ABSTRACT

Title of Thesis: EXPLORING THE LINK BETWEEN PRISON CROWDING AND INMATE MISCONDUCT: A PANEL DATA ANALYSIS

Emily Glazener, Master of Arts, 2016

Thesis directed by: Assistant Professor Kiminori Nakamura, The Department of Criminology and Criminal Justice

Research on the impact of prison crowding on inmate misconduct is mixed, with studies finding positive, negative, and null results. These inconsistencies may be due to the use of data restricted to one specific point in time as previous studies have heavily relied on cross-sectional methods. These cross-sections may or may not be representative of longer-term trends, and they do not allow for the examination of changes over time. To address this limitation, the current study utilizes state prison panel data to examine monthly within-institution changes. Using modern data from a large state correctional system, this study demonstrates the utility of examining this research question longitudinally. Findings demonstrate that prison crowding leads to increases in misconduct rates, although this relationship diminishes after crowding reaches a certain threshold. However, our data did not support the expected relationship between crowding and violent misconduct specifically. Other time-

varying factors were found to consistently predict misconduct and violence. Policy implications and future directions are discussed.

EXPLORING THE LINK BETWEEN PRISON CROWDING AND INMATE MISCONDUCT: A PANEL DATA ANALYSIS

by

Emily Glazener

Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Master of Arts
2016

Advisory Committee:
Professor Kiminori Nakamura, Chair
Jean McGloin
Brian Johnson

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

Throughout the past four decades, rising crime rates and sentencing policy changes have led to marked shifts in correctional populations, particularly an exponential increase in the incarceration rate. The number of prisoners in federal and state facilities increased by 430% between 1978 and 2009 (Carson and Golinelli, 2014). Although prison building has become a major industry, the expensive endeavor of building new facilities has been unable to stem the growth of overcrowding in American prisons (Vaughn, 1993). As discussed in the National Research Council's report on the causes and consequences of mass incarceration, beginning in 1973, incarceration was required for less serious offenses, time served increased for violent offenses and for habitual offenders, and drug crimes were more harshly punished (Travis et al., 2014). These policies and trends have persisted, increasing incarceration rates and resulting in unprecedented overcrowding in prisons across the country, and as of 2012, 18 states and the Federal Bureau of Prisons had systems above 100% reported capacity (Carson and Golinelli, 2014). Many possible consequences of overcrowded prisons have been evaluated in past research, particularly the impact of crowded prisons on inmate misconduct and the potential for overcrowding to produce unsafe environments (Eckland-Olson et al., 1983; Gaes, 1994; Gaes and McGuire, 1985; Nacci et al., 1977). In one such study examining population density and inmate misconduct within federal prisons in 1977, Nacci et al., stated, "Crowding is therefore considered a foremost problem in our prisons today" (1977: 26). The fact that the issue of prison crowding and its potential consequences

were identified nearly four decades ago demonstrates the persistence of this issue in our prison system.

Although the relationship between prison crowding and inmate misconduct has been studied in the past, there remain several gaps in understanding. One of the most important gaps has been the relative absence of longitudinal studies evaluating changes in crowding and misconduct, an issue that has been highlighted by many researchers (Bonta and Gendreau, 1990; Franklin et al., 2006; Pelissier, 1991). While cross-sectional research uses between-prison comparisons to infer the relationship between crowding and misconducts, panel data exploit within-prison variation to examine the relationship while accounting for time-stable observed and unobserved prison characteristics that may be associated with crowding and misconducts. Additionally, a sizable portion for the research on this topic used data from the 1970s and 1980s, and the vastly different prison landscape of today raises concerns regarding how closely these original findings can be generalized to modern prison systems. Thus, research using more modern data is warranted. Lastly, some of the more recent work on this subject has been conducted using jail or federal prison data (Camp et al., 2003; Gaes and McGuire, 1985; Tartaro, 2002; Tartaro and Levy, 2007). Although this research is informative, the differences between jails, state prisons, and federal prisons, ranging from population characteristics to administration, preclude applying definite conclusions from this research to state prisons. As an attempt to address these shortcomings, based on contemporary panel data from the Pennsylvania Department of Corrections (PADOC), one of the largest state prison systems, the current study examines the relationship between prison

crowding and inmate misconduct using fixed-effects models, with the aim of improving the understanding of this relationship and informing correctional policy.

This paper first describes the rise of mass incarceration and the resulting issue of prison crowding. Along with this discussion is an introduction to the frequently researched consequences of prison crowding, highlighting the consequence of inmate misconduct and the theories that have been used to explain misconduct. Previous research examining the relationship between crowding and misconduct is described and the gaps in knowledge are identified. A study is presented to meet the gaps in knowledge and issues of existing literature, and to further understand the relationship between prison crowding and misconducts within institutions. Panel data from a large state system are analyzed and results are presented. Lastly, limitations and policy implications are discussed.

Chapter 2: Rise of Mass Incarceration and Prison Crowding

It is now well documented that the rate of incarceration in the United States more than quadrupled in the past four decades (Travis et al., 2014). From 1972 through 2000 the imprisonment rate grew annually by 6 to 8 percent, at which point the rate of growth slowed, peaking in 2007 and 2008 with a rate of 506 per 100,000 (Travis et al., 2014). Multiple reasons have been cited as contributing to the rise of mass incarceration, particularly rising crime rates and political and racial upheaval in the United States during the late 1960s and early 1970s. However, as pointed out in the National Research Council's report, policy choices enacting punitive laws such as truth-in-sentencing, mandatory minimums, and habitual offender laws were the largest contributors to the exponential rise in incarceration in the United States (Raphael and Stoll, 2013; Travis et al., 2014).

One well-publicized consequence of mass incarceration has been crowding within prisons. As mentioned previously, by 2012, 18 states and the Federal Bureau of Prisons were above 100% reported capacity (Carson and Golinelli, 2014). Three potential consequences of overcrowding are discussed most often: poor inmate health care, increased risk of inmate suicide, and inmate misconducts (Bonta and Gendreau, 1990; Huey and McNulty, 2005; Thornberry and Call, 1983; Travis et al., 2014). The most highly publicized incidence of crowding negatively impacting prisoner health care access was evident in the California case of *Brown v. Plata* (Lofstrom and Raphael, 2016; Travis et al., 2014). The Court ruled that prison overcrowding resulted in the health-care provider-to-prisoner ratios being below the constitutionally required levels, and the Court ordered California to reduce its prison population to

137.5% design capacity within two years (Kubrin and Seron, 2016; Travis et al., 2014). California's response was to drastically reduce its prison population largely through funneling low-level offenders to local jails and eliminating returns to prison for technical parole violators (Lofstrom and Raphael, 2016; Raphael and Stoll, 2013). Research has highlighted the deleterious effect of crowding on health care and mental health care in prisons across the country, particularly due to the decreased prison resources available to inmates (Thornberry and Call, 1983; Travis et al., 2014). In addition, there is some evidence that crowding leads to poor physical conditions. For example, McCain et al. (1976) found prison crowding led to higher numbers of illness complaints while de Viggiani (2007) found overcrowding led to high levels of inmate stress and an increase in risk-taking behaviors.

Another area of concern has been the relationship between crowded prison environments and the increase in risk of inmate suicide, and empirical research has identified a link between the two (Huey and McNulty, 2005; Leese et al., 2006; Travis et al., 2014; Wooldredge, 1999). In one example of research on this consequence, Huey and McNulty (2005) found that while minimum-security facilities have been linked to lower suicide risk, minimum-security prisons with high levels of crowding were as likely to experience suicide as both medium- and maximum-security facilities. This research demonstrates that the beneficial aspects of minimum-security prisons compared to higher security facilities can be "voided by the deleterious effects of high overcrowding" (Huey and McNulty, 2005: 507).

Lastly, a prominent concern stemming from prison crowding has been the possibility for increases in inmate misconduct and violence (Camp et al., 2003;

Eckland-Olson et al., 1983; Franklin et al., 2006; Lawrence and Andrews, 2004; Martin et al., 2012; Nacci et al., 1977; Ruback and Carr, 1993; Steiner and Wooldredge, 2009a; Steiner and Wooldredge, 2009b). This potential consequence has received much attention due to the fact that providing a safe and secure environment for both inmates and staff is paramount in every prison system. In a national survey of prison wardens, maintaining custody and institutional order were the main concerns and goals of the sampled wardens (Cullen et al., 1993), and the perception among prison staff and administrators that prison crowding leads to unsafe environments has been documented (Klofas et al., 1992; Martin et al., 2012). Martin et al. (2012) surveyed correctional officers in three Alabama prisons on the impact of prison crowding on various aspects of their work. Every respondent identified crowding as a problem for officer safety, and all respondents agreed that crowding led to violence in their facilities (Martin et al., 2012). In addition to concerns for officer safety, the majority of respondents believed facility operations and management were disrupted by the crowded conditions. In an examination of prison officer safety, another study found an officer's perceived crowding was related to not feeling safe on shift, although it was not related to objective measures of safety (Steiner and Wooldredge, 2016). These concerns are the main focus of the current study.

Chapter 3: Defining Crowding

Prior to the review of previous research on crowding and misconduct, we should clarify the multiple definitions of crowding that have been utilized. Within individual-level analyses, crowding has been measured subjectively, typically as a result of inmate survey responses and perceptions of crowding. Facility-level analyses tend to utilize more objective measures, most commonly design capacity and rated capacity, although some studies attempt to measure "social density" (Franklin et al., 2006; Steiner and Wooldredge, 2009b; Tartaro, 2002). Design capacity is the number of prisoners the architects of the prison designed that facility to hold, while rated capacity generally refers to the number of prisoners a rating official indicated the prison could hold (Carson, 2014). A lesser used but similar measure is operational capacity which is defined as the number of inmates a facility can accommodate based on the number of staff and available programs and other services (Carson, 2014). Social density tends to refer to the number of inmates in a given space such as the number of occupants per cell (Gaes, 1985).

Every definition has its use depending on the research question, and there are pros and cons for each definition. For example, subjective measures allow for the examination of individuals' views of crowding but can't necessarily generalize to other studies. On the other hand, objective measures are more policy relevant, but utilize aggregate numbers and may be manipulated by prison administrators (Steiner and Wooldredge, 2009b).

Chapter 4: Overcrowding and Inmate Misconduct

There are human, financial, and public safety costs to inmate misconduct that have propelled research in this area. With regards to human costs, prison misconduct and violence threatens the safety of inmates and correctional staff and increases concerns of victimization behind bars. It is important to note that inmate misconduct can range from violent events such as inmate-inmate and inmate-staff assaults to minimal infractions such as being out of bounds. Although the Bureau of Justice Statistics (BJS) does not publish numbers on all types of misconduct, in 2013 (the year with the most current data), homicide accounted for 2.6% of all state inmate deaths, up from a low of 1.2% in 2008 (Noonan et al., 2015). In the 2000 BJS Census of State and Federal Correctional Facilities it was reported there were 14.6 assaults on staff and 28 assaults on other inmates per 1,000 inmates in all state and federal facilities in the U.S. (Stephen and Karberg, 2003). In a BJS Special Report on sexual victimization within prisons, it was found that allegations of sexual victimization increased every year from 2005 to 2011 (Beck et al., 2014). While this increase is at least in part due to more rigorous reporting, the increased reported number of sexual victimizations highlights the grave costs of prison violence. Although these statistics provide a picture of the rates of certain types of misconducts, it is acknowledged that misconducts are likely underreported for many reasons such as a lack of surveillance or a prison culture against snitching (Steiner and Wooldredge, 2009b; Wolff et al., 2007).

Inmate misconduct also places a financial burden on the system. In an examination of disciplinary reports in a medium-security prison, Lovell and Jemelka

(1996) found the average cost of an infraction was $970. This study divided infractions into two categories, minor and major, and found major infractions made up 90% of the total costs, even though minor events outnumbered major two to one (Lovell and Jemelka, 1996). These costs can include issues of damaged property, medical costs, and misconduct hearings, among other potential expenses. As the correctional system is an expensive institution, the cost of prison misconduct is another factor encouraging research in this area.

Lastly, there are potential public safety costs to misconduct. Previous studies have found a link between prison misconduct and later recidivism (Cochran et al., 2014; Huebner et al., 2007), particularly for violent misconducts among adult incarcerated populations (Cochran et al., 2014). Additionally, as highlighted by Gendreau and Keyes (2001), both misconducts and recidivism are often predicted using the same types of risk assessment tools, and programs aimed at reducing misconducts have also been found to reduce recidivism (French and Gendreau, 2006). Thus, another reason to study institutional misconduct is the potential for misconduct and recidivism to be highly correlated and for infractions to translate to later crimes after release. Understanding what causes misconducts could help improve programs aimed to reduce both misconduct and recidivism.

MISCONDUCT THEORIES

Inmate misconduct has typically been studied through the lens of three main theories: the deprivation, importation, and situational models. The deprivation model is based in large part on Gresham Sykes' (1958) work on what he called the "pains of imprisonment." Sykes (1958) specified that the difficulties of imprisonment, such as

losses of freedom, privacy, and autonomy, cause prisoners to act out or attempt to satisfy needs via illegal behavior (Jiang and Fisher-Giorlando, 2002; Morris and Worrall, 2014; Rocheleau, 2013). The importation model of misconduct highlights differences across individuals and attributes infractions to an inmate's previous experiences and cultural expectations that he/she brought into prison. This model allows for individual variation in the experience of incarceration and is often used to explain individual-level correlates of misconduct, such as age and prior criminal history (Jiang and Fisher-Giorlando, 2002). Lastly, the situational model purports that situational factors, such as the time of year or location of the prison, are the main causes of inmate misconduct (Jiang and Fisher-Giorlando, 2002). Each of these models has been criticized as not satisfactorily explaining the various causes of inmate misconduct, and in recent years, researchers have attempted to apply more general criminological theories, such as general strain theory and control theory, to explain individual-level misconduct (Blevins et al., 2010; Morris et al., 2012; Steiner and Wooldredge, 2009a). For example, Steiner and Wooldredge (2009a) apply a social control perspective in examining various impacts on misconducts in women's prisons, highlighting the potential for both direct and indirect controls to contribute to conformity and rule-following while behind bars. However, there continues to be disagreement over the applicability of various theories to explain misconducts.

The three main misconduct theories have been the basis for numerous studies on the individual and environmental correlates and causes of misconduct (for a recent review, see Steiner et al., 2014). Variables such as prearrest drug use (Jiang, 2005; Steiner and Wooldredge, 2008), college program participation (Lahm, 2009), mental

health (James and Glaze, 2006), prison security level (Griffin and Hepburn, 2013; Steiner and Wooldredge, 2008; Steiner et al., 2014), self-control (DeLisi et al., 2003; Kerley et al., 2010), strain (Morris et al., 2012), prison architecture (Morris and Worrall, 2014), and inmate age (Eckland-Olson et al., 1983; Franklin et al., 2006; Nicci et al., 1977; Steiner and Wooldredge, 2008; Valentine et al., 2015; Wooldredge and Steiner, 2009) have been found to impact violent infractions, non-violent infractions, or both. Other research has investigated policy changes on misconduct. One such study by Bales (2012) examined the impact of the truth-in-sentencing law in Florida and found the law had the unintended consequence of increasing inmate misconduct.

The deprivation model of misconduct explains the potential relationship between prison crowding and inmate infractions in that crowding leads to greater deprivation of privacy among inmates who can then react with misconducts and violence (Jiang and Fischer-Giorlando, 2002; Sykes, 1958). Following in the vein of the deprivation model, the potential for crowding to interfere with opportunities such as work assignments and program availability could result in decreases in the amount of time an inmate spends productively, leading to boredom and the possibility for all types of misconduct. In this way, crowding has been discussed as an environmental deprivation. This mechanism indicates that crowded settings provide environmental opportunities for committing misconduct. It does not seem likely that an explanation of crowding as an environmental deprivation could have prolonged effects if the environmental effect only provides immediate misconduct opportunities. Thus, it is expected that crowding and misconducts will occur nearly contemporaneously.

It is also possible that crowding has a psychological impact on inmates and inmates' perceptions (Gaes, 1985). For example, Lawrence and Andrews (2004) examined the impact of prison crowding on the interpretation of aggressive events, such as a violent exchange between two prisoners. They found that experiences of crowding were associated with the interpretation of an event as aggressive and the individuals involved in the event as "hostile, intentional, and malevolent" (281). Thus, the experience of overcrowding has been linked to a changed perception of events. In turn, the interpretation of an event as aggressive increases the likelihood an individual will also respond with aggression. These changed perceptions can remain chronic after the environmental stressor of crowding has passed (Gaes, 1985). This psychological and stressful impact of crowding could result in crowding having immediate, as well as, delayed effects on inmate misconducts due to the changed perceptions of events that are not instantaneously tied to the crowded environment.

PREVIOUS EMPIRICAL FINDINGS

As highlighted by Travis et al. (2014), "The concern that overcrowding would create more violent environments did not materialize during the period of rising incarceration rates: rather, as the rates rose, the numbers of riots and homicides within prisons declined" (6). There are many potential reasons for this relationship between incarceration rates and violence within prisons over the past several decades, such as improved technology, better classification systems and management, or increasing percentages of less serious offenders behind bars (Morris and Worrall, 2014; Travis et al., 2014; Useem and Piehl, 2006). This correlation does not demonstrate that there is no relationship between crowding and inmate violence or other misconduct. The

various changes in prisons over the past few decades necessitate research using contemporary data to account for these differences. Additionally, as mentioned previously, correctional administrators express concern for the potential for violence stemming from overcrowded and understaffed facilities (Klofas et al., 1992; Martin et al., 2012). Klofas et al. (1992) conducted a focus group of jail administrators who identified 80% capacity as the point at which crowding effects were intuited and began interfering with the administration of correctional facilities. Thus, although there was not an aggregate increase in homicides and riots within prisons over the decades when prison populations increased dramatically, the relationship between prison crowding and inmate misconduct deserves further attention and research.

Although research has examined the effects of prison overcrowding on inmate misconduct, the literature is mixed likely due to the use of varying measures and contexts throughout. As well, the different methods utilized across studies make it difficult to form a complete understanding of the relationship (Steiner and Wooldredge, 2009b; Travis et al., 2014). Although studies examining individual responses to crowding have contributed to the research examining crowding and misconduct, the current discussion focuses on studies utilizing institutional- or multi-level analyses due to their relevance for the current study and for policy implications. As highlighted by Steiner et al. (2014), of the studies examining prison-level crowding pubished between 1980 and 2013, 37% had positive results indicating crowding led to an increase in misconduct, 14% had inverse results, and 49% nonsignificant.

A positive relationship between crowding and disciplinary issues has been found in several studies. In one of the few longitudinal studies on this topic, Ruback and Carr (1993) examined 25 state prisons over a period of ten years and found institutional density[1] to have a small but significant impact on violent and nonviolent infraction rates. Utilizing hierarchical models on cross-sectional data, Wooldredge et al. (2001) found a positive association between prison overcrowding and misconducts across all three samples of state institutions (New York, Washington, and Vermont). These findings demonstrate there is reason to believe crowding and misconduct have a positive relationship. Although Nacci et al. (1977) did not find a significant relationship between crowding and misconducts of all types, there was a significant relationship between crowding and total assaults as well as a measure of assaults on other inmates. This research may have influenced later studies to focus solely on violent misconducts (Gaes and McGuire, 1985; Steiner, 2009; Wooldredge and Steiner, 2009).

The occasional study has found a negative relationship between crowding and misconduct, although these findings have been rare. In one such cross-sectional study, utilizing administrative surveys from 646 jails, Tartaro (2002) examined the impact of density on assaults. This research found increases in spatial density[2] resulted in decreases in assault rates among the studied jails. The finding of a negative relationship could result from the facility's response to crowding through the

[1] Institutional density was measured by dividing the monthly population by the facility's maximum operating capacity. Maximum operating capacity was defined as "the number of individuals who could be housed at the institution if every possible space that was intended for living arrangements were used" (Ruback and Carr, 1993: 132).
[2] Spatial density was measured as the inmate population divided by the rated capacity of each institution.

introduction of additional programs, more staff, or higher security (Tartaro, 2002). Although this particular study used a sample of jails, the finding of a negative relationship highlights the need to account for potential compensatory measures enacted to combat the deleterious effects of prison crowding (Travis et al., 2014).

Other research has not revealed statistically significant relationships between overcrowding and inmate misconduct. Ekland-Olson et al. (1983) used four years of Texas prison data and did not find any statistically significant relationships between overcrowding and infractions among the studied institutions. In a study of the federal prison population in a single month, Camp et al. (2003) found crowding[3] had no effect on misconducts overall, except in increasing the odds of "other" misconduct occurring by a small amount. While this finding was significant, the insignificance of the major types of misconduct, including violent misconducts, contributes to the literature of null findings.

In evaluating the previous literature it appears the vast majority of studies find positive or null effects. Although the rare study has had negative findings, most of these were conducted using jail or federal prison data (Sechrest, 1991; Tartaro, 2002; Walters, 1998). Thus, it seems the crowding research points to positive or null effects in state prisons utilizing between-prison analyses (Camp et al., 2003; Eckland-Olson et al., 1983; McCorkle et al., 1995; Nacci et al., 1977; Steiner, 2009; Wooldredge et al., 2001). It seems that studies using multi-level models have been more likely to find positive, yet small effects (Huebner, 2003; Pelissier, 1991; Wooldredge et al.,

[3] Crowding was measured as the extent to which the prison population exceeded a facility's design capacity.

2001) compared to other types of analyses. However, previous findings still do not seem to fit a clear pattern.

There are many potential reasons cited for the inconclusive findings. Steiner and Wooldredge (2009b) cite various definitions of crowding (subjective measures at the individual level and varying objective measures at the facility level), differing measures of misconduct, as well as various units of analysis as potential sources for the unclear relationship. Travis et al. (2014) cite three potential aspects of this line of research that could lead to these mixed results: the level of analysis at which crowding is measured- within housing units, within institutions, or within an entire state system; whether prison practices are changed in response to crowding; and how many misconducts result in a report. Together, these varying methodological issues have resulted in an unclear understanding of the relationship between prison crowding and inmate misconduct.

Chapter 5: Gaps in the Literature

While there are numerous limitations in the state of research on this subject, the current study focuses largely on addressing the need for longitudinal analyses with contemporary state prison-level data. As Steiner (2009) pointed out, the vast majority of prison research has been cross-sectional and conducted at one point in time. These cross-sectional studies attempt to estimate the effects of crowding based on between-prison comparisons. However, while they often statistically adjust for prison characteristics that could confound the relationship between crowding and misconduct, there remains concern for unobserved characteristics that are not accounted for. Additionally, cross-sectional analyses do not distinguish between variables that change over time and those that remain stable. The panel data in the current study take advantage of multiple observations of the same prisons over time, which allows for the control of unobserved, time-stable prison characteristics, and also incorporates how changes within prisons, such as the addition of more prison staff or a shift in the inmate age makeup, affect inmate misconduct. Highlighting this advantage of longitudinal data, Bonta and Gendreau (1990) made a case that the use of longitudinal analysis at both the individual and institutional levels is crucial to fully understand the relationship between crowding and misconduct. Additionally, longitudinal analysis may be more suitable to shed light on how crowding affects misconducts and if there is the possibility of threshold effects (Pelissier, 1991) or the potential for a mediating impact of administrative responses to prison crowding over time (Franklin et al., 2006).

The few studies that have utilized longitudinal data have focused on yearly changes or even changes from one point in time to another point 5 years later (Steiner, 2009). It is possible that month-to-month changes are washed out when aggregated to year or to five-year increments.[4] In the study of correctional officers' perceptions of crowded conditions, Martin et al. (2012) found officers believed the threat of violence in crowded facilities was greater at certain points in the year, largely due to the variation in weather and conditions within the facilities. In a review of literature on this topic, only one study was found that examined the effects of crowding on misconduct with monthly panel data from state facilities (Ruback and Carr, 1993). In their examination of monthly changes in Georgia, Ruback and Carr (1993) utilized hierarchical linear modeling and found institutional density had a significant effect for both violent and non-violent misconducts. However, the authors state "density does not have consistent effects on infraction rates within a prison across time" (Ruback and Carr, 1993: 144). Although the authors included various controls, such as the number of violent offenders and the number of employees in a month, it is possible omitted variables, such as risk composition of the inmate population or work and program participation, resulted in the inconsistent effects.

Two similar studies were conducted utilizing federal prison panel data (Gaes and McGuire, 1985; Walters, 1998). Gaes and McGuire (1985) examined month-to-month changes in 19 federal prisons from 1975 to 1978 and found three of the four assault types measured (inmate-no weapon, inmate-weapon, staff-no weapon, and

[4] One could argue that finer-interval analyses (e.g., daily or weekly) would capture even more variation than monthly. However, given that population reporting in most correctional agencies is conducted monthly, analyses based on monthly data are of greater policy value.

staff-weapon) were positively related to crowding[5]. Walters (1998) utilized monthly changes in the federal system from 1986 through 1995, and found population density was inversely related to total assaults. However, Walters (1998) used minimal control variables (age, ratio of black to white inmates, staff experience, and inmate-to-staff ratio) and acknowledged missing data but did not attempt to address it. As discussed below, the many differences between federal prisons and state prisons may limit the ability to generalize the findings of these two studies to state prisons. Overall, these studies were an important step in utilizing month-to-month analyses in examining this research question. The current study improves on these three studies with the use of contemporary data and stronger time-varying controls.

Another gap in the literature is the lack of generalizability of some of the more recent research utilizing federal prisons and local jails. It is worth noting much of the research conducted over past decades has utilized data from federal prisons, and these findings have been included in previous discussions of crowding in state prisons (Camp et al., 2003; Gaes and McGuire, 1985). Although information on crowding in federal prisons is informative, it may be inappropriate to generalize those findings to state prisons. The differential makeup of federal and state prison populations[6], as well as the differing administrative structures, likely influences misconduct within these institutions. Additionally, some of the more recent research is based on jail data rather than prison data (Tartaro and Levy, 2007). Jails and prisons differ substantially, particularly in conviction status, inmate makeup, and inmate turnover.

[5] Gaes and McGuire (1985) measured crowding by dividing each facility's average daily population by the rated capacity.

[6] For example, the majority of state prisoners are violent offenders while the majority of federal offenders are convicted of drug crimes, and drug offenders may have different reactions to prison crowding compared to violent offenders (Carson, 2014).

Although the relationship between crowding and misconduct within jails is important to understand, due to the differences between prisons and jails, the findings of research in jails cannot necessarily be generalized to prisons. Therefore, there is a relative lack of studies and policy relevant knowledge about the relationship between crowding and misconducts in contemporary state prison systems. Additionally, state prisons held about 57% of the country's total incarcerated population in 2012, thus more research on these institutions holding the majority of incarcerated adults is needed (Travis et al., 2014).

One issue in establishing an empirical relationship between overcrowding and inmate misconduct is the difficulty in measuring a facility's potential response to overcrowding (Tartaro, 2002; Travis et al., 2014). Previous literature has repeatedly called for studies to include measures of such responses (Steiner, 2009; Steiner and Wooldredge, 2008; Tartaro, 2002; Travis et al., 2014). The current study attempts to address that limitation with the measures of both filled and vacant correctional officer positions. Although there are numerous other potential responses to crowding besides hiring more staff, this measure captures a potential response to both changes in prison crowding as well as changes in the rate of infractions.

The decades of research on prison crowding and inmate misconduct has informed the field of the complexity of this relationship. The shortcomings of the previous literature on this topic, particularly the lack of longitudinal analyses, the need for research with modern prison data, and the need to address administrative responses to crowding, demonstrate the need for research to address these issues to form a better understanding of the relationship between crowding and misconduct.

The current study's use of a panel design, unique variables on staffing, programs, and work, and the use of data from a contemporary, large state prison system make a unique contribution to the literature.

Chapter 6: Data and Analytical Plan

The current study utilizes an institution-level analysis. An aggregate level approach to examining the consequences of crowding is potentially more relevant for policy makers, and prison officials focus on an institutional level more so than the individual level (Steiner and Wooldredge, 2009b). As pointed out by Steiner and Wooldredge (2008), and rearticulated by Steiner et al. (2014), the majority of research has focused only on the individual level of analysis and hasn't examined prison characteristics to the same extent as inmate characteristics or experiences. To address this, the current study examines monthly data from a state prison system. The data were gathered directly from the Pennsylvania Department of Corrections (PADOC) and contain three years of data collection (January 2012 through December 2014) in which information for each month was collected on the last day of every month, creating 36 time points.

Data were collected for this time period due to PADOC's definition change of prison capacity in the beginning of 2011, discussed further in the measurement section. Additionally, Pennsylvania experienced a three-month parole moratorium in late 2008 in which parole release was mostly suspended due to the concern of the adequacy of the state's parole supervision[7] (Prison Legal News, 2009). As to be expected the moratorium resulted in more inmates behind bars and greater issues and concerns of crowding. Utilizing PADOC data encompassing the rather unusual time

[7] The parole moratorium stemmed from an incident in which a paroled inmate killed a police officer, and the Pennsylvania Governor responded with a parole moratorium for all inmates to allow for the evaluation of the state's parole policies. The moratorium shifted to just violent offenders and lasted for three months.

of the parole moratorium or immediately after the moratorium lift would cause issues with generalizability of this study's findings to other state systems. Thus, to allow for generalizability of the system and study period, and ease of measurement continuity, data were collected on all 24 institutions that were operational throughout the three-year period after the definitional change in 2011.[8] The examination of 24 prisons over 36 months resulted in 864 data points.

Pennsylvania houses one of the largest state prison systems in the country with approximately 51,000 inmates in custody (Carson, 2015). The Bureau of Justice Statistics gathers data on inmate populations on the last day of the year, and in 2013 and 2014 Pennsylvania had the 7th largest state inmate population in the country (Carson, 2014; Carson, 2015). The system houses two Diagnostic and Classification centers, one for each gender, where each inmate brought into the PADOC system undergoes programmatic and special needs assessment and is assigned a custody level and a home institution for transfer. Of the 24 institutions open during the three-year study period, two were for female offenders and the remaining 22 facilities housed male offenders.

This study examines the impact of prison overcrowding on inmate misconduct. With the use of panel data, in which there are multiple observations for each prison, there are mainly two modeling approaches, fixed effects and random effects models (Halaby, 2004).[9] Fixed effects models assume that unobserved, stable

[8] Three PADOC institutions opened or closed during the three-year study period. These facilities were excluded from the analysis due to the drastic changes, other than changing crowding levels, occurring in the facilities in the months surrounding the open or close of the facility.

[9] Hierarchical linear modeling (HLM) was considered for this study to allow for the investigation of individual and facility-level changes by situating inmates within facilities.

characteristics are correlated with at least one predictor variable, while random effects models assume the time-stable characteristics are uncorrelated with each predictor variable (Bushway et al., 1999; Wooldridge, 2013). Thus, although a random effects estimator could be more efficient if the assumption holds (Halaby, 2004), the main concern with random effects is the bias that is introduced when any time-stable variables not included in the model are correlated with any included time-varying factors (Brame et al., 1999). It is likely that for this study an excluded time-stable variable could be correlated with an included time-varying variable. For example, a facility's architecture, a time-stable variable not included in this study, could be correlated with the number of staff in a facility, particularly if certain types of architecture lend themselves to easier surveillance (Morris and Worrall, 2014). Due to this potential bias, Brame et al. (1999) highlighted that "estimates of the coefficients of time-stable factors will always be biased in random-effects models because of confounding with unobserved heterogeneity" (606). Additionally it is acknowledged that fixed-effects models provide a stronger control of unobserved time-stable factors (Brame et al., 1999, Wooldridge, 2013). Although a potential limitation of fixed effects is the inability to measure the specific effect of time-stable variables, and random effects is often used when certain time-stable factors are believed to be theoretically important, the potential for bias in random effects models led this study to utilize fixed effects estimators.[10]

However, the low relative number of facilities (n=24) in PADOC limited the ability to trust and generalize the findings of HLM as Maas and Hox (2005) found a sample size of less than 50 at level two (in this case institutions) led to biased standard errors.

[10] Additionally, the Hausman test (Hausman, 1978) was applied to examine for statistically significant differences between the basic random effects and fixed effects models. The test found significant differences, resulting in a rejection of the key assumption of random effects

Within fixed effects models, the unobserved heterogeneity across institutions is represented by a time-constant intercept for each institution (Bushway et al., 1999). This intercept then controls for institution-specific factors that remain unchanged over the three-year study period. Thus, factors such as a facility's architecture, location of the facility within the state of Pennsylvania, security level, or gender of the inmate population are essentially controlled in the fixed effects estimator. The estimator then only focuses on within-institution variation with each facility serving as its own counterfactual. Once these time-stable characteristics are controlled, any changes in the dependent variable, in this case misconduct rate, must be due to other influences besides the fixed characteristics. Fixed effects models can still produce biased estimates of crowding if there are omitted time-varying factors that are related to crowding and misconduct rates (Bjerk, 2009). It is thus crucial to try to capture any relevant time-varying factors in our models, which we will discuss below. To contrast with the fixed effects models, pooled ordinary least-squares (OLS) regression is run which utilizes both between and within variation.

---

that the unobserved effect is uncorrelated with each control variable. Thus, the Hausman test supported the use of fixed effects in the current study.

Chapter 7: Variables

DEPENDENT VARIABLES

The current study utilizes all misconduct reports filed in PADOC in calculating the dependent variables. Within PADOC, all rule violations are to be reported and the infraction is dealt with informally or formally depending on the seriousness of the charge. During the three year study period, refusing to obey an order was the highest cited misconduct with 26.9% of all misconduct types, followed by using abusive, obscene or inappropriate language (9.2%) and possessing contraband including money (8.4%). While official reports undoubtedly undercount many types of misconducts (Steiner and Wooldredge, 2009b), in the absence of prisoner self-reports, official measures of misconducts have been utilized in previous studies, and such reports likely form a basis for prison officials' and administrators' decision making (Gaes and McGuire, 1987; Morris and Worrall, 2014; Nacci et al., 1977; Steiner, 2009; Steiner and Wooldredge, 2009a; Wooldredge et al., 2001). The main dependent variable of interest is misconduct rate calculated by dividing the number of misconducts in each month in each institution by the population of each institution on the last day of that month. This rate is then multiplied by 100 to allow for a meaningful interpretation (*Misconduct Rate*). Figure 1 demonstrates the distribution of the misconduct rate per 100 inmates. The distribution is unimodal and relatively symmetric with some evidence of a right skew. As reported in Table 1 and as shown in Figure 1, across all months and institutions the average misconduct rate per 100 inmates per month was 10.849.

Analyses are also conducted with violent misconduct as the dependent variable (*Violent Misconduct Rate*). A large proportion of previous research has solely focused on violence (Gaes and McGuire, 1985; Steiner, 2009; Wooldredge and Steiner, 2009). As this relationship is crucial to the perception of overcrowding as contributing to a dangerous environment, and prison administrators are most concerned with violence, particular attention is paid to violent misconducts in addition to the main analysis involving all misconducts. Utilizing PADOC's definition of violent misconducts the following incidents were identified as violent: aggravated assault, assault, body punching or horseplay, involuntary deviate sex, kidnapping, fighting, murder, rape, riot, robbery, and unlawful restraint. Fighting was the most common violent misconduct reported during the study period with 3.4% of all misconducts and 48.3% of violent misconducts, followed closely by assaults with 3.3% of all misconducts and 47.3% of violent misconducts[11]. As reported in Table 1, the average violent misconduct rate was .809 per 100 inmates, a small proportion of the overall misconduct rate. This distribution is shown in Figure 2 and is similar to the distribution for all misconducts.

INDEPENDENT VARIABLES

The main independent variable of interest is prison crowding which is measured as percent capacity. Each facility's population was measured on the last day of each month. Percent over capacity is calculated by dividing the prison's population size by the rated capacity of each institution (*Percent Capacity*). The rated capacity was provided by PADOC for which no specific formula is available.

[11] These numbers indicate that previous research focusing solely on assaults (Gaes and McGuires, 1985; Walters, 1998) are potentially missing a large proportion of violence in prison that is identified as fighting rather than assaults.

The rated capacity is described as the number of inmates a facility can hold comfortably without interfering with day-to-day prison activity. Although previous research discusses the potential for rated capacity to be manipulated by prison administrators (Steiner and Wooldredge, 2009b), PADOC does not have design capacity on record, and they only use rated capacity in their published reports. The major advantage of utilizing prison population as a function of design or rated capacity is its ability to be calculated for any length of time, as well as the ease of comparing the measure of crowding across institutions (Klofas et al., 1992; Steiner and Wooldredge, 2009b). Although the measure of percent capacity lends itself to the conclusion that any facility over 100% capacity is identified as overcrowded, as discussed by Steiner and Wooldredge (2009b), it is the variation in the scale that matters for predicting variation in inmate misconduct.

As seen in Table 1, the average percent capacity across the study period was 106.2%. However, percent capacity varied widely from a minimum of 75.2% to a maximum of 124.4% across institutions during the 36-month study period. Although it could be argued that an average percent capacity of 106.2% demonstrates there are not overcrowding issues in PADOC, as discussed previously, prison administrators identified 80% capacity as a point at which crowding interferes with day-to-day prison administration (Klofas et al., 1992). Table 2 displays the percent capacities published monthly by PADOC and shows the variation in this measure per institution over the 36-month study period. This table provides a better description of the range in percent capacity within institutions.

Figure 3 displays the patterns of average percent capacity and misconduct rate over the study period. Average percent capacity had a sharp increase at the end of 2012 and the beginning of 2013 and then steadily decreased over the remainder of 2013 and 2014. This pattern is largely due to the closure of two prisons in mid-2013. These facilities began transferring their inmates to other facilities in late 2012 and early 2013, thus increasing the percent capacity of other PADOC facilities during that time. Misconduct rate also varied over the three years, showing a sharp decline in mid-2013 but then steadily rose to about the same rate as early 2012. Both measures showed declines in mid-2013. Figure 4 displays the patterns of average percent capacity and the violent misconduct rate. Due to the smaller rate of violent events, the figure gives the appearance of large fluctuations in violence month to month. While the rate fluctuates in 2012 and 2013, there appears to be a small rise in the violent misconduct rate in 2014.

In addition to a linear effect of percent capacity, the current study explores the possibility of a curvilinear relationship between crowding and the misconduct rate. It is possible that crowding has a greater impact on misconducts at certain points in the percent capacity spectrum. Particularly, it is possible that crowding increases the misconduct rate but there could be a certain threshold at which point crowding has a weaker effect or no longer has a positive effect on misconduct rates (Gaes and McGuire, 1985). There are any number of explanations for why crowding and misconducts would not have a constant, linear relationship. For example, administrators of overcrowded facilities may take steps to combat the perceived threat of overcrowding, possibly when crowding reaches a certain threshold, resulting in

lower infraction rates (Gaes and McGuire, 1985, Travis et al., 2014). Thus a quadratic term (*Percent Capacity Squared*) was added to investigate the possibility of a curvilinear relationship between crowding and misconduct.

Lastly, with regards to the main independent variable of crowding, there is the potential for lagged effects. As discussed previously, there are competing mechanisms in explaining the potential relationship between crowding and misconducts. One is an environmental effect in which crowded environments lead to eruptions and more misconduct opportunities. On the other hand, psychological literature highlights the potential for crowding to lead to psychological shifts in the interpretation of aggressive events (Lawrence and Andrews, 2004). The interpretation of events as aggressive could perpetuate the effect of crowding into later months. Thus, in an attempt to explore the mechanism behind this relationship, this study included a lagged effect of crowding. To create this measure each facility's monthly percent capacity was lagged one month (*Lagged Percent Capacity*).[12]

In addition to the main independent variable of crowding, there are time-varying control variables included in the model as an attempt to minimize dynamic omitted variable bias and to isolate the effect of crowding. Race is measured by the percent of the population identified as white (*White*), black (*Black*), Hispanic[13] (*Hispanic*), or other race (*Other Race*) on the last day for each institution per month. Other race encompasses the categories of American Indian, Asian, and other. Percent white is the omitted category. Race is included as a control because some previous

[12] Additional analyses were run with crowding lagged up to five months.
[13] Percent Hispanic was measured by PADOC as a race category rather than a separate ethnicity indicator.

studies have found support for differential involvement in misconducts by race (Steiner, 2009; Steiner and Wooldredge, 2009a; Steiner et al., 2014). Custody level, determined by the Pennsylvania Additive Classification Tool (PACT), is included in the analysis, which designates an inmate's potential to commit misconduct and determines the level of supervision necessary to maintain a safe environment. Custody level is measured on a scale, L1 through L5, with L1 designating the inmates with least restriction and allowed most privileges, and L5 designating the inmates who have had the most consistent behavioral issues and are designated to restrictive housing. In addition the percentage of the population labeled as L1 through L5, a variable "blank custody" was also included (*L1, L2, L3, L4, L5, Blank Custody*). These inmates' custody levels are not necessarily missing by error, rather custody level assessments may not have been conducted yet. Thus, the majority of inmates assigned a "blank custody" are present in the Diagnostic and Classification Centers[14] where inmates are first entered into the DOC system and assigned risk scores, custody levels, mental health examinations etc., before typically moving to a different, more permanent facility. The percent of the population classified as L5 is the omitted category.

Previous research on prison crowding has largely not discussed the impact of crowding on various units within facilities, largely due to the lack of available data from particular units. This research aims to provide an exploratory examination of the impact of the proportion of a facility's population in restricted housing[15] on the

[14] PADOC has two Diagnostic and Classification Centers, Muncy for female inmates and Camp Hill for male inmates.

[15] Disciplinary and administrative custody make up what is referred to as Restricted Housing Units (RHU). However, there are other units not measured in this study that have special

misconduct rate. Disciplinary custody (DC) houses disruptive inmates who are most often placed in restricted housing for punishment. In their investigation of PADOC's use of segregation, the Vera Institute of Justice found that from March 31, 2013 through March 31, 2014 disciplinary custody was given as a punishment in 75% of guilty misconduct verdicts (Browne et al., 2015). Reasons for admittance to administrative custody (AC) were more varied, with Vera finding the top three reasons as "held temporarily", "investigative", and "DC expired/moved to AC". "Dangerous to self" and "dangerous to others" were the fourth and fifth most common reasons respectively (Browne et al., 2015). As with population size, the proportion of each facility present in certain units was captured on the last day of every month. Since the use of restricted housing is a result of inmate misconducts, there is a direct, expected relationship between the misconduct rate in a month and the number of inmates in restricted housing in the same month. As it is of greater empirical interest to examine the extent to which the population in restricted housing predicts the number of misconducts in the following month, both the measures of the percentage of the population in AC and the percentage of the population in DC were lagged one month (*lagAC, lagDC*). These measures are included as it is possible the majority of infractions are occurring in restricted housing where some of the more disruptive inmates are housed. Thus, a large determinate of the misconduct rate would be the percent of a facility in restricted housing and not necessarily the crowding issues facing the general population. Although in their national prison

---

designation: Psychiatric Observation Cells (POC), the Capital Case Unit (CCU), the Special Management Unit (SMU), and the Secure Threat Group Management Unit (STGMU). When we refer to "restricted housing" we are only referring to the makeup of the disciplinary and administrative custody units.

sample, Butler and Steiner (2016) did not find that crowding impacted the use of disciplinary segregation, it's possible within PADOC crowding lessens the availability of space within restricted housing, resulting in disruptive inmates remaining in the general population instead of being placed in disciplinary custody.

Risk assessment score was measured on a 12-point scale using the Risk Screen Tool (RST). The RST is a risk assessment tool that is designed to predict recidivism and help identify the inmates who are more likely to be disruptive. The instrument consists of previous criminal involvement, age of the offender, educational attainment, and a history of alcohol or drug problems. Higher scores indicate higher risk, and the scale was transferred into three variables, the first (*Riskone*) included the percentage of the population who scored between 0 and 3, the second (*Risktwo*) between 4 and 7, and the third (*Riskthree*) between 8 and 11[16]. Riskone is the omitted category. All inmates besides those serving life sentences within PADOC are eventually given a risk assessment. The missing data for risk assessment are those inmates serving life sentences or are inmates who have recently entered the system and not yet received the RST when data was gathered for that month (*Riskmissing)*. Mental health in PADOC is measured on a scale from A through D, with A (*MHA)* designating inmates with no record of mental health issues, B (*MHB*) designating inmates with a history of mental health issues but no recent problems, C (*MHC*) inmates are currently on the mental health roster, and D (*MHD*) inmates have present, severe mental illness. Thus, mental health is measured as the percentage of a facility's population on the last day of the month with each mental health distinction

[16] There was little variation in the average risk score across and within institutions. Thus, a categorical scale breaking up the range into three groups of four risk scores each was chosen to examine changes in the risk classification of a facility's population.

with MHA serving as the reference category. The missing data for both risk assessment and mental health (*MHmissing*) are clustered in the Diagnostic and Classification Centers, which demonstrates the majority of the missing data is the result of tests not yet run and not actual missing information. Mental health designation is included due to the potential for inmates with more severe mental health issues to have a more difficult time adjusting to prison life (Travis et al., 2014). Additionally, previous research has found mentally ill inmates disproportionately participate in misconducts compared to the general inmate population (James and Glaze, 2006). Both risk and mental health are typically evaluated annually for each inmate, and an inmate's risk score or mental health status was applied to every subsequent month until another evaluation was conducted.

Inmates' participation in programs was captured by a count of every inmate enrolled in a program on any day for a given month. This number was then converted to a percentage of the prison's population who were enrolled in a program in a month (*Percent Programs*). All programs were included, and ranged from general education classes to drug treatment and individual counseling. As seen in Table 1, the percentage of a facility's population engaged in a program averaged just 19.8% across the study period. Work participation was similarly measured as a count of every inmate on work duty for any day in a given month that was then converted to a percentage of the prison's population who were working on any day in that month (*Percent Work*). Inmates were much more likely to work than to participate in a program with facilities averaging 97.2% of the population working in a month during the study period. Both the work and program variables are included in this analysis to

account for inmates' time spent within each facility. As has been previously discussed, crowding can interfere with program and work availability resulting in a decrease in an inmate's time spent productively. Without work or programs to attend, inmates may have more time on their hands with which to commit misconducts (Butler and Steiner, 2016; Gaes and McGuire, 1985). Additionally, the possibility for having a work or program assignment taken away due to misconduct could serve as a deterrent against participating in instances of violence or other infractions. This is a possibility as Browne et al. (2015) found 31% of guilty misconducts in PADOC resulted in loss of work, although the guilty misconducts resulting in disciplinary custody as punishment likely also led to loss of work, at least temporarily.

Age was measured as the average inmate age for each institution. Every inmate's age was calculated for the last day of the month from each inmate's date of birth. This number was then aggregated to the average inmate age for that facility on the last day of every month (*Average Inmate Age*). Additionally, an interaction term is included to examine the interaction between crowding and inmate age. Age and an age and crowding interaction are included in the analysis due to their consistent significance in previous literature (Eckland-Olson et al., 1983; Franklin et al., 2006; Nicci et al., 1977; Steiner and Wooldredge, 2008; Valentine et al., 2015; Wooldredge and Steiner, 2009). Similar to the well-known relationship between age and crime (Hirschi and Gottfredson, 1983; Sampson and Laub, 2003), it has been consistently found that younger inmates are more likely to participate in situations resulting in disciplinary actions (Steiner and Wooldredge, 2008; Wooldredge and Steiner, 2009). As has been mentioned in previous research, it is possible younger inmates have a

more difficult time adjusting to prison which can then lead to higher rates of misconduct (Franklin et al., 2006; McShane and Williams, 1989).

Research has identified interaction effects between crowding and population age on inmate misconduct (Nacci et al., 1977; Wooldredge et al., 2001). In one of the earliest works within this field of study, Nacci et al. (1997) found the relationship between crowding and misconduct was strongest within prisons with younger populations. In their meta-analysis of the research on crowding and inmate misconduct, Franklin and colleagues found crowding "had substantially large effects among younger inmates, consequently leading to higher levels of violent and nonviolent misconduct among younger inmate populations" (2006: 408). These studies serve to demonstrate the significance of age in predicting misconduct as well as the evidence for an interaction between crowding and population age.

Prison age was also included in the analysis. This variable is included as it is possible older institutions are not as equipped to deal with crowding issues (Morris and Worrall, 2014). Prison age was calculated by subtracting the first year of operation for each institution from the current year at each month (either 2012, 2013, or 2014) (*Prison Age*). Additionally, control variables were included for the percent of each institution with certain offense types at conviction. The PADOC data only recorded the most severe charge at conviction that led to the current incarceration. Specifically, variables are included for percent convicted of drug offenses (*Drug*), Part I violent offenses (*Part I Violent*), and other violent offenses (*Other Violent*). These variables are included due to the potential for certain types of offenders to disproportionately engage in misconducts and to react to crowded situations

differently from other inmates. Additionally, Steiner and Wooldredge (2009c) specifically advocate the importance of including the offense for which an inmate is incarcerated to improve model specification. Previous studies have found violent offenders, as well as drug offenders, to be differentially involved in misconducts (Steiner and Wooldredge, 2008; Steiner et al., 2014).

Lastly, previous research has called for the inclusion of measures of correctional staff due to the potential for a reporting effect in misconducts, as well as a measure for a facility's reaction to crowding. As stated in the National Research Council report, "Heightened staffing levels may allow prisons to approximate the kind of programming and increased out-of-cell time that less crowded prisons would afford (at least to the point where the sheer lack of space impedes or prevents doing so) and may serve to counteract some of the adverse consequences of overcrowding" (Travis et al., 2014: 182). Such variables are necessary to include due to the likely relationship between crowding, staff, and misconduct reporting. It is possible that in crowded facilities staff may tend to ignore more minor infractions to deal with bigger issues, but have less discretion in reporting violence, regardless of crowding levels (Gaes and McGuire, 1985; Travis et al., 2014). Although previous studies have included measures of prison staff (Steiner, 2009; Steiner et al., 2014), no study has included information on vacant staff positions. Capturing the number of vacant positions allows for the examination of not only how many staff are currently working through the inmate-to-staff ratios, but also the number of positions prison administrators want filled. Together, the number of positions filled and the number

of vacant positions identify how many staff prison administrators believe are necessary to adequately manage the population.

PADOC gathered data on the number of correctional officer (CO) and non-CO positions filled and vacant per each institution four times a year (in March, June, September, and December). To create a monthly staff variable, each data collection was applied to the following two months until staff measures were gathered again.[17] To account for population size, an inmate-to-staff ratio was created for correctional officers (*CO Ratio*).[18] As displayed in Table 1, on average, for every correctional officer there were 5.558 inmates. Additionally, the proportion of CO positions filled (*Prop CO Filled*) was included in the analysis. This variable was created by dividing the number of filled CO positions by the combined number of both filled and vacant positions. Facilities were well staffed, averaging 95.6% of CO positions filled.

These variables could affect misconducts in either direction. From the deterrence perspective, an increase in the inmate-to-staff ratio would result in a decreased rate of misconducts due to the decreased surveillance. On the other hand, it's possible a relationship could be due to a reporting effect where an increase in the proportion of positions filled results in enhanced surveillance, reporting, and following through with instances of misconduct. Summary statistics for all included variables in the models are provided in Table 1.

[17] For example, March 2012 staff data was applied to April and May 2012 before June 2012 supplied new data.

[18] Data was also gathered for non-CO staff positions. However, the measures for non-CO ratio and proportion non-CO positions filled were highly correlated with the CO measures. Thus, non-CO measures were excluded from the analysis.

Chapter 8: Results

Table 3 displays the estimates of the pooled OLS regression. Column 1 displays just the main effect of percent capacity, Column 2 introduces the other time-varying control variables, and Column 3 introduces the percent capacity squared term. Robust standard errors were used in all models to account for heteroskedasticity, and standard errors were clustered to account for serial correlation within the institutions[19]. As seen in Column 1, without time-varying or time-stable controls accounted for, the relationship between an institution's crowding level and the rate of all misconducts is insignificant, as once the standard errors were clustered, the main effect lost its impact. The addition of time-varying controls in Column 2, and the addition of the squared term in Column 3, does not result in significance for the main effect. Although the main relationship was not significant, other findings in the OLS models support previous literature of between-institution effects. Particularly, the findings for all levels of custody and MHC were significant and in the expected direction. It's surprising that MHC was significantly related to misconduct rates but MHD was not. It is possible more programming, surveillance, and housing arrangements may be utilized for the inmates with the most severe mental deficits, which counteract their greater likelihood of misconducts.

Another interesting finding comes from the different signs for the lagged percent in administrative custody and the lagged percent in disciplinary custody,

[19] Clustering greatly impacted the standard errors demonstrating that the errors were highly correlated within institutions across time. Prior to clustering, inmate age, prison age, CO-ratio, MHmissing, work, programs, and lagDC were all significantly related to misconducts. However, these estimates were no longer significant after clustering.

although the relationship for disciplinary custody did not reach significance. Facilities with larger percentages in AC in the previous month had a lower rate of misconducts, while facilities with larger percentages of the population in DC in the previous month had a higher rate. It's possible that since AC is used for protection or investigative reasons, there are less misconducts because these inmates are no longer being victimized in the general population. On the other hand, it is possible inmates in DC continue to participate in infractions, or even participate more, due to the more stressful environment of restricted housing. There is also the possibility of contagion effects in which housing disruptive inmates together compounds the issue and leads to even more misconducts. Interestingly, none of the risk variables, other than risk missing, were significant. The significance for risk missing indicates that facilities with higher percentages of inmates missing risk classification had lower levels of inmate misconducts. It's possible the individuals in prison serving life without parole, who are not assigned a risk score, represent stabilizing forces within prison society and are less likely to commit misconducts and are driving this effect (Kreager et al., 2016).

While the pooled OLS models provide a basis of comparison, fixed effects models provide a more comprehensive analysis of panel data by controlling for time-stable heterogeneity. The fixed effects results are shown in Table 4,[20] and the table is presented in the same way as the OLS table with robust standard errors for all models. Accounting for time-stable characteristics but not time-varying factors (Column 1)

[20] In addition to prison fixed effects, the current study utilized time fixed effects to account for potential yearly-specific effects and time trends. However, in none of the misconduct rate or violent misconduct rate models were the year indicators significant. Thus, these year indicators were excluded from the analyses.

results in a negative and significant relationship (at the .05 level) between percent capacity and misconduct rate. When time-varying controls are included in Column 2, and we assume a linear relationship between crowding and misconduct rate, this relationship became insignificant. However, the introduction of the percent capacity squared term in Column 3 resulted in significant effects for both the main effect and the squared term, indicating that the effect of crowding is not constant. It appears increases in percent capacity have a positive but diminishing effect on misconduct rate. For example, holding the other variables at their means, the model predicts an institution at 75% capacity will have a misconduct rate of 8.756 per 100 inmates, while a facility at 100% capacity will have a misconduct rate of 11.504 per 100 inmates, and a facility at 125% capacity will have 7.969 misconducts per 100 inmates.

Other results merit mention. Both the Percent Black and Percent Hispanic variables were negative and marginally significant prior to the addition of the squared percent capacity term. These results are surprising in that they indicate that increases in the percent Hispanic or percent Black population compared to percent white resulted in a decreased rate of all misconducts, but previous literature has typically found Hispanic and black inmates disproportionately commit misconduct (Camp et al., 2003; Steiner, 2009; Steiner et al., 2014). However, these results are marginal and are not robust in other models. It is possible that smaller Hispanic populations on average limit the gang activity among this group, decreasing their average misconduct rates. However, the lack of gang data in this study precludes the ability to examine this further. As in the pooled OLS results, custody level continued to be a significant

determinant of misconducts within institutions. Increases in percent of the prison population convicted for a Part I violent offense resulted in increases in misconduct rates. Also, risk missing is significant and negative, and MHmissing is positive and significant.[21]

Other time-varying factors deserve attention for their lack of significance, particularly the staffing variables and the work and programming variables. The proportion of CO positions filled was marginally significant in Column 2, but the following model that included the squared crowding term caused that variable to lose significance. This is surprising in that staff members are responsible for reporting the dependent variable in this study, and it would be expected that changes in both types of staffing measures would have an impact on disciplinary reporting. It is possible the deterrent capabilities of the staff canceled out the potential reporting effect of more officers. Additionally, both measures of work and programs were insignificant in the model investigating within-institution changes. Lastly, both the lagged variables for percentage of the population in administrative and disciplinary custody were insignificant in the full fixed effects model. It appears lagAC was a better predictor of between-prison differences than of changes within a single institution.

[21] To investigate the significance of the MHmissing variable in the fixed effects models certain facilities were excluded from the analysis. The Graterford and Pittsburgh facilities are the likely entry point for many male inmates as these are the facilities closest to Philadelphia and Pittsburgh respectively. A large proportion of inmates enter the PADOC system here before moving to the Diagnostic and Classification center for males (Camp Hill). Thus, these three facilities were excluded as the majority of the missing data were concentrated there and this exclusion eliminated the significance of the mental health missing variable but did not impact the main independent variable. This is not surprising as it is possible inmates have the hardest time adjusting to prison life in the beginning of their prison stay, prior to receiving diagnostics and settling into a home institution. It is also possible that many inmates without mental health status in Graterford and Pittsburgh may be newly admitted for parole violations, a likely indicator of high misconduct rate. Thus, it is the intake and diagnostic centers that are driving the significance of MHmissing.

Additional analyses were conducted with the fixed effects model to examine if certain types of institutions were driving the relationship between crowding and misconduct. In another model (not shown), both Diagnostic and Classification Centers (one for female inmates and one for male inmates) were removed from the analysis to examine if the high turnover rate or other unique aspects of those prisons were driving the main relationship. Although the exclusion of these institutions did cause the main relationship to lose significance, it was marginally significant at the .05 level. Thus, these institutions remained in the final model. Additionally, the two female prisons were also excluded from the analyses to examine the potential differences between male and female prisons and the relationship between changes in crowding and changes in misconducts. However, there was not a large impact and the main coefficient remained significant at the .05 level. Since none of these exclusions significantly impact the results, all prisons open throughout the three-year study period were included in the presented analyses.

LAGGED EFFECT OF CROWDING

As discussed earlier, there is theoretical reason to believe there could be a lagged effect of crowding on misconduct. However, the inclusion of a lagged percent capacity variable into each model was insignificant[22]. The inclusion of lagged percent capacity in the pooled OLS model in Column 4 of Table 3 caused the main percent capacity effect to become marginally significant, although the lagged effect was not significant. In the fixed effects model in Column 4 of Table 4, the lagged effect eliminated the explanatory power of the main effect, and the lagged effect was

[22] The models report the results for a one-month lag of crowding. Models were also run with lagged effects of higher orders (up to five months) but none of the lagged variables reached significance in any of the models.

not significant. The lack of significance for the lagged variable indicates the harmful effects of crowding are likely felt instantaneously with crowded environments in the facility. These findings shed light on the potential mechanism for crowding's impact on misconduct rates and will be addressed further in the discussion.

VIOLENT MISCONDUCTS

Previous literature has typically focused solely on the relationship between crowding and violence within prisons (Gaes and McGuire, 1985; Steiner, 2009; Wooldredge and Steiner, 2009). To provide an understanding of this relationship, violent misconduct rate was also utilized as a dependent variable, and the results from the pooled OLS models are presented in Table 5, and the fixed effects models are presented in Table 6. Overall, both the OLS and fixed effects models had much less explanatory power for violent misconducts compared to the previous analyses for all misconducts. This is in line with previous longitudinal work as Ruback and Carr (1993) found while the effect of crowding on both the violent and nonviolent models were significant, the effect of crowding was slightly stronger for nonviolent infractions. Although there was a positive bivariate correlation between percent capacity and violent misconduct rate, the introduction of time-varying controls explained away that relationship. As can be seen in the pooled OLS regression (Table 5, Column 1), there is not a significant relationship between percent capacity and violent misconduct,[23] and this persists regardless of the control variables included in each model. Notably, the introduction of the squared term in Column 3 results in a negative main effect, but it remains insignificant. Other variables of note are

[23] Again, clustering the standard errors in the pooled OLS models caused this relationship to lose significance, indicating the errors were highly correlated within institutions.

statistically significant. For example, the percentage of the population classified as MHD (the most severe classification), are positively related to violent misconducts in all models as expected since it was hypothesized that individuals with more severe mental health issues would have greater trouble adapting to imprisonment and may act out with infractions. However, as mentioned previously, this variable was not significant in the general misconduct analyses, indicating different mechanisms connecting mental health and different types of misconduct. Additionally, the race variable of percent Hispanic was consistently significant and negative across the pooled OLS models. These results indicate that prisons with larger Hispanic populations compared to white populations experience lower rates of violent misconduct.

Two surprising findings stand out from these results. The first is the significant and negative effect of the percentage of the prison population designated as Risk two and Risk three compared to the omitted category of Risk one. It is possible facilities with these more risky inmates utilize more counteractive measures, unobserved by this study, to keep such inmates from participating in violent misconducts. Secondly, programming was significant but positive across the OLS models, meaning that months with larger percentages participating in programs had higher rates of violent misconduct. It is possible this finding stems from individuals who need programming for counseling or other avenues which signal that individual as more risky or dangerous and in need of programming help, and may not be representative of the inmates in more elective programming such as educational classes (Steiner and Wooldredge, 2008).

Fixed effects models provide a stronger test of this relationship by controlling for time-stable characteristics and these models for violent misconduct are presented in Table 6.[24] As seen in the table, the relationship between percent capacity and violent misconduct is not significant in any of the fixed effects models regardless of the addition of non-linear or lagged effects. Additionally, mental health designation was a much better predictor of violent misconduct than of all misconducts generally in that all three levels of mental health classification were positively related to violence. As with the previous analyses of all misconducts, custody levels remained significant predictors for the violent misconduct rate. An interesting finding is the lack of significance for the proportion of a facility convicted for a Part I violent offense. While this variable was significant in the fixed effects model for all misconducts, it is not a predictor for violence specifically. Although percent Part I violent offenders was positively correlated with both general and violent misconducts, with the introduction of control variables, months with larger percent Part I violent offenders had higher rates of other types of misconducts such as drug or property misconducts compared to violent misconduct. This is an interesting finding that deserves more research.

The lagged effect of percent capacity was also included in the violent misconduct model and these results are presented in Column 4 of both Tables 5 and 6. Since percent capacity was not significantly related to violence, lagged percent capacity also was not related to violent misconduct. However, the inclusion of the

[24] Additional analyses were run with the number of violent misconducts as the dependent variable to account for the possibility of the rate of the dependent variable affecting the results. The number of violent misconducts was examined and a control variable for prison population size was included in the analysis. However, crowding remained insignificant in these models.

lagged effect did slightly improve the amount of variation explained by the models. As with all misconducts, these findings show that crowding does not appear to have a delayed impact on violent misconducts, at least as it is measured in this study.

AGE, CROWDING, AND MISCONDUCT

One of the most significant predictors of inmate misconduct in previous literature has been inmate age (Eckland-Olson et al., 1983; Franklin et al., 2006; Nicci et al., 1977; Steiner and Wooldredge, 2008; Valentine et al., 2015; Wooldredge and Steiner, 2009), and average inmate age was included in the current analysis. Surprisingly, this relationship was not significant in the pooled OLS models for either violence or general misconducts. However, in the fixed effects models for general misconduct accounting for time-stable factors, there was a significant effect for age, although the effect is slightly diminished with the addition of the squared percent capacity term. This indicates something about the percent capacity squared term limits the explanatory effect of inmate age. However, in these models age is positive, which is contrary to existing literature. The bivariate correlation between age and misconducts was negative and significant so it is the addition of the time-varying controls that is causing this variable to become positive. In the fixed effects models for violence, inmate age was consistently significant and negative across all models as hypothesized, indicating a stronger relationship between age and violence than age and all misconducts. This variable indicates there is an inverse relationship between

age and violence and prison months with older inmate populations had lower rates of violence.[25]

Additionally, previous research has highlighted the potential for an interaction between crowding and inmate age in that crowding appears to have a larger impact on younger inmates participating in misconduct (Nacci et al., 1977; Wooldredge et al., 2001). Thus, models were run to analyze the impact of such an interaction (not shown). The addition of the percent capacity-age interaction to the pooled OLS models for both general and violent misconducts did not achieve significance and did not impact the main effect of percent capacity. In the fixed effects models, the interaction was marginally significant in the most basic models for both general and violent misconducts containing just the main percent capacity effect, inmate age, and the percent capacity-age interaction. In both models inmate age was negative and significant while the interaction was positive and marginally significant. However, the addition of other time-varying control variables for both general and violence eliminated the interaction effect. This indicates the crowding-age interaction found in previous research does not hold when analysis is focused on within-institution changes.

[25] To further investigate the impact of age, Pine Grove facility was excluded from analyses. Pine Grove has an average inmate age of 30.7 years old compared to 38.6 for all other facilities, and Pine Grove was built specifically to house younger inmates. However, the exclusion of this facility does not impact the relationship between crowding and misconducts.

Chapter 9: Conclusions and Discussion

The present study advances the existing literature on crowding and misconduct on several fronts. First, by using fixed effects models based on state prison panel data over 36 months, it accounts for between-prison heterogeneity that can bias the results from cross-sectional research. While the pooled OLS provided interesting results, the fixed effects models' ability to better account for, and take advantage of, panel data and analysis of within-institution changes contributes to the state of knowledge on this research question. Additionally, it attempts to control for time-varying confounders by including a rich set of time-varying controls, some of which (e.g., use of restricted housing) have been rarely captured in prior work. It also updates our knowledge on the relationship between crowding and misconducts in a contemporary, large state prison system, which is urgently needed in the era of mass incarceration. The findings from this study provide evidence that prison crowding leads to inmate misconduct although the effect diminishes as crowding increases. However, the relationship between crowding and violence, which is often found in prior work, was not supported in our analyses.

Part of this study was the attempt to explore the potential mechanism behind the relationship between crowding and inmate misconduct. Two possible mechanisms were put forth. One, that crowding is an environmental stressor where inmates have less privacy and more opportunities to commit misconduct (Gaes, 1985). On the other hand, it's possible that crowding has a psychological impact on inmates and changes the way inmates perceive certain actions (Lawrence and Andrews, 2004). The first hypothesizes that crowding will result in misconducts

nearly instantaneously while the second mechanism has the potential for delayed effects. Thus, the current study introduced a one-month lagged measure of crowding to examine the potential for crowding to have long-term effects beyond the simple environmental stressor. A thorough search of the literature determined only one other study has examined this possibility (Gaes and McGuire, 1985). However, as described in both the misconduct analyses and the violent misconduct analyses, none of the models demonstrated significance for the lagged capacity variable. Thus, the current study supports the notion that crowding is an environmental stressor and more misconducts are likely to occur in the same month when a facility is crowded, which is consistent with the findings of Gaes and McGuire's (1985) examination of federal data.

Several other findings merit discussion. The current study did not find as consistent of an impact of age on misconduct. In the fixed effects models for general misconducts, inmate age was significant but was slightly diminished in the model that included the percent capacity squared term. However, this relationship was positive and opposite of the hypothesized direction. Age was negatively and significantly related to violent misconduct in the fixed effects models, meaning in months with a younger inmate population, there were more misconducts per 100 inmates. Thus, it is possible the consistent finding of the negative effect of age on misconduct in previous literature has largely been due to the strong relationship between age and violence. This is supported by Steiner and Wooldredge's (2009c) findings of a stronger effect of age for assaults compared to other misconducts. The previous support for an

interaction between crowding and age was not supported in this study, indicating this variable is not as impactful when between-prison variation is removed.

The current study included measures of work and programming to examine the potential for these activities to keep inmates from participating in misconduct. These variables were insignificant in the general misconduct models. However, with pooled OLS models for violent misconducts programming was positive and significant. This finding is contrary to expectations and could indicate that more disruptive inmates are enrolled in programs. One possible explanation for the lack of findings in the fixed effects models is that incremental shifts in the percentage of an institution in a program or with a work assignment were not large enough to have an impact on misconduct rates. Additionally, this study used a conservative measure of work and programming, allowing any inmate who worked or participated in a program at least one day in a month to count toward the aggregate percentage. It is possible this measure contributed to the lack of findings for within-institution changes.

Lastly, the current study attempted to address a facility's potential response to crowding with the inclusion of staff variables, particularly an inmate-to-CO ratio and the proportion of CO positions filled in a given month. However, the only meaningful relationship was found for the proportion of CO positions filled in the fixed effects models examining general misconduct rates. This finding indicates an increase in positions filled results in a decrease in misconducts, potentially due to the deterrent effect of more officers. The ratio of inmates to officers was not significant

in any of the presented models indicating the potential for deterrent and reporting effects to be canceling each other out.

Although the methods and data used in this study led to a unique contribution to previous literature, there are limitations that deserve acknowledgement. First, this study utilized official measures of misconduct. Official disciplinary reports were used due to their data availability and the use of such reports by PADOC to administratively keep track of all misconducts occurring in the system. It is acknowledged that official measures of misconduct likely do not provide a complete picture of the disciplinary issues occurring in any given facility and all misconduct types are likely undercounted in official infraction reports (Wolff et al., 2007). There is also the possibility that certain types of misconduct or misconducts committed by certain types of inmates are systematically undercounted, particularly as prisons become overcrowded. These issues cannot be adequately addressed in the current study. However, a few previous studies comparing self-report measures of misconduct with official measures have concluded both types of measurements are valid and reliable (Hewitt et al., 1984; Steiner and Wooldredge, 2014). In particular, Steiner and Wooldredge (2014) found the divergence between self-report and official measures was not systematic. Thus, while the use of official measures is a potential limitation of this study, the use of PADOC's disciplinary reports is still important to understand how an institution can deal with issues of discipline.

There is also a potential limitation in this study's use of rated capacity as compared to design capacity. As mentioned previously, there is potential for prison administrators to manipulate the rated capacity to allow for more inmates to be

allowed into the facility than what the facility was originally built to hold (Steiner and Wooldredge, 2009b). Comparisons of crowding measured using design or rated capacity have not been performed in previous literature, likely because most studies only have access to one definitional measure of capacity. Although the use of rated capacity is a potential limitation and little is known of the differences between design and rated capacity measures, it was the only measure of capacity available to this study. Additionally, the definitional issues likely did not impact the results of this study due to the rated capacity definition being the same across the state of Pennsylvania. The same measure of capacity over the 36-month study period allows for the analysis of change regardless of the base measure used to define "crowding." These definitional issues are likely more of a concern for studies that attempt to examine crowding across several states.

Third, as with all studies of this nature, omitted variables are a concern. For this particular study, the concern is with time-varying factors that are not accounted for by the fixed-effects model that could result in biased estimates. Thus, factors such as previous incarceration information on inmates, gang membership, visitation, time served, implementation of violence reduction programs, or changes of prison superintendent, would have provided valuable controls as they could by dynamically associated with both crowding and misconducts and bias fixed effects estimates (Bjerk, 2009).

Additionally, a potential limitation of the use of a fixed effects model is the need for sufficient within-institution variation in the time-varying controls included in the model. There is the possibility that some of the insignificance in the control

variables is due to a lack of variation in within-prison change rather than the lack of importance of that variable. For example, work and programming were not significant in the fixed effects models. It is possible this is due to the somewhat stable proportions of the inmate population working or engaging in programs within institutions in PADOC rather than the lack of time spent productively impacting misconduct rates.

Lastly, while this study contributes to the literature by using contemporary state prison data, the study is limited to observational data from Pennsylvania in particular years. There are potentially unique aspects of the state of Pennsylvania or of the PADOC system that shaped results, and the current findings may not generalize to other states. For example, Pennsylvania had a particular Governor and Secretary of Corrections during the study period. Pennsylvania also uses an indeterminate sentencing system with discretionary parole release, so the results may not generalize to states with other sentencing structures. Thus, more studies using state prison panel data are required to fully understand the relationship between crowding and misconducts within facilities nationally.

With regards to specific recommendations for PADOC, the current analyses did not identify the long-held belief of prison administrators and staff that crowding results in violence. However, the current study did find changes in crowding levels within an institution lead to increases in general misconduct. While these changes were somewhat small in magnitude, PADOC administrators may want to focus attention of programs aimed at reducing non-violent misconduct to counteract the deleterious effects of crowding, which would allow prison staff to focus on other

issues besides minor incidents of misconduct. PADOC may also want to better distribute inmates across facilities to keep crowding to manageable levels. For example, the Pine Grove and Waymart facilities had lower levels of crowding during the study period (Table 2). It is possible these prisons could receive a limited number of inmates from more full facilities without compromising the ability of Pine Grove and Waymart to manage their inmate populations. Additionally, this study did find a strong relationship between inmate age and violent misconducts. Thus, prison administrators who continue to be concerned with inmate violence could dedicate resources and violence-reduction programs to younger inmates rather than attempting to reach the entire prison population.

While crowding was found to significantly impact misconducts, there were other institutional factors that were more consistently related to the dependent variable (Ruback and Carr, 1993). For example, the MH missing variable was consistently related to greater rates of general misconducts in the fixed effects models. This likely indicates greater misconduct rates in the intake and Diagnostic and Classification centers. PADOC may want to focus some resources in these facilities to aid the transition for newly incarcerated offenders.

Lastly, mental health classification had an impact on violent offenses when controlling for time-stable factors. The significance of the proportion of a population with MHC and MHD classification indicates the need for programming and other resources to be dedicated to the mentally ill inmate population. The importance of these variables in predicting violence indicates mental health is a much greater factor for violent misconducts than crowding.

This study demonstrated crowding can lead to all types of misconducts in a large state facility over the course of three years. However, there does not appear to be a relationship between prison crowding and rates of violent misconduct specifically. This finding contradicts the views of prison administrators and staff who view crowding as a threat to staff and inmate safety and as a potential risk for violence. It is possible this concern of violence in crowded institutions leads prison officials to take counteractive actions, not observed in this study, to deal with such a relationship. Future studies should continue the examination of crowding and misconduct over time, especially accounting for such counteractive policy and program changes, to isolate the impact of prison-level changes on misconduct. Such research is needed before complete policy recommendations and remedies can be provided to prison administrators.

Appendices

Figure 1: Distribution of Misconduct Rate (per 100 inmates)

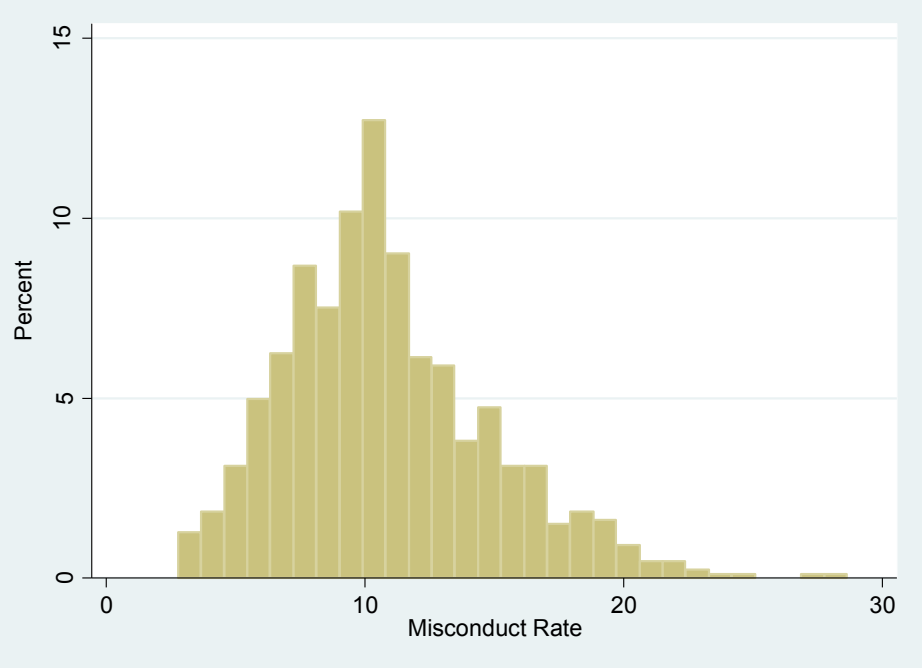

Figure 2: Distribution of Violent Misconduct Rate (per 100 inmates)

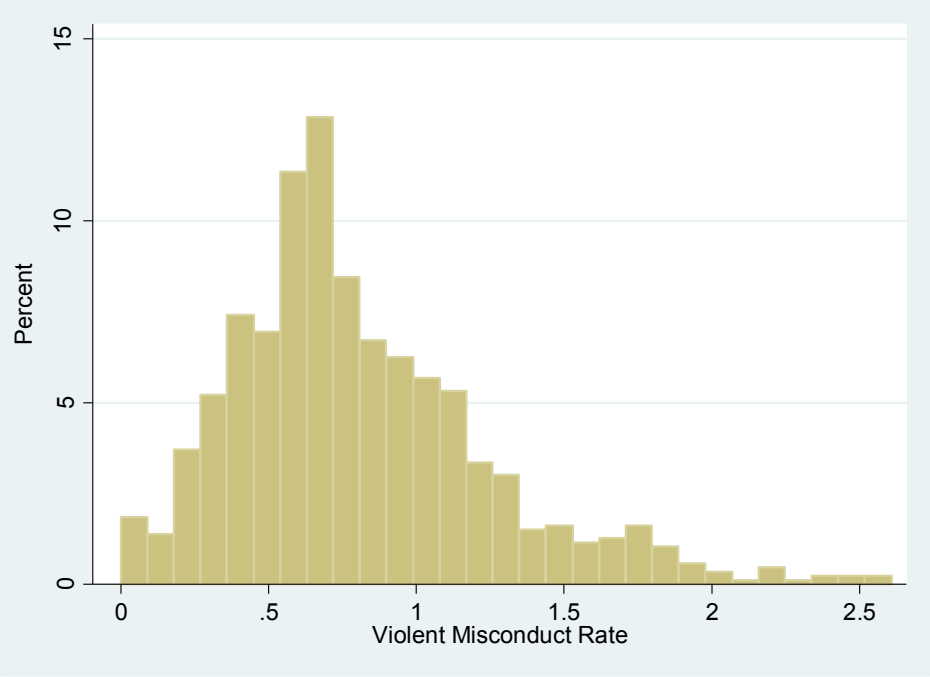

Figure 3: Percent Capacity and Misconduct Rate

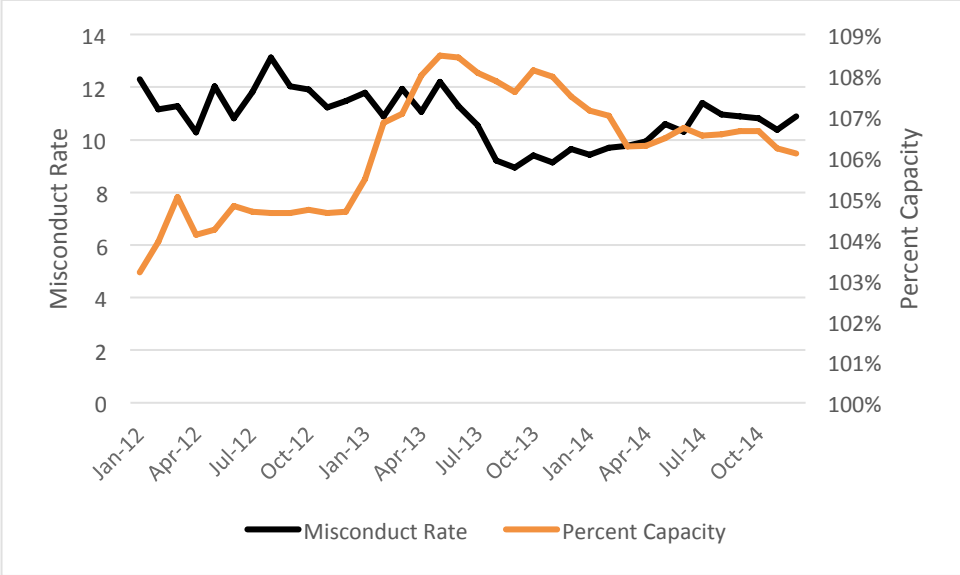

Figure 4: Percent Capacity and Violent Misconduct Rate

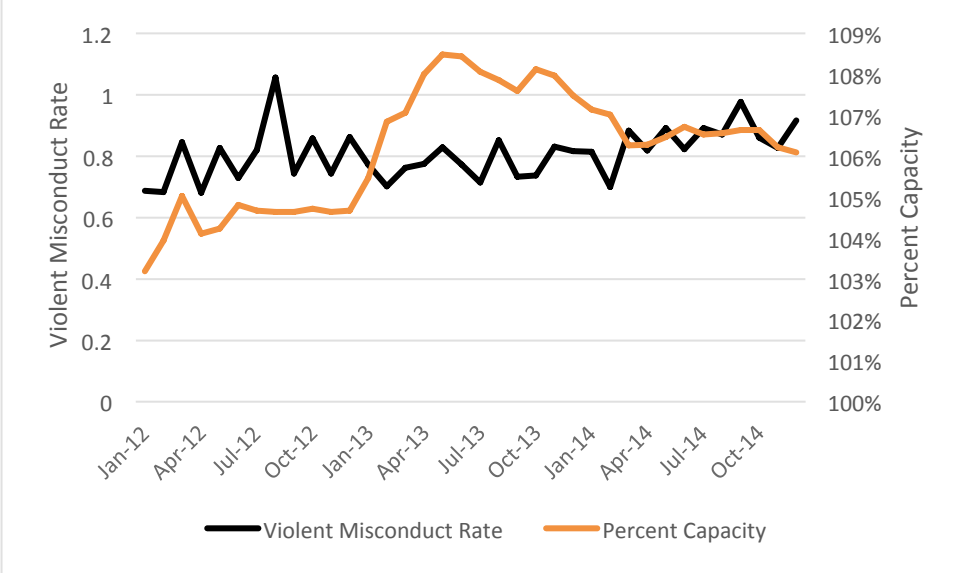

Table 1: Summary Statistics (n = 864)

Variable	Mean	SD	Min	Max
Misconduct Rate	10.849	3.982	2.774	28.653
Violent Misconduct Rate	.809	.437	0	2.608
Percent Capacity	106.201	8.964	75.2	124.4
Percent Capacity Squared	11358.9	1866.127	5655.04	15475.36
Lagged Percent Capacity	106.204	9.006	75.2	124.4
Time-varying covariates:				
Percent Race				
Black	47.998	9.508	26.950	67.681
White	40.143	10.602	20.672	64.881
Hispanic	11.125	3.745	3.521	26.108
Other Race	.734	.333	.155	2.472
Percent Custody				
Blank Custody	.617	1.716	0	17.502
L1	2.092	3.852	0	21.379
L2	44.788	11.848	18.648	75.300
L3	34.251	5.853	20.466	66.477
L4	12.883	6.668	0	26.121
L5	5.369	4.122	.401	24.561
Average Inmate Age	38.289	2.586	28.811	44.569
Percent Offense Type				
Drugs	18.594	5.321	7.39	33.49
Other Violent	11.839	5.136	4.7	30.35
Part 1 Violent	43.246	11.722	22.55	68.17
Prison Age	41.292	36.668	8	132
Percent Risk Assessment				
Riskone	13.068	6.426	4.583	35.661
Risktwo	69.983	7.331	43.064	84.839
Riskthree	9.630	3.149	3.235	15.670
Riskmissing	7.320	8.118	.263	43.260
Percent Mental Health				
MHA	47.504	10.257	9.733	63.129
MHB	26.556	5.131	14.521	38.873
MHC	16.947	7.879	6.014	46.813
MHD	4.952	5.183	0	27.745
MHmissing	4.040	6.368	.087	39.548
Percent Work	97.158	5.140	71.475	100
Percent Programs	19.833	8.608	4.048	51.620
Staff Position				
CO Ratio	5.558	1.224	3.147	8.273
Prop CO Filled	.956	.024	.839	1
Lag Percent Administrative Custody	1.910	2.004	0	13.102

Lag Percent Disciplinary Custody	2.791	1.475	0	7.350

Table 2: Percent Capacity by Institution Across 36 Months

Institution	Mean	SD	Min	Max
Albion (ALB)	107.21	1.02	105	108.6
Camp Hill (CAM)	109.05	3.18	102.6	115.1
Cambridge Springs (CBS)	98.06	2.82	91	102.1
Chester (CHS)	106.64	1.66	101.9	109.7
Coal Township (COA)	106.64	1.53	99.4	108.5
Dallas (DAL)	108.88	1.11	106.3	110.6
Frackville (FRA)	103.81	1.08	101.1	106
Forest (FRS)	117.73	3.24	112.8	122.6
Fayette (FYT)	112.16	1.17	109.7	114.1
Graterford (GRA)	110.44	6.26	101.2	119.5
Greene (GRN)	119.32	2.09	116.1	123.5
Houtzdale (HOU)	108.15	.70	105.8	109.3
Huntingdon (HUN)	118.43	1.12	115.9	120
Laurel Highlands (LAU)	96.19	4.26	86.8	101.7
Mahanoy (MAH)	109.47	1.61	106.3	116.2
Mercer (MER)	99.15	1.31	94.4	101.4
Muncy (MUN)	101.68	2.73	97.4	108
Pittsburgh (PIT)	99.17	7.00	86.1	108
Pine Grove (PNG)	90.57	10.94	75.2	105.4
Retreat (RET)	102.35	1.78	97.4	105.3
Rockview (ROC)	105.73	3.57	95.1	108.4
Smithfield (SMI)	121.81	1.60	117.3	124.4
Somerset (SMR)	106.19	1.21	103.9	108.6
Waymart (WAM)	90.03	6.15	79.8	98

Table 3: OLS Models- Misconduct Rate (per 100 Inmates)

Variables	B (S.E.)	B (S.E.)	B (S.E.)	B (S.E.)
Percent Capacity	.106 (.074)	-.042 (.054)	-.072 (.273)	-.097 (.051)*
Percent Capacity Squared	-	-	.000 (.001)	-
Percent Capacity Lagged	-	-	-	.058 (.061)
Time-varying controls:				
Percent Black	-	.026 (.174)	.026 (.173)	.024 (.175)
Percent Hispanic	-	.029 (.086)	.030 (.086)	.033 (.086)
Percent Other Race	-	-.279 (1.169)	-.286 (1.185)	-.288 (1.167)
Percent Blank Custody	-	-.179 (.195)	-.179 (.195)	-.165 (.196)
Percent L1	-	-.611 (.188)***	-.609 (.188)***	-.602 (.186)***
Percent L2	-	-.452 (.170)**	-.451 (.170)**	-.450 (.170)**
Percent L3	-	-.409 (.176)**	-.408 (.178)**	-.405 (.176)**
Percent L4	-	-.404 (.155)**	-.402 (.154)**	-.401 (.153)**
Inmate Age	-	-.322 (.413)	-.318 (.408)	-.330 (.419)
Offense type-drugs	-	-.074 (.245)	-.073 (.248)	-.080 (.246)
Offense type-other violent	-	-.017 (.134)	-.017 (.136)	-.018 (.135)
Offense type-Part 1 violent	-	.037 (.195)	.034 (.194)	.034 (.194)
Prison age	-	.016 (.010)	.016 (.010)	.016 (.010)
CO ratio	-	-.317 (.337)	-.313 (.336)	-.316 (.337)
Proportion CO filled	-	2.094 (10.782)	2.185 (10.600)	1.868 (10.884)
Risk Two	-	-.016 (.189)	-.016 (.189)	-.018 (.190)
Risk Three	-	.069 (.128)	-.068 (.129)	.056 (.135)
Risk Missing	-	-.354 (.131)**	-.352 (.131)**	-.354 (.132)**
MHB	-	.089 (.103)	.088 (.105)	.087 (.104)
MHC	-	.208 (.067)***	.209 (.070)***	.208 (.067)***
MHD	-	.008 (.077)	.008 (.077)	.005 (.079)
MH Missing	-	.323 (.208)	.320 (.210)	.316 (.208)
Work	-	-.109 (.130)	-.108 (.130)	-.107 (.129)
Programs	-	-.116 (.072)	-.116 (.072)	-.118 (.073)
Lag AC	-	-.798 (.320)**	-.798 (.322)**	-.794 (.318)**
Lag DC	-	.584 (.353)	.580 (.366)	.592 (.347)
Constant	-.402 (7.918)	74.831 (41.478)*	75.902 (43.479)*	75.135(41.705)*

*p<.1 **p<.05 ***p<.01

Robust and clustered standard errors are presented in parentheses. Column 1 shows the main relationship between prison crowding and misconduct without controls. Column 2 adds the time-varying controls to the model. Column 3 adds the squared percent capacity term. Column 4 examines the one-month lagged percent capacity effect.

Table 4: Fixed Effects Models- Misconduct Rate (per 100 Inmates)

Variables	B (S.E.)	B (S.E.)	B (S.E.)	B (S.E.)
Percent Capacity	-.107 (.049)**	.032 (.048)	.990 (.425)**	-.002 (.038)
Percent Capacity Squared	-	-	-.005 (.002)**	-
Lagged Percent Capacity	-	-	-	.038 (.041)
Time-varying controls:				
Percent Black	-	-.214 (.113)*	-.157 (.127)	-.212 (114)*
Percent Hispanic	-	-.262 (.134)*	-.202 (.139)	-.258 (.134)*
Percent Other Race	-	1.056 (.847)	.995 (.815)	1.063 (.846)
Percent Blank	-	-1.093 (.326)***	-1.140 (.324)***	-1.088 (.328)***
Custody				
Percent L1	-	-1.240 (.303)***	-1.391 (.329)***	-1.230 (.306)***
Percent L2	-	-1.416 (.307)***	-1.532 (.326)***	-1.418 (.309)***
Percent L3	-	-1.226 (.310)***	-1.337 (.327)***	-1.225 (.312)***
Percent L4	-	-1.256 (.295)***	-1.386 (.311)***	-1.255 (.296)***
Inmate Age	-	.779 (.309)**	.496 (.248)*	.750 (.313)**
Offense type-drugs	-	.300 (.157)*	.233 (.156)	.293 (.157)*
Offense type-other violent	-	.204 (.180)	.248 (.179)	.205 (.181)
Offense type-Part 1 violent	-	.291 (.111)**	.250 (.115)**	.291 (.112)**
Prison age	-	-.056 (.145)	-.196 (.160)	-.057 (.146)
CO ratio	-	-.526 (.829)	.129 (.966)	-.453 (.847)
Proportion CO filled	-	-13.704 (6.975)*	-9.575 (8.755)	-13.629 (7.023)*
Risk Two	-	-.015 (.117)	-.092 (.133)	-.022 (.115)
Risk Three	-	-.051 (.255)	-.098 (.250)	-.063 (.255)
Risk Missing	-	-.415 (.156)**	-.526 (.151)***	-.426 (.155)**
MHB	-	.011 (.168)	.081 (.176)	.015 (.169)
MHC	-	-.051 (.066)	-.023 (.067)	-.048 (.065)
MHD	-	-.082 (.061)	-.033 (.067)	-.079 (.061)
MH Missing	-	.378 (.171)**	.467 (.160)***	.385 (.172)**
Work	-	-.053 (.087)	-.071 (.082)	-.051 (.087)
Programs	-	-.062 (.062)	-.062 (.060)	-.065 (.063)
Lag AC	-	.271 (.197)	.263 (.186)	.267 (.196)
Lag DC	-	.265 (.209)	.296 (.219)	.269 (.207)

Constant	22.212(5.243)***	121.766(28.953)***	101.736(25.088)***	122.423(29.077)***
Within R-Squared	.0247	.3022	.3124	.3028

*p<.1

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

Robust standard errors are presented in parentheses. Column 1 shows the main relationship between prison crowding and misconduct without controls. Column 2 adds the time-varying controls to the model. Column 3 adds the squared percent capacity term. Column 4 examines the one-month lagged percent capacity effect.

Table 5: OLS Models- Violent Misconduct Rate (per 100 Inmates)

Variables	B (S.E.)	B (S.E.)	B (S.E.)	B (S.E.)
Percent Capacity	.005 (.008)	.004 (.003)	-.036 (.036)	-.006 (.008)
Percent Capacity Squared	-	-	.000 (.000)	-
Percent Capacity Lagged	-	-	-	.010 (.008)
Time-varying controls:				
Percent Black	-	.009 (.010)	.010 (.010)	.009 (.010)
Percent Hispanic	-	-.017 (.009)*	-.016 (.008)*	-.016 (.009)*
Percent Other Race	-	-.114 (.073)	-.123 (.068)*	-.115 (.072)
Percent Blank Custody	-	-.012 (.020)	-.012 (.019)	-.009 (.019)
Percent L1	-	-.017 (.016)	-.014 (.015)	-.015 (.016)
Percent L2	-	-.020 (.016)	-.018 (.015)	-.019 (.016)
Percent L3	-	-.010 (.018)	-.008 (.017)	-.009 (.018)
Percent L4	-	.013 (.015)	.017 (.016)	.014 (.015)
Inmate Age	-	-.034 (.029)	-.030 (.028)	-.036 (.030)
Offense type-drugs	-	.017 (.016)	.018 (.016)	.016 (.016)
Offense type-other violent	-	.008 (.013)	.008 (.012)	.008 (.013)
Offense type-Part 1 violent	-	.006 (.010)	.005 (.010)	.006 (.010)
Prison age	-	-.001 (.001)	-.001 (.001)	-.001 (.001)
CO ratio	-	-.032 (.030)	-.026 (.029)	-.032 (.030)
Proportion CO filled	-	-.285 (.662)	-.163 (.747)	-.323 (.655)
Risk Two	-	-.031 (.012)**	-.031 (.013)**	-.031 (.012)**
Risk Three	-	-.025 (.013)*	-.026 (.014)*	-.027 (.013)*
Risk Missing	-	-.018 (.011)	-.015 (.012)	-.018 (.011)
MHB	-	.002 (.009)	.001 (.009)	.001 (.009)
MHC	-	.006 (.007)	.007 (.007)	.006 (.007)
MHD	-	.019 (.007)**	.019 (.007)**	.018 (.007)**
MH Missing	-	-.013 (.015)	-.016 (.016)	-.014 (.015)
Work	-	-.008 (.008)	-.007 (.008)	-.007 (.008)
Programs	-	.010 (.003)***	.010 (.004)**	.010 (.003)***
Lag AC	-	-.049 (.022)**	-.048 (.022)**	-.049 (.022)**
Lag DC	-	.015 (.028)	.010 (.029)	.016 (.027)
Constant	.316 (.873)	5.364 (2.771)*	6.789 (2.631)**	5.416 (2.769)*

*p<.1 **p<.05 ***p<.01

Robust and clustered standard errors are presented in parentheses. Column 1 shows the main relationship between prison crowding and violent misconduct without controls. Column 2 adds the time-varying controls to the model. Column 3 adds the squared percent capacity term. Column 4 examines the one-month lagged percent capacity effect.

Table 6: Fixed Effects Models- Violent Misconduct Rate (per 100 Inmates)

Variables	B (S.E.)	B (S.E.)	B (S.E.)	B (S.E.)
Percent Capacity	-.000 (.003)	.002 (.006)	.074 (.049)	-.009 (.008)
Percent Capacity Squared	-	-	-.000 (.000)	-
Lagged Percent Capacity	-	-	-	.013 (.008)
Time-varying controls:				
Percent Black	-	.015 (.017)	.019 (.017)	.016 (.017)
Percent Hispanic	-	-.007 (.013)	-.002 (.014)	-.005 (.013)
Percent Other Race	-	.014 (.089)	.010 (.089)	.017 (.091)
Percent Blank Custody	-	-.069 (.033)**	-.073 (.031)**	-.067 (.033)*
Percent L1	-	-.064 (.028)**	-.075 (.026)***	-.061 (.028)**
Percent L2	-	-.062 (.031)*	-.070 (.029)**	-.062 (.032)*
Percent L3	-	-.053 (.031)*	-.061 (.028)**	-.053 (.031)*
Percent L4	-	-.053 (.030)*	-.063 (.028)**	-.053 (.030)*
Inmate Age	-	-.124 (.051)**	-.145 (.053)**	-.133 (.051)**
Offense type-drugs	-	.032 (.019)	.027 (.019)	.030 (.019)
Offense type-other violent	-	.006 (.022)	.009 (.023)	.006 (.022)
Offense type-Part 1 violent	-	.003 (.016)	.000 (.015)	.003 (.016)
Prison age	-	-.008 (.033)	-.019 (.037)	-.008 (.032)
CO ratio	-	.016 (.131)	.065 (.157)	.040 (.125)
Proportion CO filled	-	.584 (.825)	.895 (.789)	.610 (.845)
Risk Two	-	-.050 (.016)***	-.056 (.015)***	-.052 (.016)***
Risk Three	-	-.060 (.031)*	-.063 (.031)*	-.064 (.030)**
Risk Missing	-	-.034 (.020)	-.042 (.019)**	-.037 (.020)*
MHB	-	.025 (.012)**	.030 (.012)**	.026 (.012)**
MHC	-	.041 (.010)***	.043 (.009)***	.042 (.010)***
MHD	-	.043 (.008)***	.047 (.008)***	.044 (.008)***
MH Missing	-	-.007 (.022)	.000 (.023)	-.004 (.023)
Work	-	-.014 (.012)	-.016 (.012)	-.014 (.012)
Programs	-	.002 (.007)	.002 (.006)	.001 (.006)
Lag AC	-	-.013 (.025)	-.013 (.024)	-.014 (.024)
Lag DC	-	-.036 (.031)	-.033 (.031)	-.034 (.031)
Constant	.856 (.313)**	13.168 (4.046)***	11.662 (4.464)**	13.389 (3.956)***
Within R-Squared	.0000	.0779	.0808	.0811

*p<.1 **p<.05 ***p<.01

Robust standard errors are presented in parentheses. Column 1 shows the main relationship between prison crowding and violent misconduct without controls. Column 2 adds the time-varying controls to the model. Column 3 adds the squared percent capacity term. Column 4 examines the one-month lagged percent capacity effect.

Bibliography

Bales, William D. 2012. The impact of determinate sentencing on prisoner misconduct. *Journal of Criminal Justice* 40:394-403.

Beck, Allen J., Ramona R. Rantala, and Jessica Resroat. 2014. Sexual victimization reported by adult correctional authorities, 2009-11. U.S. Department of Justice, Office of Justice Programs. Bureau of Justice Statistics.

Bjerk, David. 2009. How much can we trust causal interpretations of fixed-effects estimators in the context of criminality? *Journal of Quantitative Criminology* 25:391-417.

Blevins, Kristie R., Shelley Johnson Listwan, Francis T. Cullen, and Cheryl Lero Jonson. 2010. A general strain theory of prison violence and misconduct: An integrated model of inmate behavior. *Journal of Contemporary Criminal Justice* 26:148-66.

Bonta, James, and Paul Gendreau. 1990. Reexamining the cruel and unusual punishment of prison life. *Law and Human Behavior* 14:347-72.

Brame, Robert, Shawn Bushway, and Raymond Paternoster. 1999. On the use of panel research designs and random effects models to investigate static and dynamic theories of criminal offending. *Criminology* 37:599-642.

Browne, Angela, Leon Digard, Christine Herrman, Sara Sullivan. 2015. Segregation Reduction Project Findings and Recommendations: Pennsylvania Department of Corrections Use of Segregation. New York, NY: Vera Institute of Justice.

Bushway, Shawn, Robert Brame, and Raymond Paternoster. 1999. Assessing stability and change in criminal offending: A comparison of random effects, semiparametric, and fixed effects modeling strategies. *Journal of Quantitative Criminology* 15:23-61.

Butler, H. Daniel, and Benjamin Steiner. 2016. Examining the use of disciplinary segregation within and across prisons. *Justice Quarterly*. epub ahead of print. doi: 10.1080/07418825.2016.1162319

Camp, Scott D., Gerald G. Gaes, Neal P. Langan, and William G. Saylor. 2003. The influence of prisons on inmate misconduct: A multilevel investigation. *Justice Quarterly* 20:501-33.

Carson, E. Ann. 2014. Prisoners in 2013. Washington, DC: Bureau of Justice Statistics Bulletin.

Carson, E. Ann. 2015. Prisoners in 2014. Washington, DC: Bureau of Justice Statistics Bulletin.

Carson, E. Ann, and Daniela Golinelli. 2014. Prisoners in 2012: Trends in admissions and releases, 1991-2012. Washington, DC: Bureau of Justice Statistics Bulletin.

Cochran, Joshua C., Daniel P. Mears, William D. Bales, and Eric A. Stewart. 2014. Does inmate behavior affect post-release offending? Investigating the misconduct-recidivism relationship among youth and adults. *Justice Quarterly* 31:1044-73.

Cullen, Francis T., Edward J. Latessa, Velmer S. Burton Jr., and Lucien X. Lombardo. 1993. The correctional orientation of prison wardens: Is the rehabilitative ideal supported? *Criminology* 31:69-92.

DeLisi, Matt, Andy Hochstetler, and Daniel S. Murphy. 2003. Self-control behind bars: A validation study of the Grasmick et al. scale. *Justice Quarterly* 20: 241-63.

De Viggiani, Nick. 2007. Unhealthy prisons: Exploring structural determinants of prison health. *Sociology of Health & Illness* 29:115-35.

Eckland-Olson, Sheldon, Dennis M. Barrick, and Lawrence E. Cohen. 1983. Prison overcrowding and disciplinary problems: An analysis of the Texas prison system. *The Journal of Applied Behavioral Science* 19:163-76.

Franklin, Travis W., Cortney A. Franklin, and Travis C. Pratt. 2006. Examining the empirical relationship between prison crowding and inmate misconduct: A meta-analysis of conflicting research results. *Journal of Criminal Justice* 34:401-12.

French, Sheila A., and Paul Gendreau. 2006. Reducing prison misconducts: What works! *Criminal Justice and Behavior* 33:185-218.

Gaes, Gerald D. 1985. The effects of overcrowding in prison. *Crime and Justice* 6:95-146.

Gaes, Gerald D. 1994. Prison crowding research reexamined. *The Prison Journal* 74:329-63.

Gaes, Gerald D., and William J. McGuire. 1985. Prison violence: The contribution of crowding versus other determinants of prison assault rates. *Journal of Research in Crime and Delinquency* 22:41-65.

Gendreau, Paul, and David Keyes. 2001. Making prisons safer and more humane environments. *Canadian Journal of Criminology 43*:123-30.

Griffin, Marie L., and John R. Hepburn. 2013. Inmate misconduct and the institutional capacity for control. *Criminal Justice and Behavior* 40:270-88.

Halaby, Charles N. 2004. Panel models in sociological research: Theory into practice. *Annual Review of Sociology* 30:507-44.

Hausman, Jerry A. 1978. Specification tests in econometrics. *Econometrica* 46:1251-71.

Hewitt, John D., Eric D. Poole, and Robert M. Regoli. 1984. Self-reported and observed rule-breaking in prison: A look at disciplinary response. *Justice Quarterly* 1:437-47.

Hirschi, Travis, and Michael R. Gottfredson. 1983. Age and the explanation of crime. *American Journal of Sociology* 89:552-84.

Huebner, Beth M. 2003. Administrative determinants of inmate violence: A multilevel analysis. *Journal of Criminal Justice* 31:107-17.

Huebner, Beth M., Sean P. Varano, and Timothy S. Bynum. 2007. Gangs, guns, and drugs: Recidivism among serious, young offenders. *Criminology & Public Policy* 6:187-221.

Huey, Meredith P., and Thomas L. McNulty. 2005. Institutional conditions and prison suicide: Conditional effects of deprivation and overcrowding. *The Prison Journal* 85:490-514.

James, Doris J., and Lauren E. Glaze. 2006. Mental Health Problems of Prison and Jail Inmates. Bureau of Justice Statistics, NCJ 213600, Washington, DC.

Jiang, Shanhe. 2005. Impact of drug use on inmate misconduct: A multilevel analysis. *Journal of Criminal Justice* 33:153-63.

Jiang, Shanhe, and Marianne Fisher-Giorlando. 2002. Inmate misconduct: A test of the deprivation, importation, and situational models. *The Prison Journal* 82:335-58.

Kerley, Kent R., Heith Copes, Richard Tewksbury, and Dean A. Dabney. 2010. Examining the relationship between religiosity and self-control as predictors of prison deviance. *International Journal of Offender Therapy and Comparative Criminology* 55:1251-721.

Klofas, John M., Stan Stojkovic, and David A. Kalinich. 1992. The meaning of correctional crowding: Steps toward an index of severity. *Crime and Delinquency* 38:171-88.

Kreager, Derek A., David R. Schaefer, Martin Bouchard, Dana L. Haynie, Sara Wakefield, Jacob Young, and Gary Zajac. 2016. Toward a criminology of inmate networks. *Justice Quarterly* 33:1000-28.

Kubrin, Chris, and Carroll Seron. 2016. The prospects and perils of ending mass incarceration in the United States. *The ANNALS of the American Academy of Political and Social Science* 664:16-24.

Lahm, Karen F. 2009. Educational participation and inmate misconduct. *Journal of Offender Rehabilitation* 48:37-52.

Lawrence, Claire, and Kathryn Andrews. 2004. The influence of perceived prison crowding on male inmates' perception of aggressive events. *Aggressive Behavior* 30:273-83.

Leese, Morven, Stuart Thomas, and Louisa Snow. 2006. An ecological study of factors associated with rates of self-inflicted death in prisons in England and Wales. *International Journal of Law and Psychiatry* 29:355-60.

Lofstrom, Magnus, and Steven Raphael. 2016. Prison downsizing and public safety: Evidence from California. *Criminology & Public Policy* 15:349-65.

Lovell, David, and Ron Jemelka. 1996. When inmates misbehave: The costs of discipline. *The Prison Journal* 76:165-79.

Maas, Cora J. M. and Joop J. Hox. 2005. Sufficient sample sizes for multilevel modeling. *Methodology* 1:86-92.

Martin, Joseph L., Bronwen Lichtenstein, Robert B. Jenkot, and David R. Forde. 2012. "They can take us over any time they want": Correctional officers' responses to prison crowding. *The Prison Journal* 91:88-105.

McCain, Garvin, Verne C. Cox, and Paul B. Paulus. 1976. The relationship between illness complaints and degree of crowding in a prison environment. *Environment and Behavior* 8:283-90.

McCorkle, Richard C., Terance D. Miethe, and Kriss A. Drass. 1995. The roots of prison violence: A test of the deprivation, management, and "not-so-total" institution models. *Crime & Delinquency* 41:317-31.

McShane, Marilyn D., and Frank P. Williams III. 1989. The prison adjustment of juvenile offenders. *Crime and Delinquency* 35:254-69.

Morris, Robert G., Michael L. Carriaga, Brie Diamond, Nicole Leeper Piquero, and Alex R. Piquero. 2012. Does prison strain lead to prison misbehavior? An

application of general strain theory to inmate misconduct. *Journal of Criminal Justice* 40:194-201.

Morris, Robert G., and John L. Worrall. 2014. Prison architecture and inmate misconduct: A multilevel assessment. *Crime & Delinquency* 60:1083-109.

Nacci, Peter L., Hugh E. Teitelbaum, and Jerry Prather. 1977. Population density and inmate misconduct rates in the federal prison system. *Federal Probation* 41:26-31.

Noonan, Margaret, Harley Rohloff, and Scott Ginder. 2015. Mortality in Local Jails and State Prisons, 2000-2013- Statistical Tables. Washington, DC: Bureau of Justice Statistics.

Pelissier, Bernadette. 1991. The effects of a rapid increase in a prison population: A pre- and posttest study. *Criminal Justice and Behavior* 18:427-47.

Prison Legal News. 2009. Pennsylvania Prison Crowding, Parole Crisis Result in New Laws, Parole Suspension. April 15.

Raphael, Steven, and Michael A. Stoll. 2013. Why are so many Americans in prison? New York: Russell Sage Foundation.

Rocheleau, Ann Marie. 2013. An empirical exploration of the "pains of imprisonment" and the level of prison misconduct and violence. *Criminal Justice Review* 38:354-74.

Ruback, R. Barry, and Timothy S. Carr. 1993. Prison crowding over time: The relationship of density and changes in density to infraction rates. *Criminal Justice and Behavior* 20:130-48.

Sampson, Robert J., and John H. Laub. 2003. Life-course desisters? Trajectories of crime among delinquent boys followed to age 70. *Criminology* 41:555-92.

Sechrest, Dale K. 1991. The effects of density on jail assaults. *Journal of Criminal Justice* 19:211-23.

Steiner, Benjamin. 2009. Assessing static and dynamic influences on inmate violence levels. *Crime & Delinquency* 55:134-61.

Steiner, Benjamin, H. Daniel Butler, and Jared M. Ellison. 2014. Causes and correlates of prison inmate misconduct: A systematic review of the evidence. *Journal of Criminal Justice* 42:462-70.

Steiner, Benjamin, and John Wooldredge. 2008. Inmate versus environmental effects on prison rule violations. *Criminal Justice and Behavior* 35:438-56.

Steiner, Benjamin, and John Wooldredge. 2009a. Individual and environmental effects on assaults and nonviolent rule breaking by women in prison. *Journal of Research in Crime and Delinquency* 46:437-67.

Steiner, Benjamin, and John Wooldredge. 2009b. Rethinking the link between institutional crowding and inmate misconduct. *The Prison Journal* 89:205-33.

Steiner, Benjamin, and John Wooldredge. 2009c. Implications of different outcome measures for an understanding of inmate misconduct. *Crime & Delinquency* 59:1234-62.

Steiner, Benjamin, and John Wooldredge. 2014. Comparing self-report to official measures of inmate misconduct. *Justice Quarterly* 31:1074-101.

Steiner, Benjamin, and John Wooldredge. 2016. Individual and environmental influences on prison officer safety. *Justice Quarterly.* epub ahead of print. doi: 10.1080/07418825.2016.1164883

Stephen, James J., and Jennifer C. Karberg. 2003. Census of state and federal correctional facilities, 2000. U.S. Department of Justice, Office of Justice Programs. Bureau of Justice Statistics.

Sykes, Gresham M. 1958. *The society of captives.* Princeton, NJ: Princeton University Press.

Tartaro, Christine. 2002. The impact of density on jail violence. *Journal of Criminal Justice* 30:499-510.

Tartaro, Christine, and Marissa P. Levy. 2007. Density, inmate assaults, and direct supervision jails. *Criminal Justice Policy Review* 18:395-417.

Thornberry, Terence P., and Jack E. Call. 1983. Constitutional challenges to prison overcrowding: The scientific evidence of harmful effects. *Hastings Law Journal* 35:313-53.

Travis, Jeremy, Bruce Western, and Steve Redburn. 2014. *The Growth of Incarceration in the United States: Exploring Causes and Consequences*. Washington, DC: National Academies Press.

Useem, Bert, and Anne M. Piehl. 2006. Prison buildup and disorder. *Punishment & Society* 8:87-115.

Valentine, Colby L., Daniel P. Mears, and William D. Bales. 2015. Unpacking the relationship between age and prison misconduct. *Journal of Criminal Justice* 43:418-27.

Vaughn, Michael S. 1993. Listening to the experts: A national study of correctional administrators' responses to prison overcrowding. *Criminal Justice Review* 18:12-25.

Walters, Glenn D. 1998. Time series and correlational analyses of inmate-initiated assaultive incidents in a large correctional system. *International Journal of Offender Therapy and Comparative Criminology* 42:124-32.

Wolff, Nancy, Cynthia L. Blitz, Jing Shi, Jane Siegel, and Ronet Bachman. 2007. Physical violence inside prisons: Rates of victimization. *Criminal Justice and Behavior* 34:588-99.

Wooldredge, John. 1999. Inmate experiences and psychological well-being. *Criminal Justice and Behavior* 26:235-50.

Wooldredge, John, Timothy Griffin, and Travis Pratt. 2001. Considering hierarchical models for research on inmate behavior: Predicting misconduct with multilevel data. *Justice Quarterly* 18:203-31.

Wooldredge, John, and Benjamin Steiner. 2009. Comparing methods for examining relationships between prison crowding and inmate violence. *Justice Quarterly* 26:795-826.

Wooldridge, Jeffrey M. 2013. Introductory Econometrics: A Modern Approach, 5th ed. South Western College Publications.