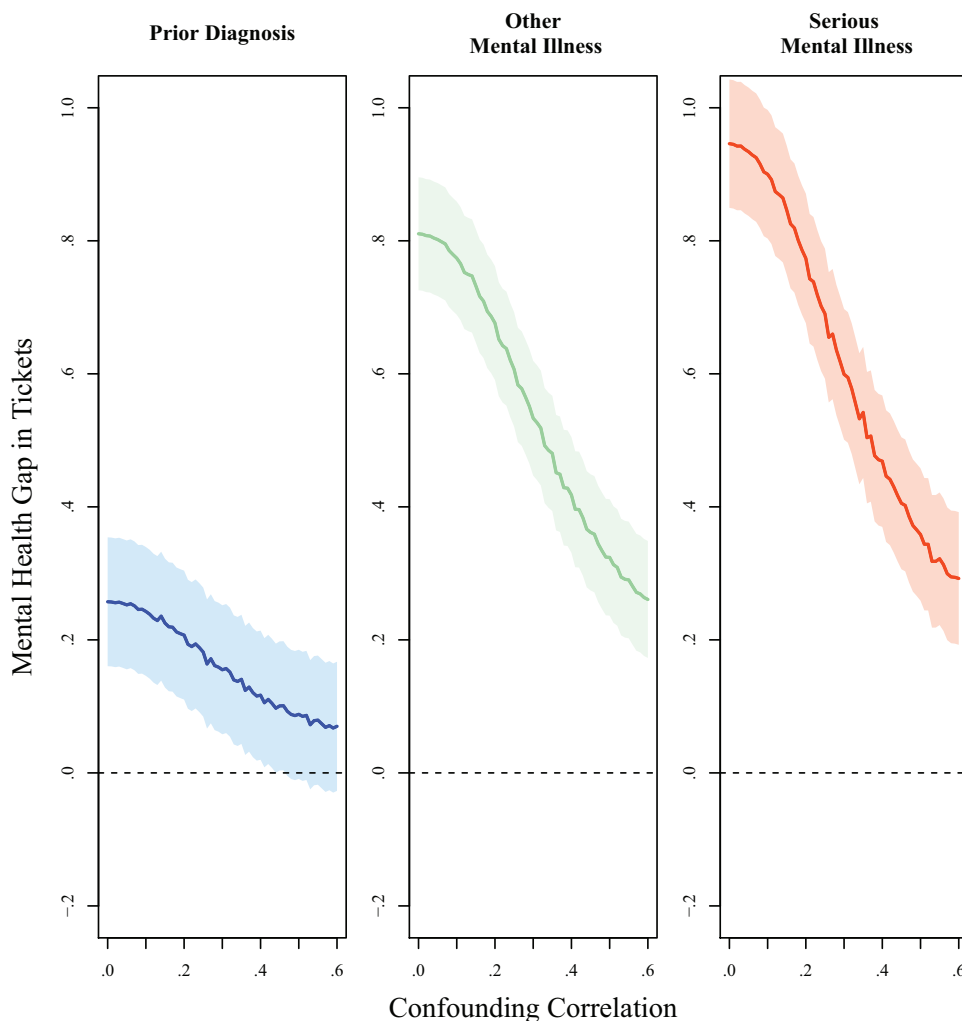
**FIGURE 3**   Sensitivity analysis showing women's estimated mental health disparities in the number of misconduct tickets, given confounding correlation. *NOTE: N* = 7,880 [Color figure can be viewed at wileyonlinelibrary.com]

misconduct tickets written by prison staff to mentally ill prisoners. Tickets are mostly written for the nonviolent misconduct categories of threats and defiance. Third, 64 percent of female prisoners have an on-going mental health diagnosis, putting them at high risk of punitive isolation in prison. These results imply that common markers of criminal justice inequalities, such as disparities in overall incarceration rates, underestimate the burden of harsh prison conditions for people with serious mental health problems.

The findings indicate that the largest effects of mental health stigma emerge in the high-discretion stage of prison discipline, where line staff write misconduct tickets. The results suggest being known within the prison as "schizophrenic," say, and acting out its symptoms, elicits harsh treatment from prison staff even if behavior does not rise to the level of misconduct. At the next adjudication, hearing examiners punish people with serious mental illness more harshly, but hearings account for a small proportion of the overall disparity. The analysis highlights the leading

importance of correctional officers at the first stage of the prison disciplinary process, suggesting that reductions in disparity could be achieved by changing the use of discretion through officer training, policy change, or greater oversight, for example.

Although we assume that detailed measures of the governing offense, misconduct severity, and risk scores are associated with behavioral differences among incarcerated people, behavior in prison may be incompletely observed. We interpret our findings as the gap in sanctioning by mental health classification, conditional on these observed characteristics. Mental health differences in prison discipline, however, may reflect unmeasured behavioral differences. Sensitivity analysis indicates that estimated disparities would be smaller in the presence of unobserved confounding behavior, but this only affects the first-stage regression and results would nevertheless be strongly significant. The analysis also assumes that the behavioral measures of offending, misconduct, and risk are themselves unaffected by bias. In the presence of biased sentencing, charging, and risk assessment, estimates of bias-driven disparity will be underestimated. Despite the possible offsetting influence of unmeasured variables, the controls associated with behavior used in the current analysis are more detailed than is common in prior research (Labrecque, 2018; National Institute of Justice, 2016). More detailed measurement of misconduct behavior or exogenous variation in mental health classification could be used to improve the current estimates of differential treatment. If unmeasured variables introduce similar specification errors at each stage of prison discipline, our multistage analysis would yield similar conclusions that disparities are largest at the initial stage controlled by line officers.

An empirical question raised by the current analysis is whether mental health disparities in solitary confinement arise in other jurisdictions. The process of prison discipline in Pennsylvania is similar to that in other states, and rates of solitary confinement in the state mirror national levels (Liman Program & ASCA, 2018). The current analysis could thus be applied elsewhere. Given that mental health disparities in solitary confinement have been widely observed (Haney, 2003; Kaba et al., 2014; Reiter et al., 2020; Rhodes, 2004), disparate punishment seems plausible but is an important issue for future research. Administrative records provide limited portraits of the experience of prison conditions and may underestimate exposure to conditions of solitary confinement. Despite these limitations and a study limited to disciplinary custody, we still find large mental health disparities in solitary confinement within the disciplinary process.

The analysis has three implications for research on solitary confinement and prison conditions more generally. First, in research on the correlates of solitary confinement (Cochran et al., 2018; Labrecque, 2018; Lovell et al., 2007; Mears & Bales, 2010), measures of defiant or threatening behavior could be artifacts of mental illness. Nonconformity among those with serious mental illness may be mistaken as violence or other misconduct in official prison records. Second, analysis of the mental health *effects* of solitary confinement may be subject to selection bias (see Wildeman, 2011). Although research on solitary confinement has largely focused on mental health effects (see the reviews of Haney, 2018, and Smith, 2006), the importance of selection is reflected in research interest in the vulnerability of the mentally ill to conditions of solitary confinement (Arrigo & Bullock, 2008, p. 628; Grassian, 2006; Haney, 2003). The current analysis suggests the importance of accounting for preexisting mental health conditions and tracing the pathways into solitary confinement for understanding its effects (e.g., Reiter, 2016; Reiter et al., 2020). Third, viewing the current analysis in the context of evidence for the negative psychological effects of solitary confinement, selection into solitary confinement and the negative effects that follow may be co-occurring, where the severe conditions of solitary confinement may exacerbate or create health problems for those placed in isolation with preexisting mental health problems.

Future research should explore how selection and negative health effects of solitary confinement may create a cycle of mental health deterioration in prison.

Although our focus is on prisons and the disciplinary process leading to solitary confinement, the analysis is relevant to the institutional production of social inequality more generally. Institutionalized power relations—whether in prisons, large corporations, or classrooms—facilitate the effects of stigma and accumulated disparity. Cumulative disadvantage may emerge in such contexts where due process creates a sequence of adjudications that lead to termination from a job, loss of liberty or legal status, or suspension from school. In these cases, each stage creates the possibility of differential treatment, and the largest disparities are more likely at the points of greatest discretion (see Korver-Glenn, 2018). Although we might expect cumulative disadvantage observed in the case of solitary confinement to emerge in the larger criminal justice system (Hagan, 1974; Kutateladze et al., 2014; Spohn, 2008; Sutton, 2013; Wooldredge et al., 2015), similar processes can be found in a diversity of settings, including immigrant deportation proceedings (Hartley & Tillyer, 2012), schools (Mowen & Brent, 2016), the military (Burk & Espinoza, 2012), and private corporations (Botelho & Abraham, 2017; Fernandez-Mateo, 2009). In the criminal justice context specifically, for police, courts, and jails, mental illness could also generate cumulative disparities but has received far less attention than race. In sum, the stigmatic effects of mental illness are likely in other disciplinary settings. Ascriptions of dangerousness applied to people with mental illness interact with a struggle for self-advocacy and conformity with rules and norms. In these cases, behavioral idiosyncrasy can be conflated with deliberate harm, and discipline escalates through the stages of adjudication. As a result, behavioral problems associated with mental illness are vulnerable to punishment and a reduction in life chances.

Although our empirical results may illuminate other domains, they also raise urgent questions regarding the use of solitary confinement within penal institutions and the associated long-term risks. Mental health and correctional organizations have widely called for the prohibition of solitary confinement for people with serious mental illness (Metzner & Fellner, 2010). Despite a call for the absolute prohibition of solitary confinement in excess of 15 days by the United Nations Special Rapporteur on Torture (United Nations General Assembly, 2011), isolation as a punishment in American prisons widely exceeds the 15-day standard. Indeed, we find that the median period of solitary confinement in Pennsylvania is double the upper limit set by the United Nations. The mental health disparities reported here, combined with evidence that isolation in incarceration exacerbates mental illness, underline the extreme potential for institutional harm associated with solitary confinement. Our findings of mental health disparities in solitary confinement show how American prisons heap the harshest forms of punishment on the most vulnerable.

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## APPENDIX A: SUPPLEMENTARY INFORMATION

**TABLE A.1** Covariates used in regression analyses of misconduct and solitary confinement

| Variable | Description | Equation |
|---|---|---|
| **Health and demographic covariates** | | |
| Mental health | Four mental health categories assigned at admission to prison: (A) No diagnosis or history of mental illness or intellectual disability; (B) No treatment, but some history of mental illness and no intellectual disability; (C) Receiving treatment for mental illness, but no serious mental illness or intellectual disability; (D) Receiving treatment for a serious mental illness or intellectual disability. | (1)(2)(3) |
| Race/ethnicity | Four racial and ethnic categories: Black, Hispanic, White, and other race/ethnicity (e.g., Asian, Native American, other). | (1)(2)(3) |
| Age | Five categories of age at first admission: 21 and younger, 22–25, 26–30, 31–40, >40. | (1)(2)(3) |
| Marital status | Five categories of marital status: Single, married, divorced, widowed, unknown. | (1)(2)(3) |
| **Criminal history covariates** | | |
| Recidivism risk | Score (0–11) indicating a person's risk of criminally reoffending. The seven questions used in the risk assessment include: Person's age at first arrest; current age; prior adult convictions, prior sanctions for institutional misconduct in prison, prior violations of community supervision (e.g., probation or parole supervision); less than 12th grade education; ever had a drug problem. Score of 0–4 indicates low risk, 5–6 indicates medium risk, and 7–11 indicates high risk. | (1)(2)(3) |

(Continues)

**TABLE A.1** (Continued)

| Variable | Description | Equation |
|---|---|---|
| Substance use risk | Score (0–9) indicating the severity of substance use disorder. The screening tool asks about substance use type and frequency, and history of addiction and treatment. A score of 2–3 indicates mild substance use disorder, 4–5 indicates moderate disorder, and a score of 6 or more indicates severe disorder. | (1)(2)(3) |
| Governing offense severity | An ordinal variable of offenses described by the Pennsylvania criminal code severity levels (1–15), ranging from traffic violations to homicide; coded as 15 dummy variables. | (1)(2)(3) |
| Misconduct severity | A dummy variable indicating if a misconduct ticket contains a charge that requires a formal hearing (e.g., assault, rape, fighting, threatening another person, possession or use of controlled substance). | (2)(3) |
| Misconduct type | A set of five dummy variables indicating if the misconduct ticket contains any charges of: Violence, drug use or possession, defiance, threats, or possession of contraband other than drugs. | (2)(3) |
| Misconduct in solitary | A dummy variable indicating if additional misconduct tickets were issued during the solitary confinement spell. | (3) |
| **Fixed effects covariates** | | |
| Prison fixed effects | A dummy variable for the main prison of commitment (27 dummy variables). | (1)(2)(3) |
| Year fixed effects | A dummy variable for the year of the admission (equation 1) or the year of the misconduct event (equations 2 and 3). | (1)(2)(3) |

**TABLE A.2** Detailed misconduct charges on misconduct tickets in Pennsylvania prisons, 2007–2018

| Misconduct Charge category | Specific charges |
|---|---|
| Violence charges ($n = 9$) | Aggravated assault |
| | Assault |
| | Body punching or horseplay |
| | Fighting |
| | Kidnapping |
| | Murder |
| | Rape |
| | Riot |
| | Unlawful restraint |
| Drug charges ($n = 3$) | Possession of contraband, including drugs |
| | Possession or use of dangerous or controlled substance |
| | Possession or use of intoxicating beverage |
| Threat charges ($n = 5$) | Extortion by threat of violence |
| | Extortion or blackmail |
| | Threaten an employee or their family with bodily harm |
| | Threaten, harass, or interfere with Dept. K-9 or patrol horse |
| | Threatening another person |
| Defiance charges ($n = 7$) | Engage or encourage unauthorized group activity |
| | Failure to stand count or interference with count |
| | Lying to an employee |
| | Possess or circulate a petition without superintendent's authorization |
| | Refuse to work, attend school, or mandatory programs |
| | Refusing to obey an order |
| | Wearing a disguise or mask |

*Note*: The Pennsylvania Department of Corrections specifies 52 unique misconduct charges.

**TABLE A.3** Regression coefficients for covariates in models of misconduct tickets and solitary confinement for men in Pennsylvania prisons, 2007–2018 (Absolute *t* statistics in parentheses)

| Variable | Misconduct Tickets | | Solitary Sanction | | Days of Solitary | |
|---|---|---|---|---|---|---|
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| Black | .46** | .40** | −.09** | −.08** | .05** | .04* |
|  | (36.96) | (30.25) | (5.51) | (4.22) | (2.93) | (2.23) |
| Hispanic | .18** | .17** | .03 | .01 | .06* | .03 |
|  | (9.61) | (9.34) | (1.04) | (.39) | (2.42) | (1.32) |
| Other race | .00 | .06 | .01 | −.06 | −.09 | −.11 |
|  | (.05) | (.78) | (.10) | (.48) | (1.52) | (1.70) |
| Age 22–25 | −.26** | −.28** | −.02 | −.04 | −.05* | −.01 |
|  | (16.30) | (17.78) | (1.15) | (1.92) | (2.12) | (.39) |
| Age 26–30 | −.54** | −.52** | .01 | −.01 | −.05* | −.02 |
|  | (33.06) | (32.39) | (.36) | (.23) | (2.12) | (.81) |
| Age 31–39 | −.87** | −.84** | .06** | .03 | −.07** | −.04 |
|  | (52.78) | (51.41) | (2.59) | (1.36) | (2.81) | (1.89) |
| >40 | −1.12** | −.98** | .02 | .02 | −.08** | −.09** |
|  | (56.81) | (49.20) | (.92) | (.84) | (2.77) | (3.04) |
| Married | −.16** | −.12** | −.10** | −.06** | .03 | −.00 |
|  | (8.84) | (6.38) | (4.19) | (2.60) | (1.07) | (.13) |
| Recidivism risk score |  | .12** |  | .03** |  | .01 |
|  |  | (37.70) |  | (6.28) |  | (1.15) |
| Substance use risk score |  | −.01** |  | .01* |  | −.00 |
|  |  | (7.56) |  | (1.99) |  | (.31) |
| No. individuals | 82,833 | 82,833 | 38,962 | 38,962 | 26,596 | 26,596 |
| No. observations | 122,646 | 122,646 | 130,536 | 130,536 | 63,895 | 63,895 |

*Notes*: Reference category for age is 21 and younger, and Non-Hispanic White for race/ethnicity. Covariates for governing offense severity, misconduct type and severity, year, and prison effects are suppressed.
*p < .05; **p < .01.

**TABLE A.4** Regression coefficients for covariates in models of misconduct tickets and solitary confinement for women in Pennsylvania prisons, 2007–2018 (Absolute *t* statistics in parentheses)

| Variable | Misconduct Tickets | | Solitary Sanction | | Days of Solitary | |
|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| Black | .73** | .56** | .21** | .11 | .01 | −.02 |
| | (14.93) | (10.61) | (3.80) | (1.71) | (.20) | (.28) |
| Hispanic | .50** | .46** | .21* | .10 | −.26** | −.22** |
| | (6.16) | (5.79) | (2.39) | (.97) | (2.80) | (3.12) |
| Other race | .65** | .45* | −.12 | −.10 | −.09 | −.27* |
| | (3.30) | (2.08) | (.47) | (.44) | (.75) | (2.35) |
| Age 22–25 | −.26** | −.20** | −.08 | −.12 | −.11 | −.08 |
| | (3.42) | (2.71) | (.96) | (1.34) | (1.16) | (.84) |
| Age 26–30 | −.57** | −.44** | −.07 | −.11 | −.08 | .00 |
| | (7.64) | (5.99) | (.78) | (1.25) | (.72) | (.01) |
| Age 31–39 | −.86** | −.69** | −.01 | −.01 | −.14 | −.09 |
| | (11.06) | (8.96) | (.14) | (.08) | (1.45) | (.92) |
| >40 | −1.05** | −.72** | −.10 | −.08 | −.11 | −.05 |
| | (11.93) | (7.77) | (1.09) | (.75) | (1.12) | (.43) |
| Married | −.11 | −.07 | −.11 | −.12 | −.08 | −.08 |
| | (1.50) | (1.00) | (1.29) | (1.44) | (1.01) | (.93) |
| Recidivism risk score | | .17** | | .00 | | .02 |
| | | (10.76) | | (.09) | | (.97) |
| Substance use risk score | | −.02* | | .02* | | −.01 |
| | | (2.34) | | (2.01) | | (1.60) |
| No. of individuals | 7,923 | 7,923 | 2,929 | 2,929 | 1,832 | 1,832 |
| No. of obs. | 11,047 | 11,047 | 9,288 | 9,288 | 4,033 | 4,003 |

*NOTES*: Reference category for age is 21 and younger, and Non-Hispanic White for race/ethnicity. Covariates for governing offense severity, misconduct type and severity, year, and prison effects are suppressed.

*p < .05; **p < .01.

## APPENDIX B: SENSITIVITY ANALYSIS

Exploring the effects of unobserved confounding in a sensitivity analysis was proposed in the context of matching by Rosenbaum (2002), applied in sociology by Harding (2003), and discussed for regression by Winship and Western (2016). A textbook treatment is provided by Imbens and Rubin (2015), Chapter 22.

The main intuition can be seen from an analysis of omitted variable bias in linear regression. Say the true model for an outcome, $y$, is as follows:

$$y = X_1 \beta_1 + X_2 \beta_2 + e$$

where $X_1$ is a matrix of observed predictors, $X_2$ is a matrix of unobserved predictors, and $e$ is random error with zero expectation. Rearranging terms and taking expectations, the regression estimate of $\beta_1$ based only on the observed predictors is equal to the following:

$$(X_1' X_1)^{-1} X_1' y = \beta_1 + (X_1' X_1)^{-1} X_1' X_2 \beta_2$$

The regression estimate based only on $X_1$ is thus equal to the true coefficient, $\beta_1$, plus a bias term, $(X_1' X_1)^{-1} X_1' X_2 \beta_2$. Part of the omitted variable bias depends on the correlation between observed and unobserved predictors, a function of $X_1' X_2$, and the correlation between unobserved predictors and $y$, associated with $\beta_2$.

Sensitivity analysis replaces the unobserved $X_2$ with a simulated pseudo-predictor with a known correlation with $X_1$ and $y$. To construct the pseudo-predictor, we standardize mental health and the number of misconduct tickets, and we take a weighted sum plus random error. The resulting pseudo-predictor thus has known correlations with mental health status and the number of misconduct tickets. The sensitivity analysis is obtained by reestimating the reported regressions and adding the pseudo-predictor. There is a small amount of simulation variability across realizations of the pseudo-predictor. To control simulation variability, at each level of confounding correlation, $r$, we took the average of point estimates and confidence intervals obtained from 20 realized simulations of the pseudo-predictor.

Sensitivity results for the probability and duration of solitary confinement are obtained with the same pseudo-predictor used in the analysis reported in the article. Sensitivity results for men are reported in figures B.1 and B.2, and results for women are reported in figures B.3 and B.4. The figures indicate little sensitivity to omitted correlated predictors in the first-stage regression for the number of misconduct tickets.
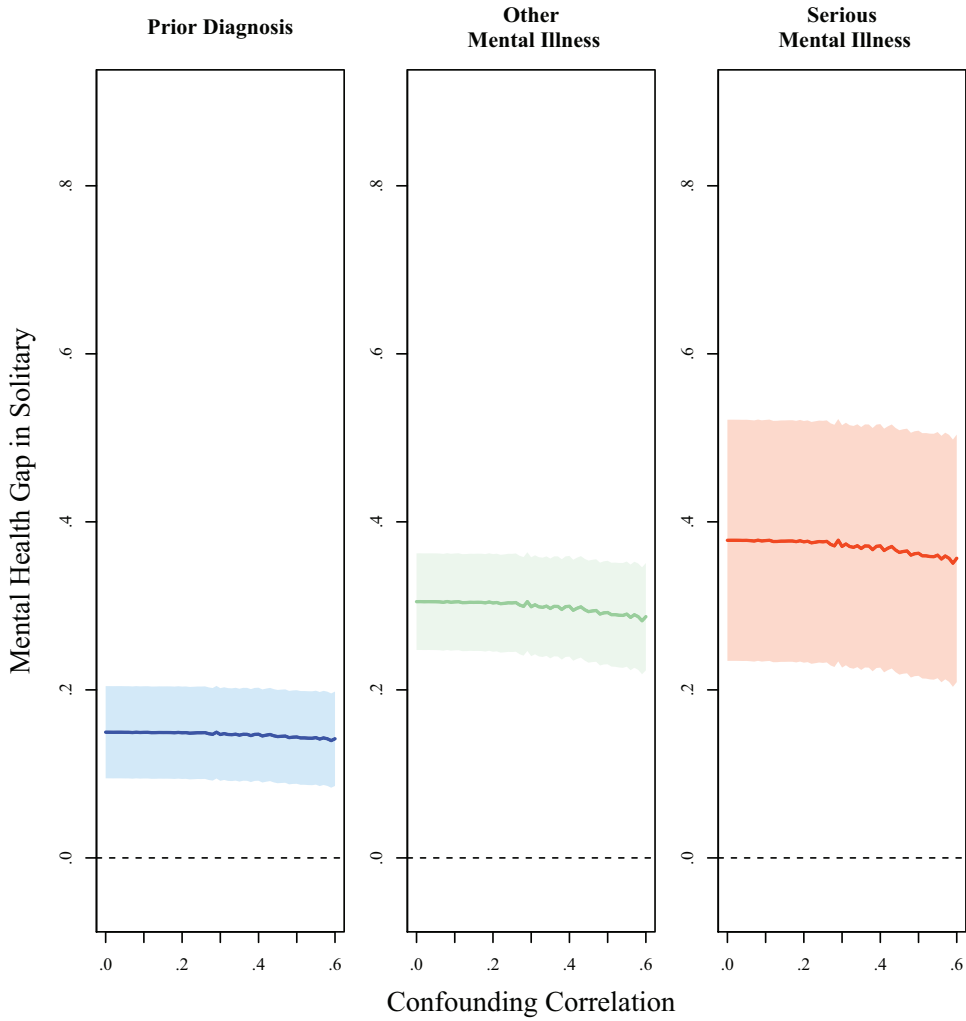
**FIGURE B.1** Sensitivity analysis showing men's estimated mental health disparities in the probability of a solitary confinement sanction, given confounding correlation [Color figure can be viewed at wileyonlinelibrary.com]
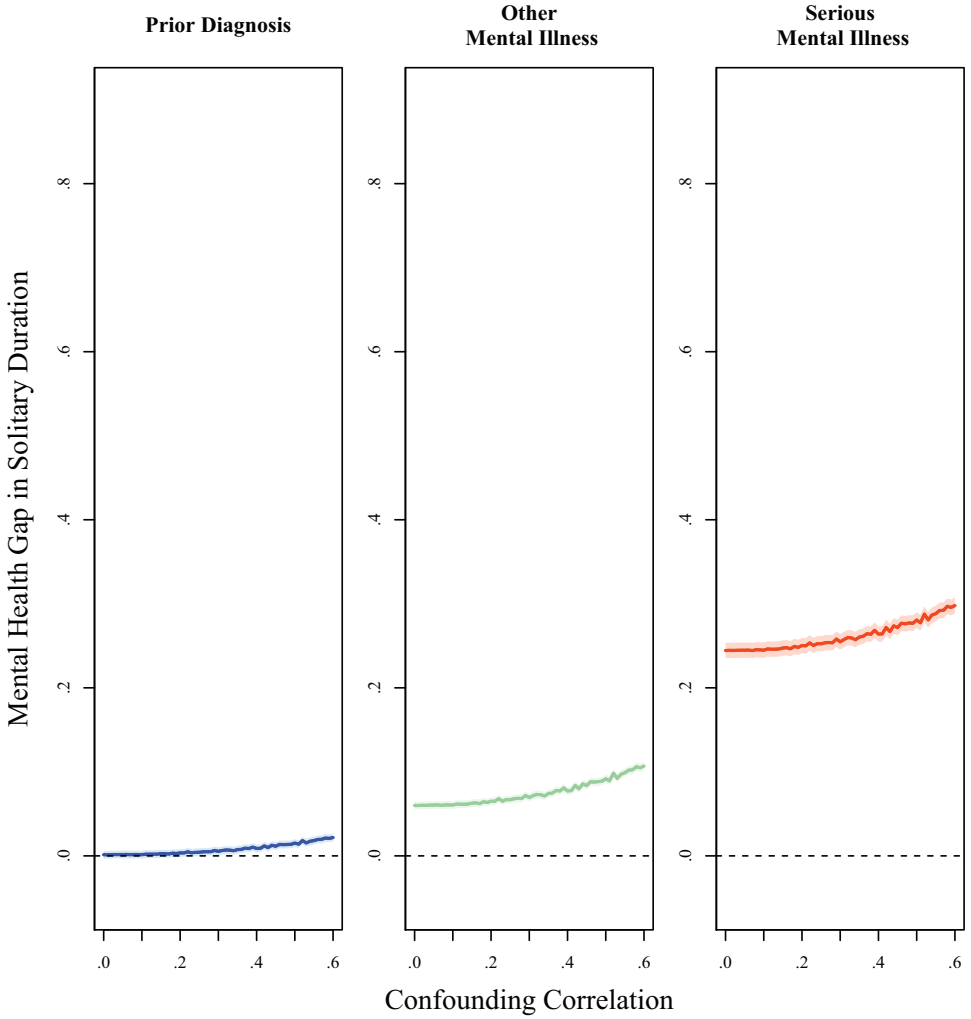
*Note: N* = 82,484.

**FIGURE B.2** Sensitivity analysis showing men's estimated mental health disparities in the duration of solitary confinement, given confounding correlation [Color figure can be viewed at wileyonlinelibrary.com]
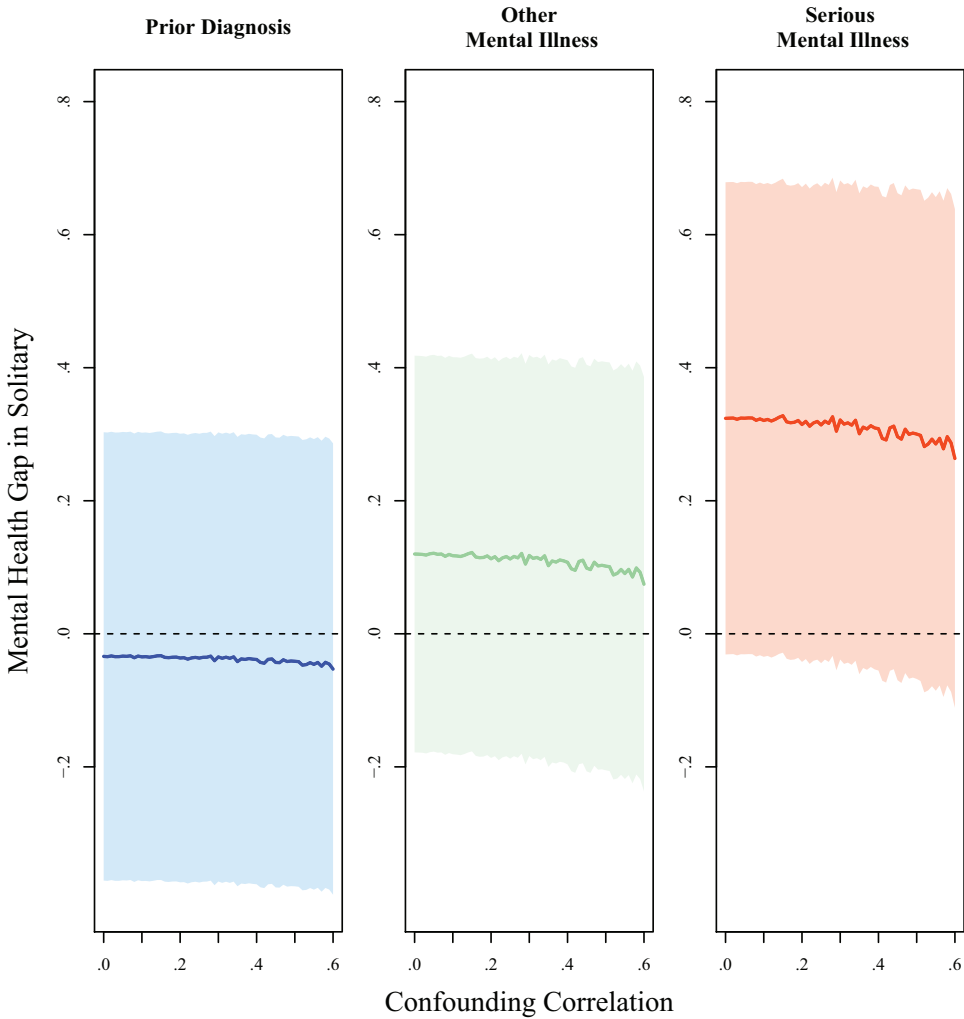*Note: N* = 82,484.

**FIGURE B.3** Sensitivity analysis showing women's estimated mental health disparities in the probability of a solitary confinement sanction, given confounding correlation [Color figure can be viewed at wileyonlinelibrary.com]
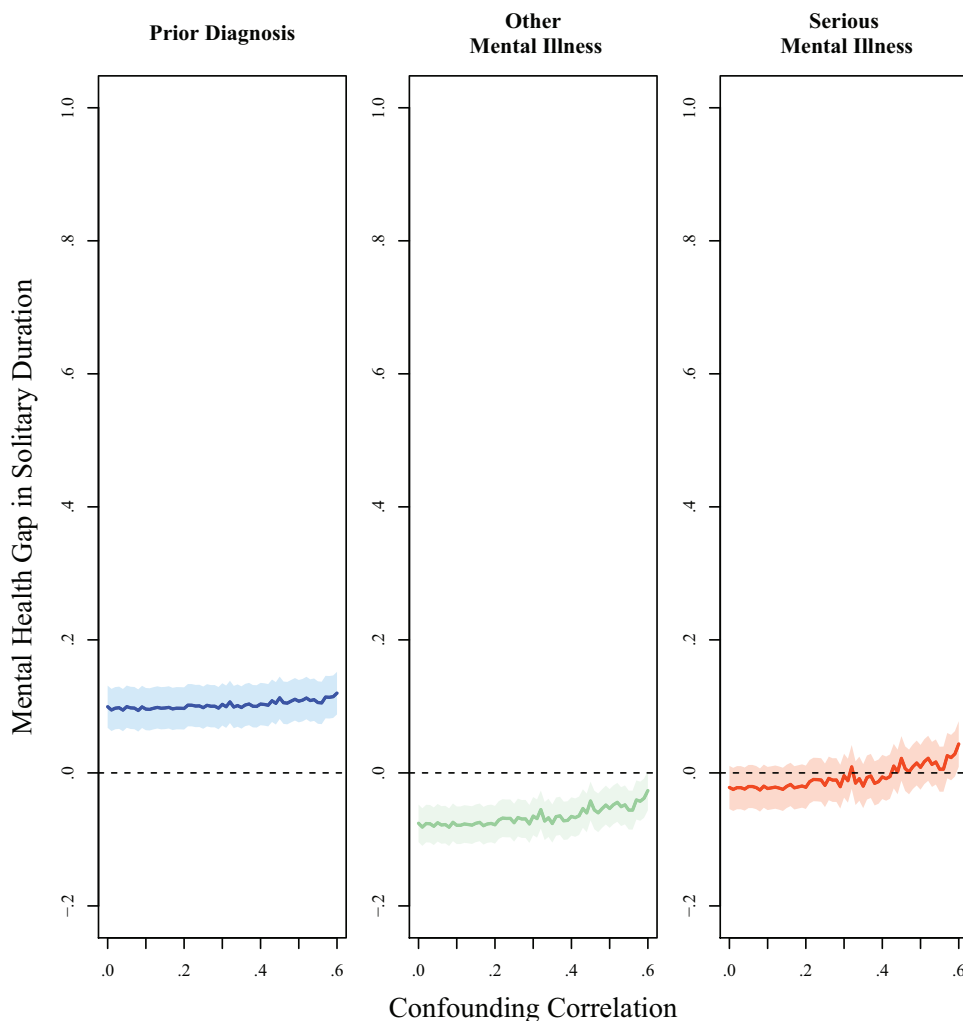
*Note: N = 7,880.*

**FIGURE B.4** Sensitivity analysis showing women's estimated mental health disparities in the duration of solitary confinement, given confounding correlation' [Color figure can be viewed at wileyonlinelibrary.com]
*Note: N = 7,880.*