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# Aging American Prisons: Length of Stay, Dying behind Bars, and Implications for Public Health

Stephanie G. Barger  
*University of Arkansas*

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**Aging American Prisons:  
Length of stay, dying behind bars, and implications for public health**

An Honors Thesis submitted in partial  
fulfillment of the requirements of Honors  
Studies in American Studies

by

Stephanie Barger

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American Studies  
J. William Fulbright College of Arts and Sciences  
**The University of Arkansas**

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## Abstract

One notable consequence of mass incarceration is the growing population of elderly prison inmates in the U.S. This growth raises questions concerning the causes and implications of such a change, as housing older prisoners places a financial strain on state and federal correctional systems. Because this added cost is largely a result of medical needs, the growing elderly inmate population has raised questions about the impact of incarceration on health. This study investigates the causes of this “graying” of American prisons and its potential effects on correctional and community health. Using National Corrections Reporting Program data from 1990 to 2009, I compare changes in offenders’ age at release (mean age & proportion 55 and older), age at admission, average length of stay, and the proportion of “released” inmates who died in prison as an indicator of correctional health. I find that while each of these measures increased over time, length of stay can explain only a small portion of the increase in release age; most of which is due to an increase in age at admission. Further, while the increase in offender age can account, fully, for the increase in prison deaths over time, length-of-stay is also among the strongest predictors of death in prison, even controlling for age. The results suggests that the incarceration of a growing number of elderly prisoners, coupled with the harmful effects of lengthy prison stays, may have a notable impact on health both within correctional systems and in the communities to which most will return.

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## Introduction

In recent decades, studies of the rapid growth in the United States prison population have revealed a number of consequential transformations within the institutional profile of the American penal system. Recently, scholars have turned their attention to the remarkable increase in the number and proportion of elderly inmates. The number of prisoners age 55 and older is increasing much faster than the general prison population, raising concerns about the economic and social implications of a greater number of elderly individuals in state and federal prison. Aging inmates require more contacts with healthcare providers and cost much more to house than do younger inmates due to increased medical needs (Rikard & Rosenberg, 2007). State and the federal governments experience financial strain as they are forced to allocate more and more money to corrections each year as a result of the growing proportion of aging prisoners. This expansion of the elderly population within prisons has consequences for the community as well (Travis, Western, & Redburn, 2014). Incarceration has been shown to have a negative effect on mental and physical health and the boundaries between incarceration and community are permeable—most prisoners are eventually released—yet the effects of an aging population of former prisoners on community health have been largely overlooked.

Research concerning the “graying” of American prisons has raised important questions regarding its causes and consequences. Scholars have suggested several potential explanations for this growth including the adoption of “three-strikes” laws, truth-in-sentencing statutes, or the increased use of life sentences (King & Mauer, 2001; Rikard & Rosenberg, 2007; Nellis, 2013). The majority of studies, however, have

focused on describing the growth and its cost, while only speculating that it is a result of policies requiring long prison terms. Some research has sought to identify a primary cause of the aging prison population using empirical data, but the results challenge the assumption that policies such as these are responsible for the increase in the elderly prison population (Luallen & Kling, 2014). However, even these have reviewed data from a limited number of states. Furthermore, past research has emphasized the number of elderly inmates in custody without considering the extent to which an aging inmate population translates to an aging ex-offender population and without investigating the impact that this might have on communities, particularly public health.

Research finds that incarceration is correlated with changes in health status, implying that ex-prisoners may have more health problems than individuals from similar backgrounds who were never incarcerated. Investigating health in prison has proven to be a difficult task, as it is complex and generally hard to measure. Studies often highlight changes in the prevalence of specific diseases or conditions as evidence of changes in overall correctional health (Maruschak, 2008; Farrer & Hedges, 2011; Sung, 2010). However, discussions of the relationship between correctional health and an aging prison population center on the increased cost of incarceration for older inmates as a result of medical needs, without considering the effects that incarceration itself may have on inmate health. Although an aging prison population could produce a decline in overall correctional health, the same policies believed to be responsible for the aging inmate population may also be affecting correctional health. Investigations of potential correlations among all of these factors are absent from past research.

The current study seeks to shed light on these issues by examining changes in the releases and admissions of prisoners age 55 and older. The aging of American prisons could be explained by an increase in the admissions of older offenders, as some recent studies suggest, or by an increase in length-of-stay (LOS) resulting in inmates growing old in prison. This study will attempt to determine which factor has had a larger influence. This study also examines whether the aging prison population is correlated with a decline in correctional health. Any decline in correctional health could be explained, in part, by an increase in average age of incarcerated individuals, but studies also find detrimental effects of prison on prisoners' health. This study will attempt to identify the extent to which growth in the elderly prison population has affected correctional health, versus other factors such as lengthy prison terms. An analysis of the effects that an aging prison population can have on inmate health will also help create a better understanding of how a changing correctional environment could affect the wider society. Because elderly inmates place a particularly high demand on healthcare providers within the correctional system, an expansion of this population could also place a strain on community and public health organizations following release.

I begin by reviewing existing research on the growth of the elderly prison population and the policies that are thought to have contributed to those changes. Next, I review the problems created by the aging inmate population, including added cost and additional health problems. As research regarding the driving forces behind this "graying" of American prisons is limited in quantity and scope, I present empirical analysis of the factors that have contributed to the growth of the elderly inmate



population and its relationship to correctional health. Finally, I conclude with a discussion of the implications for community health and criminal justice policies.

### **What We Know**

#### **The Growth of an Elderly Population**

As of 2014, there were over 1.5 million people incarcerated in America's state and federal prisons. Until 2010, this figure had been growing steadily since 1972 (BJS). The prison population has more than tripled in the last 30 years. This growth has been accompanied by an even more dramatic increase in the population of elderly prisoners. For example, between 1991 and 2014, the total number of inmates in state and federal prisons increased by 83 percent while the prison population age 55 and older increased by 444 percent during the same years (Snell & Morton, 1992; Carson, 2015). The general population of the United States is aging as well, but the correctional population is getting older at a much faster rate. Whereas the proportion of all prison inmates who were over the age of 54 grew by almost 200 percent between 1991 and 2014, the percentage of Americans in the same age group increased by only 58 percent during those years (U.S. Census Bureau). Furthermore, a 2004 report from the Bureau of Justice Statistics stated that since 1995, inmates age 55 and older saw the largest percent change of all age groups (Harrison & Beck, 2004).

A number of factors have likely contributed to this dramatic growth of the elderly prison population. Recent studies suggest that the introduction of stricter criminal justice policies during the "tough-on-crime" political movement in 1980s and 1990s have played a major role. (Chettiar, Bunting, & Schotter, 2012; Murphy, 2011). "Three-strikes" laws, the adoption of sentencing guidelines, the increased use of life sentences, and "truth-in-

sentencing” legislation are often cited as having contributed in large part to the aging of the prison population by requiring prison sentences for many more offenders and by requiring longer terms of confinement.

Three-strikes statutes, enacted by many states in the 1990s, mandate long sentences for certain habitual offenders thought to pose a significant threat to public safety. In general, habitual offender laws were intended to target and incapacitate violent offenders, who are more often younger, but an unintended consequence of these policies may be the disproportionate application of harsh sentences to older offenders. This could happen for two reasons. First, laws requiring long sentences for repeat offenders, by definition, are more likely to affect those who have had time to accumulate multiple convictions. Second, in practice, three-strikes laws are often applied to non-violent offenders, who may be older.

For example, the Sentencing Project found that California’s three-strikes law had contributed to a “rapid aging of the California prison system” (King & Mauer, 2001, p. 4). California enacted its three-strikes legislation in 1994 and “more than 50,000 offenders had been admitted to prison under the law” by 2001 (King & Mauer, 2001, p. 3). California’s three-strikes law did not require the third conviction to be violent or serious for it to warrant a life sentence. In fact, just three years after California enacted its three-strikes law more than 60 percent of the state’s third-strike offenders had been convicted of nonviolent and nonserious offences (Males & Macallair, 1999). Between 1994 and 1999, the proportion of new felony admissions over the age of 40 increased by 50 percent while admissions of persons between 20 and 35 years old declined steadily during the same years.

Many states also adopted sentencing guidelines which limit judicial discretion and require judges to apply sentences based on the seriousness of the crime and the offender's criminal history. State laws differ, but typically any deviations from either mandatory or advisory guidelines must be justified by the court, and are limited to a narrow list of factors that can be considered by the judge (Engen, Gainey, Crutchfield, & Weis, 2003). This reduces the ability of judges to consider defendants' characteristics, like old age, as mitigating factors in the sentencing process. Research finds that older offenders have remarkably low recidivism rates, about two percent for prisoners over the age of 45 (Yates & Gillespie, 2000), and their continued incarceration has been described as "net social loss" given their reduced risk to the public (Luallen & Kling, 2014, p. 461). Regardless, age is typically not a relevant factor in determining whether or not a sentence should be outside the guideline range (Corwin, 2001). Furthermore, like three-strikes laws, sentencing guidelines require longer sentences for offenders with prison convictions, who are more likely to be older.

Recent studies also point to the increased use of life sentences or life-without-parole (LWOP) as contributing to the growth of an elderly prison population (Nellis, 2013; Turner, 2013). In the early 1970s, many states began toughening their statutes regarding life sentences as well as increasing the use of LWOP. During the "tough-on-crime" political environment in the 1980s, the use of life sentences accelerated (Nellis, 2013). From 1992 to 2008, the "lifer" population rose by 104 percent and the population of those with LWOP sentences grew even faster, with an increase of 222 percent during the same years. As states increase the use of these long sentences, more and more prisoners will reach old age behind bars, thereby contributing to the growth of the elderly

population. A report released by the Sentencing Project in 2009 (Nellis & King) found that 13 percent of prisoners serving a life sentence in 1997 were 50 years of age or older and that by 2004, that proportion had reached 22 percent. That number can only rise as more offenders are sentenced to life in prison without the possibility of parole, even as states work to reduce their overall prison populations.

In addition to an increased use of longer sentences, in 1994 states began adopting “truth-in-sentencing” laws which required violent offenders to serve a minimum of 85 percent of their sentences before becoming eligible for release (Travis, Western & Redburn, 2014). These laws were enacted by many states when the Violent Crime Control and Law Enforcement Act of 1994 offered federal grants to states that adopted “truth-in-sentencing” policies (Pew, 2012). Furthermore, parole has been eliminated in the federal system and is unavailable in many states (Curtin, 2007). With a decrease in judicial and parole board discretion as a result of “truth-in-sentencing” legislation and the adoption of determinate sentencing systems, factors such as age, health, or potential risk could no longer be considered in determining sentence length or eligibility for release on parole. As a result, offenders remain incarcerated for longer periods of time.

Many of the “tough-on-crime” policy changes that came about in the 1980s and 90s focused on extending sentence lengths and restricting parole eligibility, both of which contribute to an increasing average time served for most crimes (Pew, 2012). This increase in average length-of-stay contributes to the growth in the proportion of older inmates (Shepherd, 2002). Furthermore, the adoption of three-strikes laws, sentencing guidelines, and similar policies may have increased admission rates for older offenders, thereby adding to the elderly inmate population. However, research on the effects of

these policies is limited in several ways. Research typically has focused on individual states—most often California—or on the U.S. correctional population as a whole. Few studies have examined the impact of “tough-on-crime” legislation on the elderly prison population across multiple states.

Also, some studies have challenged the assumption that prison sentences increased substantially in length, or that long sentences explain the aging prison population (Pfaff, 2014). For example, Luallen and Kling (2014) identified factors that affect the age distribution in prison, including changing admission rates and changes in the length of incarceration, in order to determine “drivers of growth” in the elderly inmate population. Their study examined admission and release data from four states, including California, between 2000 and 2012, finding that an increase in admission age had been the “primary driver of aging in prison” during those years (see also Porter et al., 2016). As the Luallen and Kling study focuses on a limited range of states, it may not be representative of actual trends across the country. This study will expand on that analysis by examining data from 33 states between 1990 and 2009 in order to better understand the extent to which each factor has contributed to the growth of the aging prison population on a national level.

### **Problems Generated by an Aging Prison Population**

A growing number of elderly inmates in state and federal prison has brought to light new problems both inside and outside of prison, most of which are products of the unique medical needs that elderly prisoners require. During incarceration, a portion of the corrections budget must be applied to healthcare for aging inmates, as there have always

been elderly prisoners. When those elderly prisoners are released into the community, their experiences in prison become issues of public health.

**Cost.** Older inmates cost much more to house than do younger inmates as a result of increased medical needs, the potential demand for separate housing, or additional assistance necessary to accommodate their unique needs. The American Civil Liberties Union estimated that incarceration for an older inmate costs two to three times what it costs to incarcerate the average inmate; the average annual cost per prisoner is \$34,135 while the average taxpayer cost of an inmate age 50 or older is \$68,270 (Chettiear, Bunting, & Schotter, 2012). Many aging inmates express a desire to be segregated from the general inmate population for fear of being especially vulnerable to victimization by younger inmates (Corwin, 2001). Segregated housing units that are adapted to be “elder-friendly” (Rikard & Rosenberg, 2007) require modifications such as lower bunks, fewer stairwells, and more ramps and handrails, which add to the cost of incarceration for elderly prisoners. However, most of this increased expense for incarcerating aging inmates is due to their medical needs. Annually, state and federal corrections cost the American taxpayer around \$77 billion and roughly 90 percent of that is allotted to incarceration. Whereas most of this cost is used in construction or operations, 10-20 percent of prison operating budgets is devoted to healthcare and those costs are the fastest growing portion of corrections budgets (Auerhahn, 2002).

Rikard and Rosenberg (2007) estimated that elderly prisoners are afflicted by an average of three chronic illnesses during their time in prison and generally have poorer health regarding substance abuse and psychological disorders. Approximately 43.3 percent of prisoners who participated in the 2004 Survey of Inmates in State and Federal

Correctional Facilities reported a current medical problem other than a cold or virus (Maruschak, 2008). A much higher percentage of older inmates, however, reported health-related problems than younger inmates, with 67.5 percent of inmates age 45 or older and only 24.2 percent of inmates under the age of 25 reporting a physical or mental impairment. Aging prisoners require more contacts with healthcare providers, and prisons with poor facilities or under-qualified staff may need to send elderly inmates outside the prison for off-site medical treatment. The added cost of this transportation and specialized treatment is paid for by the government as well (Chettiear, Bunting, & Schotter, 2012). The proportion of overall state budgets that is applied to corrections has risen dramatically since the 1980s and has become the fourth-largest category of state spending (Chettiear, Bunting, & Schotter, 2012). Considering that aging inmates make up a relatively low-risk population, keeping these offenders in prison may be an inefficient use of government funds (Luallen & Kling, 2014). In fact, the 2012 ACLU report also estimates that states would save an average of \$66,294 annually per released aging prisoner.

**Public health.** Socioeconomic status becomes a central issue when discussing the relationship between incarceration and public health. Prisoners are disproportionately drawn from underprivileged groups including the less educated and financially disadvantaged. In 1997, state inmates averaged fewer than eleven years of schooling and a third had not been working at the time of their incarceration (Western, 2006). Low socioeconomic status is not only a risk factor for incarceration, but it also affects health status. Lower income and less education restricts choices between healthcare providers and treatment options as well as awareness of strategies for good health (Feinstein, 1993).

The National Center for Health Statistics (2015) revealed that in 2014, Americans below the poverty line—when compared to Americans at or above 400 percent of the poverty level—were more than four times as likely to delay or go without needed medical care, more than six times as likely to go without needed prescription drugs, and more than five times as likely to go without needed dental care, due to cost. In the same year, those with no high school diploma or GED were about twice as likely to go without needed medical care, prescription drugs, or dental care due to cost than those with at least some college education.

To a great extent, the current health status of aging prisoners has its roots in poor healthcare habits earlier in life and a lack of preventive care as children (Marquart, Merianos, & Doucet, 2000). Individuals from groups characterized by poor health status to begin with are entering prison and then becoming exposed to a new environment which engenders changes in health condition and morbidity (Marquart, Merianos, Hebert, & Carroll, 1997). For many, incarceration provides structure to an otherwise chaotic lifestyle as well as providing opportunities for screening and treatment (Travis, Western & Redburn, 2014), but the conditions of prison life itself may have direct effects on mental and physical health.

Research examining long-term health effects of incarceration is minimal. Most studies on the health impact of incarceration examine the health conditions of offenders in custody. Furthermore, the effect of prison on mental health has been researched more thoroughly than its effects on physical health, but studies have found associations between incarceration and higher risks of stress-related diseases like asthma and hypertension following release (Travis, Western & Redburn, 2014). Rates of STDs like



chlamydia, HIV, and syphilis are higher in those who have been incarcerated due to increased likelihood of exposure within the penal system (Massoglia, 2008), but have been declining in the correctional setting in recent years. As infectious diseases like HIV and tuberculosis have been better controlled, injuries have surpassed them as the most common health problem in prisons and jails nationwide (Sung, 2010). The likelihood of incurring an injury increases with time spent in jail and the lifetime prevalence of traumatic brain injuries (TBIs) has been found to be “consistently and substantially higher” among individuals who have been incarcerated than in the general population (Sung, 2010; Travis, Western & Redburn, 2014, p. 225). Injuries of this type can have an extraordinary impact on long-term health and even repercussions for recidivism. Farrer and Hedges (2011) point out that TBIs can lead to certain behaviors linked to criminal behavior and successive incarceration such as aggression, violence, and emotional instability. With prisoners remaining incarcerated longer now than in the past, the potential for incarceration to affect inmate health may be greater than ever before and may have a significant impact on the health of older inmates who would be more susceptible to disease and injury.

As prisoners are the only class of people in the United States with a constitutional right to healthcare, a growing population of elderly inmates in state and federal prisons forces correctional systems to bear the financial burden of a problem that is in part perpetuated by the failures of the American healthcare system (Auerhahn, 2002; Curtin, 2007). According to a report released by the ACLU in 2012, prisons are required to offer a “constitutionally minimal level of care,” but often provide inadequate healthcare “until forced to improve by court order” (Chettiær, Bunting, & Schotter, p. 28). This fact

becomes especially significant when looking at release patterns and policies involving elderly prisoners. When aging inmates receive subpar medical care that result in more serious health problems, and then return to the community, the issue moves beyond criminal justice and into the realm of public health. Inmates who are released into the community are often left without insurance and without access to health care outside of prison. Nearly 80 percent of prisoners leave prison without private or public insurance and a large number of them are ineligible for Medicaid. The Affordable Care Act implemented in 2014 created new mechanisms for states to expand Medicaid eligibility to those who have been incarcerated (Phillips, 2012), but incarceration can still have a notable effect on access to care and not all states have taken advantage of this opportunity. Incarceration has a marked negative effect on wages as well as other factors which are associated with health functioning and access to healthcare (Massoglia, 2008). Without access to the treatment and screenings available in prison, those formerly incarcerated may return to the community and allow their diseases and disabilities to go unchecked. Furthermore, older prisoners are especially at risk, as disability assessments are usually only performed at intake (Travis, Western & Redburn, 2014). Even inmates who have been behind bars for decades are released without an additional disability screening. If spending time in prison alone has an especially significant negative effect on the health of elderly inmates, then a growing population of aging prisoners will place demands on the community and on public health organizations to develop strategies for caring for these individuals.

### **Current Objectives**

At present, the research regarding the forces driving a growing elderly inmate population is limited. Many attempts to explain the growth center on harsh sentencing policies that increased prison terms, but are largely based on speculation, and describe the age characteristics of the prison population in custody without testing whether this is due to an increase in the average age of prison admissions or length-of-stay. Also, most empirical research focuses on either the entire U.S. prison population, or on individual states, such as California. Individual states like California are of interest, but their policies and correctional systems are unique. As such, they are not representative of the nation as a whole. Luallen and Kling (2014) call for more “decompositional” studies—work aimed at examining growth as “the sum of criminal justice processes”—to create a better picture of what is causing these changes. Potential factors include an increase in admission rates for older offenders as well as increasing time served in prison, but the growth is likely a result of a combination of factors. Most research regarding the aging prison population addresses policy changes as potential causes, but does not analyze the degree to which changes in admission rates and length-of-stay have each contributed to the population of elderly inmates. The increase in elderly prisoners also led to more in-depth analyses of inmate health and correctional healthcare and how these might have changed in recent years. However, if health in prison is declining over time, it remains unclear if this is purely a result of the older population, or if incarceration itself is a detriment to the mental and physical states of inmates across all age groups.

It is important to examine possible explanations for the increase in the population of elderly inmates in order to better understand sources of health problems among aging

prisoners. Looking into the effects of incarceration on health in prison generally will provide clues into the effects of incarceration on public health in the wider society. The current study will attempt to identify the cause of the growth in the elderly prison population as either an increase in the admissions of older offenders or an increase in time served by all inmates. Because elderly prisoners are characterized by poor health, this study will then look into the effect of incarceration on inmate health in order to better understand the extent to which an aging prison population would impact public health. As data on the health status of individual inmates is unavailable, this report examines death rates as an indicator of poor health.

### **Data and Methods**

The Bureau of Justice Statistics began administering the National Corrections Reporting Program (NCRP) in 1983. The program collects annual data on prison admissions and releases, yearend populations, and on parole entries and discharges in participating states. Individual prisoner records provide information on demographics (age at admission and at release; race and ethnicity; sex), offense type (the most serious offense), release type, and time served. Data from 33 states were included in this study (see Appendix). Table 1 presents descriptive statistics for the sample and the variables used in this analysis. Overall, the sample included 7,000,233 cases. Of those, 190,599 inmates were over the age of 54. Because the average prisoner may experience a decline in health more rapidly than the average citizen, the age at which inmates are defined as “elderly,” although it differs among sources, is generally about ten or fifteen years younger than the age at which individuals are defined as elderly in the wider society (Maschi, Viola, & Sun, 2012). This study considers inmates age 55 and older to be

elderly. For all cases, average admission age was 31.8 years, average release age was 33.8 years, and average length-of-stay was 1.7 years. Male inmates made up 90 percent of the sample. Thirty seven percent of inmates were white, 44.3 percent of inmates were black, and 15.4 percent were Hispanic. The cases within the sample were also broken down by release type. The majority of inmates, 81.3 percent, left prison on some type of conditional release (including parole and probation). Seventeen percent of inmates were released upon the expiration of their sentences and 0.6 percent of the releases were categorized as deaths. Death as a release type includes death by natural causes, suicide, homicide, and injury to self, but excludes execution. Although deaths made up less than one percent of releases for all inmates, it made up 6.3 percent of the release of inmates age 55 and older. The average length-of-stay for elderly inmates was also notably distinctive, with an average of 3.75 years.

The analysis begins by examining the change in average release age for inmates between 1990 and 2009 and in the proportion of released inmates who were age 55 or older. The growing proportion of elderly inmates should result in an increase in the average age and in the proportion of elderly inmates among the prisoners who are released. As the growth of the aging prisoner population could have been caused by rising admission rates for older offenders or by an increase in time served for all inmates, the next step in the analysis examines changes in offenders' age at admission (mean age and the percentage that are 55 and older) and changes in the average length-of-stay for the entire incarcerated population and by age. After describing these trends, a multiple linear regression is used to assess which factor, admission age or length-of-stay, can better explain the aging the prison population.

The second part of the analysis will look at the degree to which a growing elderly prison population might affect correctional and public health. Because there is no available data on the health status of individual prisoners, this report tracks changes in death rates among released inmates as an indicator of poor health. This component of the analysis will begin by determining how the proportion of released inmates who died in prison changed between 1990 and 2009. An increase in deaths could indicate a decline in overall inmate health which may correlate with an aging prison population. The analysis continues to examine year of release, release age, and length-of-stay as potential predictors of death in prison in order to better understand the cause of any change in death rates. If length-of-stay is a significant predictor of death even controlling for year and age, this would suggest that the duration of incarceration itself correlates with poor health.

## **Results**

### **Explaining the Aging Offender Population**

The average age at release for inmates reported in the NCRP increased steadily between 1990 and 2009 by 15 percent, or almost five years. For those released inmates, the average admission age increased at a similar rate and saw a growth of almost 14 percent or about four years (Fig. 1). This increase in the average age of the incarcerated individuals could signal a growth in the elderly prison population and in fact, that population has been growing rapidly. The proportion of offenders leaving prison by any means—conditional release, expired sentence, or death—who were age 55 or older increased from 1.74 percent to 4.81 percent between 1990 and 2009, representing an increase of 176 percent (Fig. 2). This increase in the average age of incarcerated

individuals as well as a growth in the elderly inmate population could be a product of more aging individuals being admitted to prison, an increase in length-of-stay, or a combination of these factors.

As shown in Figure 3, the proportion of those admitted to prison who were over the age of 54 also increased. In 1990, offenders who were age 55 or older made up 1.6 percent of the total admissions for that year. By 2009, that proportion had increased to 3.7 percent, representing an increase of 131 percent. The proportion of those admitted who were between the ages of 40 and 54 also saw a 131 percent increase (Fig. 3). This population is just as important for understanding the growth in the elderly population in prison, as many of these inmates will age into the elderly population during their incarceration. During the same years, the number of admissions for the 40-54 age group and the 55 and older age group were both increasing while the numbers of admissions for offenders below the age of 40 remained stable.

In addition to an increase in admissions for older offenders, the average length-of-stay increased for the entire incarcerated population. Prisoners released in 1990 had served an average of 1.2 years behind bars. By 2009, this had increased to 1.8 years. The average length-of-stay for elderly inmates released during these years grew more rapidly, increasing from 2.3 years to four years from 1990 to 2009 (Fig. 4). This increase in length-of-stay may also contribute to the aging of the prison population.

In order to assess the relative importance of year, age at admission, and length-of-stay in predicting age at release, I used a multiple linear regression (Table 2). Model 1 regresses release age on year. Year alone was found to be a significant predictor of age at release, showing that the average age at release increased by 0.27 years annually, for an

overall increase of about five years from 1990 to 2009. Models 2 and 3 test whether the increase in age at release (i.e. the effect of year) is due to changes in age at admission and/or length-of stay. Whether controlling for age at admission or length-of-stay, year is a significant predictor of age at release, but the size of the effect is reduced. Controlling for age at admission (Model 2), the effect of year reduces from 0.27 to 0.04, a change of 84 percent. Controlling for length-of-stay (Model 3), the effect of year reduces slightly from 0.27 to 0.245. In other words, if admission age had remained constant from 1990 to 2009, the average release age would have increased by only 0.04 years annually, or about 9.6 months over the 20 years. Conversely, had the average length-of-stay remained constant, the average age at release would have increased by 0.245 years annually, or about 4.9 years total between 1990 and 2009. This indicates that the principle cause of the expanding population of elderly prison inmates is admitting more offenders to prison later in life. An increased length-of-stay can explain some of the growth in average release age, but did not make as much of a contribution as admission age.

### **Consequences of an Aging Prison Population**

Discussions of the problems associated with an aging prison population are often centered on budget strains for the correctional system, but this growth could also represent a new challenge for public health in the wider society. This report uses death in prison as a measure of health and analyzes changes in death rates over time, by age, and by length-of-stay. The percentage of all releases that were deaths increased by 42 percent between 1990 and 2009, suggesting that the likelihood of dying in prison has been greater in recent years than in the past (Fig. 5).



This analysis will examine whether the increase in deaths is due solely to an aging population, or if length-of-stay contributes to the likelihood of dying in prison. As expected, when compared by age groups, the percentage of the releases within an age group that were deaths increased steadily from younger age groups to older age groups (Fig. 6). For example, of the inmates between 18 and 24 years old who were released from prison between 1990 and 2009, less than one in a thousand had died (Table 3). For inmates age 55 and older who were released within the same time period, 6.29 percent had died. As shown in Table 4, length-of-stay is also related to the likelihood of dying in prison. Among those who had been behind bars for less than a year when released, 0.2 percent died in prison. This proportion increases rapidly as length-of-stay increases (Table 4). Five percent of inmates who had been incarcerated for more than ten years when released had died. This association between length-of-stay and death is represented in the 18-54 year-old population as well as the elderly population (Fig. 7). The average length-of-stay for inmates who died in prison also rose steadily between 1990 and 2009 (Fig. 8). For example, inmates who died in 1990 had been incarcerated for an average of 3.6 years and inmates who died in 2009 had served an average of 8.9 years. By contrast, the average inmate who was released into the community in 1990 had served an average of 1.2 years and the average inmate released into the community in 2009 has served an average of 1.8 years. Among the population of inmates dying in prison, the increase in length-of-stay was much more dramatic than the increase in length-of-stay for inmates who were released. For the elderly population, average length-of-stay saw an increase of almost 135 percent between the same years (Fig. 9). It appears that length-of-stay is a factor in determining the chances of dying in prison, even controlling for age.

For the final analysis, a logistic regression was performed to predict the likelihood of death based on year, age at release, and length-of-stay (Table 5). The main purposes of the regression are to identify whether an increased length-of-stay is a significant predictor of death even controlling for year and age at release and to identify whether an increase over time in the likelihood of death is due to the increase in elderly inmates. Before controlling for release age and length-of-stay, year was found to be a significant predictor of death. The odds of dying in prison changed by a factor of 1.016 annually between 1990 and 2009 ( $\text{Exp}[B]=1.016$ ), indicating an almost two percent increase in the odds of death per year. When age at release was added to the model (Model 2), the effect of year on the likelihood of death became negative. As would be expected, release age was a significant predictor of death. Controlling for year, the odds of dying in prison changed by a factor of 1.119—or 12 percent—for each unit increase in age. When length-of-stay was added in Model 3, the effects of year and release age both decreased. Length-of-stay was just as strong in predicting death in prison as age at release. Each extra year spent in prison increased the odds of death by 12 percent when controlling for year and age. Again, the effect of year on the likelihood of death was negative when controlling for release age and length-of-stay ( $\text{Exp}[B]=0.964$ ). This means that if age at admission had not increased, the rate of deaths would have decreased.

### **Discussion**

The “graying” of American prisons has attracted a great deal of attention in recent years. Many studies have focused on the growth of the elderly prison population as it relates to “tough-on-crime” policies and the correctional budget, but have failed to provide an analysis of the specific causes of the growth across multiple states or of the

effect that this change could have on the community, specifically public health. Many states have begun exploring policy alternatives that would alleviate pressures brought on by the aging prison population in recent years, but the percentage of all inmates released into the community (all releases that did not include deaths) who were age 55 or older has steadily increased. Without an examination of the specific causes of the aging prison population, attempts to correct it can only be based on trial-and-error or speculation. Furthermore, because elderly inmates are typically characterized by poor health, an increase in aging prisoners being released into the community could have an impact on public health.

This study sought to identify the extent to which the aging prison population could be explained by an increase in the admissions of older offenders or an increase in length-of-stay and to examine the effect of incarceration on health. I looked at admission rates and changes in length-of-stay to compare the effects of each variable on release age. Then, I looked for a measurable effect of incarceration on health by examining changes in death rates over time, by age, and by length-of stay.

I found that the average age at release increased by almost five years and the proportion of released inmates who were over the age of 54 increased by 176 percent between 1990 and 2009. This growth could have resulted from the admission of more elderly offenders or from an increase in length-of-stay. The proportion of total admissions who were age 55 and older increased by 131 percent between 1990 and 2009. Average length-of-stay increased from 1.2 years to 1.8 years for all inmates and from 2.3 years to four years for elderly inmates. The multiple linear regression revealed that controlling for age at admission reduced the effect of year on release age by 84 percent,

whereas controlling for length-of-stay only reduced its effect by 8.6 percent. The fact that changes in release age by year was influenced almost entirely by admission age indicates that the growth of the elderly inmate population can be explained more by the admission of more offenders to prison later in life rather than an accumulation of elderly inmates as a result of lengthy sentences.

Investigations of death rates revealed that the proportion of releases that were categorized as deaths increased by 42 percent from 1990 to 2009. More inmates are dying in prison, but it was unclear whether that had been due to a larger population of elderly prisoners or if an increasing average length-of-stay influenced correctional health and, in turn, death rates. Trends suggested that death rates increased with age and also with length-of-stay, but a logistic regression was performed to confirm this. The odds of dying in prison increased by about two percent annually between 1990 and 2009. However, when controlling for release age alone, as well as for release age and length-of-stay, the effect of year became negative and the other two variables were shown to be significant predictors of death. This suggests that if release age and length-of-stay had remained stable during those years, death rates may have declined. Model 3 showed that length-of-stay and age at release were equally strong predictors of death in prison; each year spent in prison increased the odds of death by 12 percent when controlling for inmate age and year, while each additional year of age increased the odds of death by 11 percent, controlling for length-of-stay and year. However, the increase in deaths over time can be explained entirely by the increase in admission age.

This study was unable to shed light on why the average admission age is increasing. Further analysis into factors contributing to this rise could be helpful for

developing strategies to correct the problem. Those findings could have important implications for criminal justice policy. Three-strikes laws and strict sentencing guidelines may increase length-of-stay, but they also contribute to admission rates for older offenders. Reforming those policies could have an effect on the elderly prison population. Also, death was not the ideal measure for the state of correctional health. If data were available on the health status of individual inmates, a more in depth analysis could be performed on the specific effect of incarceration on inmate health. Furthermore, I was unable to control for the health of inmates as they were going into prison. This analysis assumed that health status was relatively constant across all incoming inmates. Also, if data had been available on the mortality rates of all inmates, rather than just those who were being released, death rates within prison could have been compared to mortality rates in the general population in order to better understand the disparities between health within prisons and health in the wider society. This comparison could underscore the impact that an increase in prison releases, especially of elderly inmates and inmates who have served long sentences, could have on community health.

### **Conclusion**

As more and more elderly inmates are occupying American prisons and as the average length-of-stay continues to increase across all age groups, correctional systems across the country are perpetuating a unique public health problem. This study found that more time served in prison contributes to a decline in health status. If elderly inmates are already characterized by especially poor health, growth in this population—combined with a steadily increasing average length-of-stay for all inmates—could have important implications for healthcare once those inmates are released back into the community.

Inmates who contract infectious diseases in prison can spread their diseases to the public and inmates who develop disabilities behind bars must find special care within their communities. The ex-prisoner population, especially the elderly ex-prisoner population, will require special attention and unique support from public health organizations and community healthcare providers. An increased focus on preventive care for all American children as well as on the reduction of reliance on incarceration by the criminal justice system could help alleviate these problems and concerns. Furthermore, an active movement to reform criminal justice policy could provide states with opportunities to design creative solutions to the problems that afflict correctional systems nationwide. Shining a spotlight on this issue is the first step to managing it and any attempt to create a solution, especially through legislation, would send the message that American citizens and politicians care deeply about the health and wellbeing of all people.

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## Tables and Figures

**Table 1: Descriptive statistics**

	All Inmates (N = 7,000,233)	Inmates 55 and Older (N = 190,559)
Average Age at Admission	31.82	56.4
Average Age at Release	33.78	60.3
Average Length-of-Stay (years)	1.74	3.75
<i>Release Type:</i>		
Conditional Release	81.3%	74.5%
Expiration of Sentence	17.5%	18.6%
Death	0.5%	6.3%
Other	0.6%	0.7%
Male Inmates	90.4%	94.3%
<i>Inmates by Race:</i>		
White	36.7%	48.4%
Black	44.3%	36.4%
Hispanic	15.4%	12.3%

**Table 2: Linear regression of age at release**

Ind. Variable	Model 1 b/(s.e.)	Model 2 b/(s.e.)	Model 3 b/(s.e.)
Year	0.268 (0.001)	0.043 (0.000)	0.245 (0.001)
Age of Admission		0.969 (0.000)	
Length-of-Stay			0.615 (0.001)
Intercept	-502.869	-83.185	-458.170
Adj. R <sup>2</sup>	0.02	0.92	0.06

All coefficients are statistically significant,  $p < 0.01$ .

**Table 3: Percentage of releases that were deaths by age group (1990-2009)**

Age at Release	No. Of Deaths	% of Releases that were Deaths	Total Releases
18-24 yrs	1,186	0.09%	1,269,743
25-29 yrs	2,095	0.15%	1,419,273
30-39 yrs	7,229	0.29%	2,476,402
40-54 yrs	15,271	0.93%	1,644,256
55+ yrs	11,992	6.29%	190,559

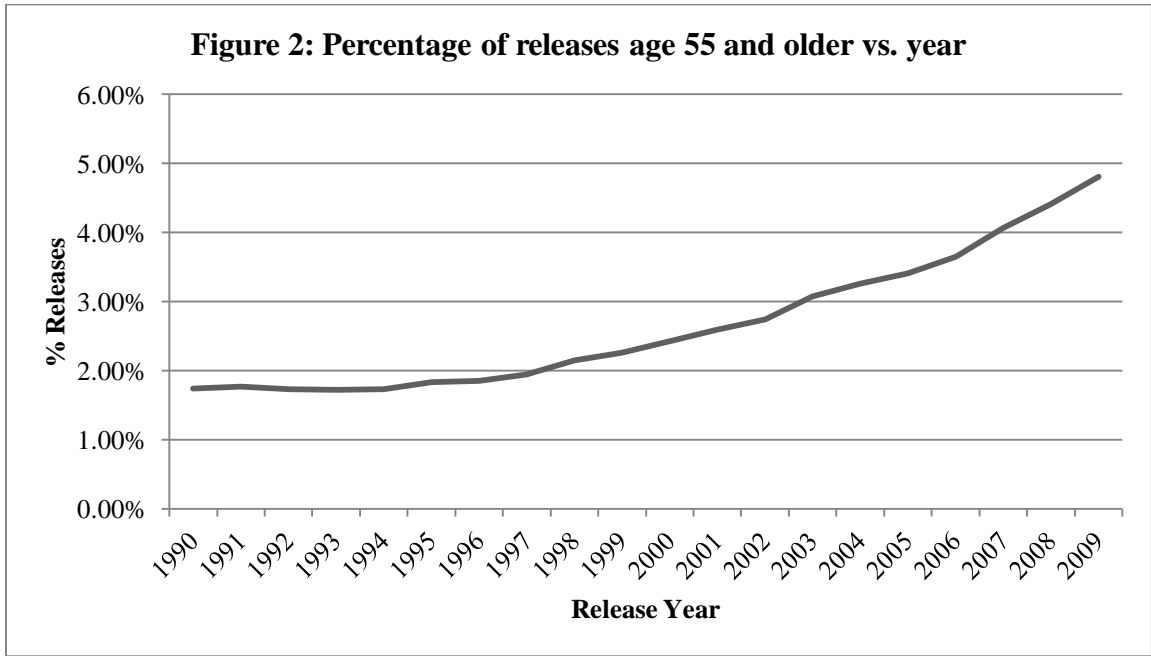
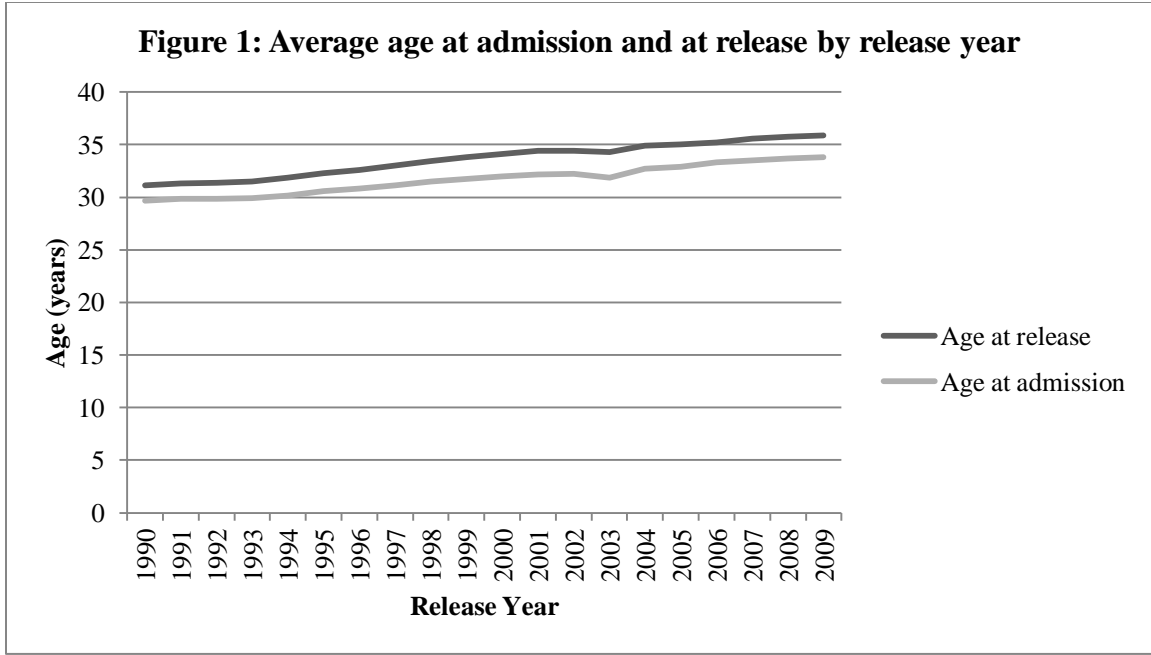
**Table 4: Percentage of releases that were deaths by age and length-of-stay (1990-2009)**

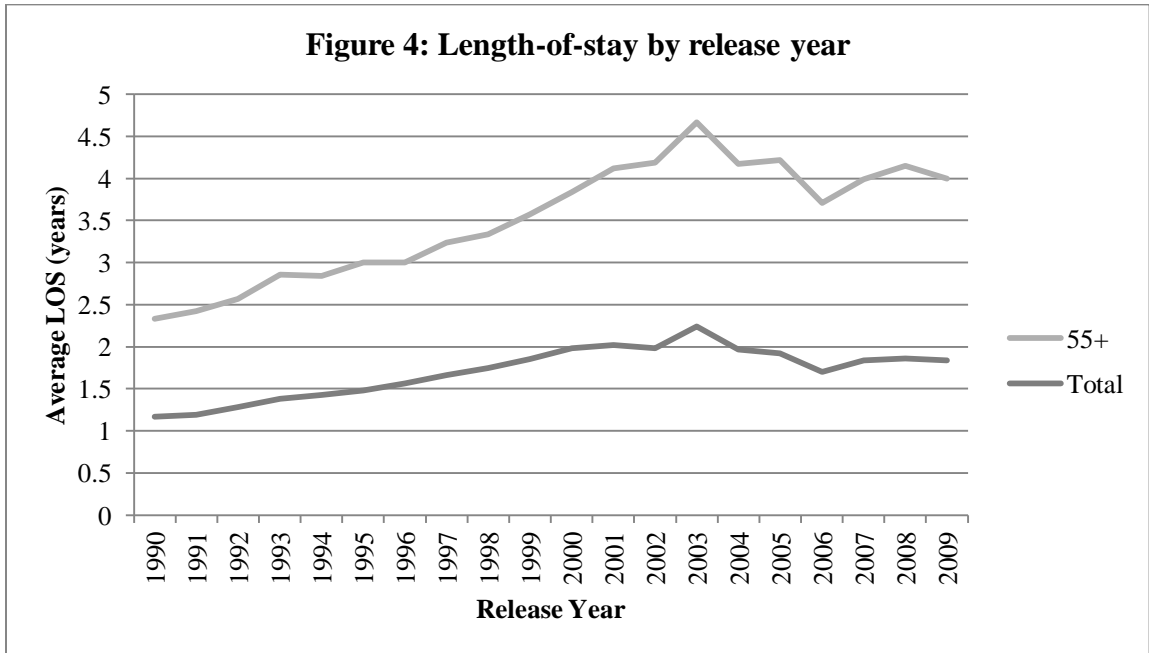
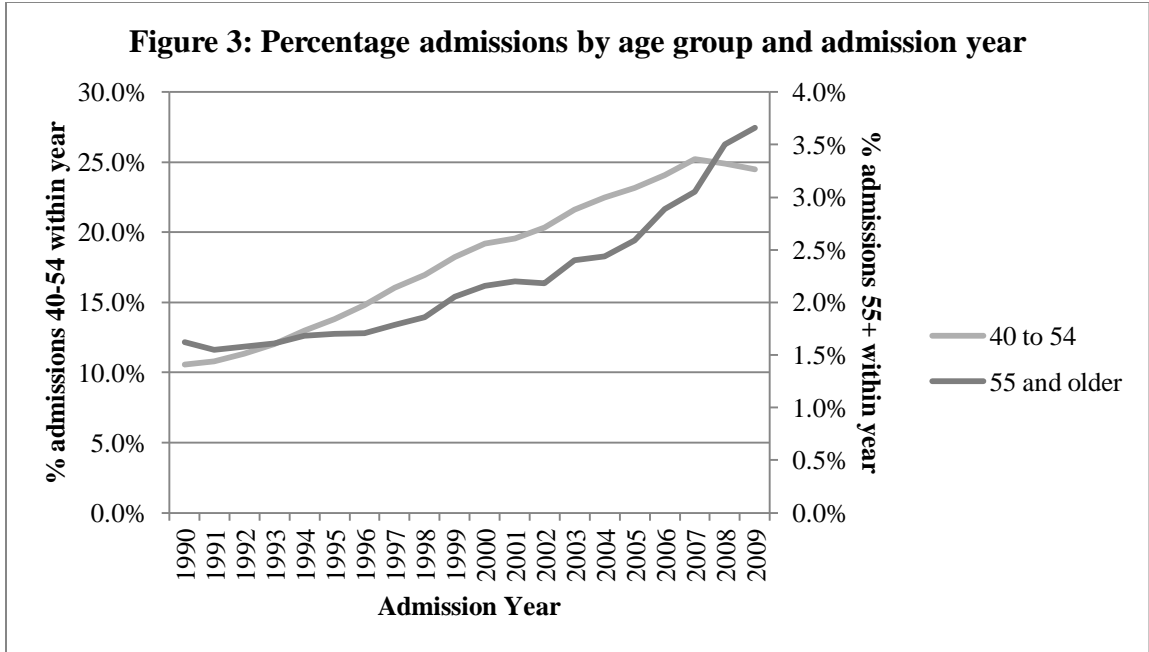
Age at Release	<1 Year	1-2 yrs	2-5 yrs	5-10 yrs	GT 10 yrs	Total
18-54 years old	6,710 (0.2%)	4,454 (0.3%)	6,344 (0.5%)	4,121 (1.0%)	4,152 (2.8%)	25,781 (0.4%)
55+ years old	1,533 (2.2%)	1,292 (3.5%)	2,442 (5.8%)	2,382 (10.5%)	4,343 (21.5%)	11,992 (6.3%)
All inmates	8,243 (0.2%)	5,746 (0.4%)	8,786 (0.7%)	6,503 (1.5%)	8,495 (5.1%)	37,773 (0.5%)

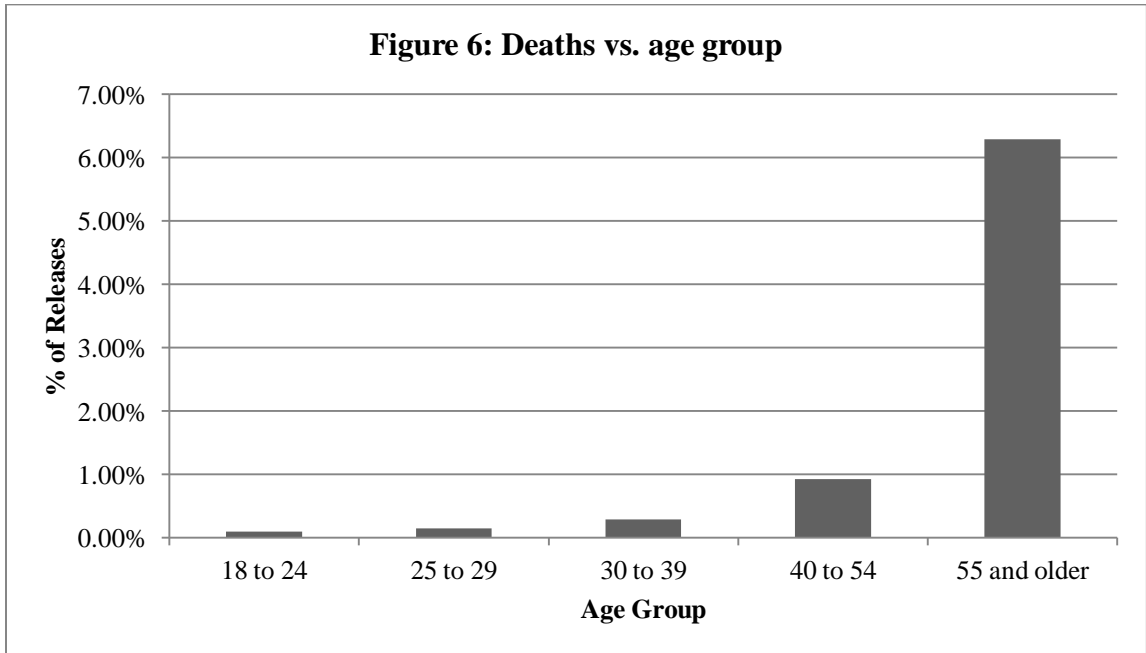
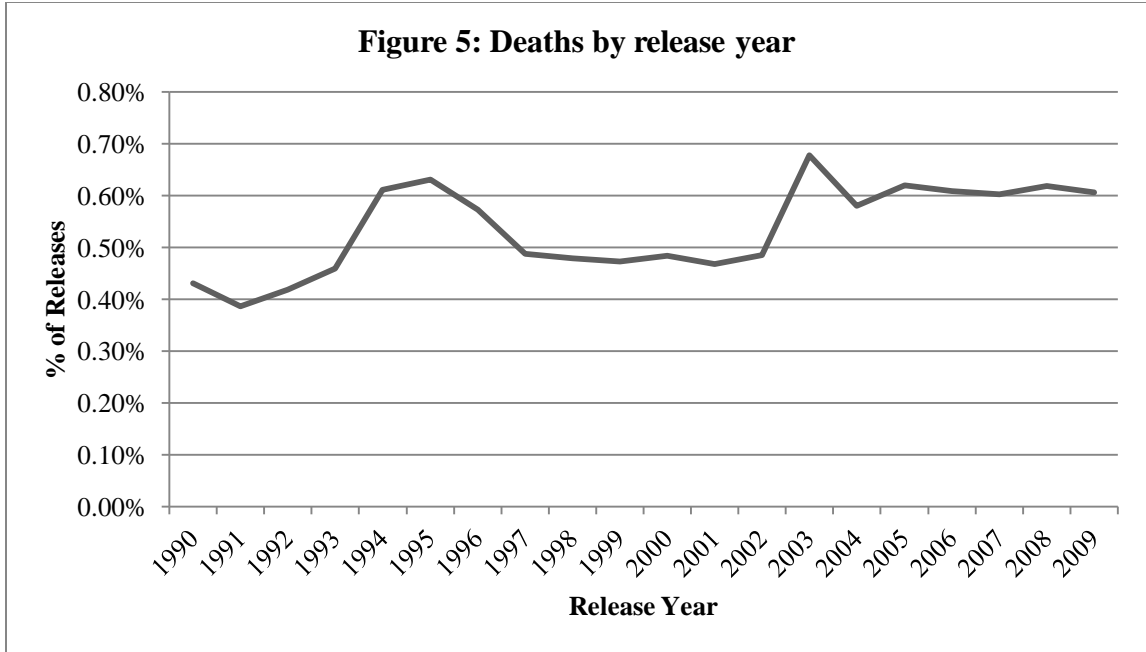
**Table 5: Logistic regression predicting the likelihood of death**

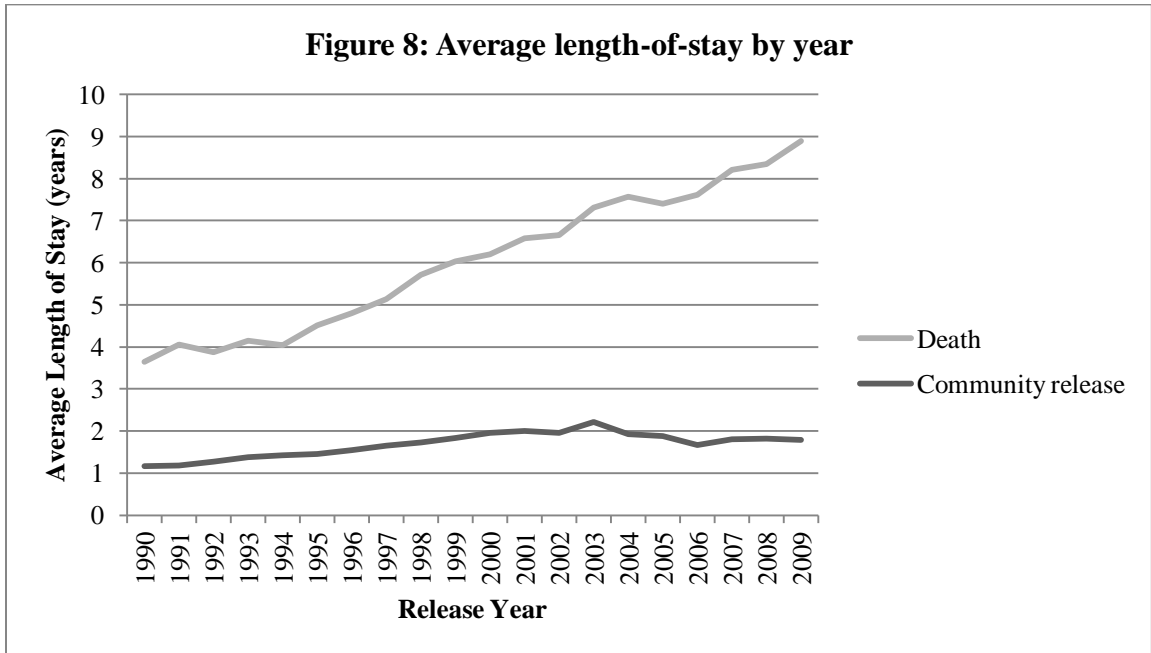
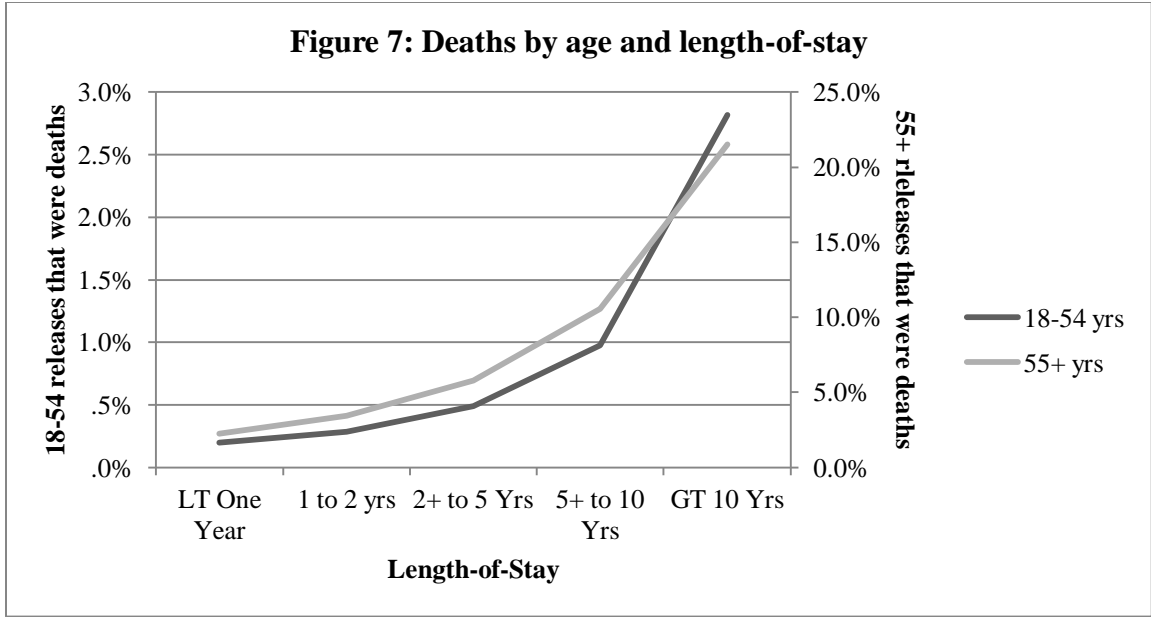
Ind. Variable	Model 1 Exp. (B)	Model 2 Exp. (B)	Model 3 Exp. (B)
Year	1.016	0.977	0.964
Age of Release		1.119	1.105
Length-of-Stay			1.120

All coefficients are statistically significant,  $p < 0.01$ .

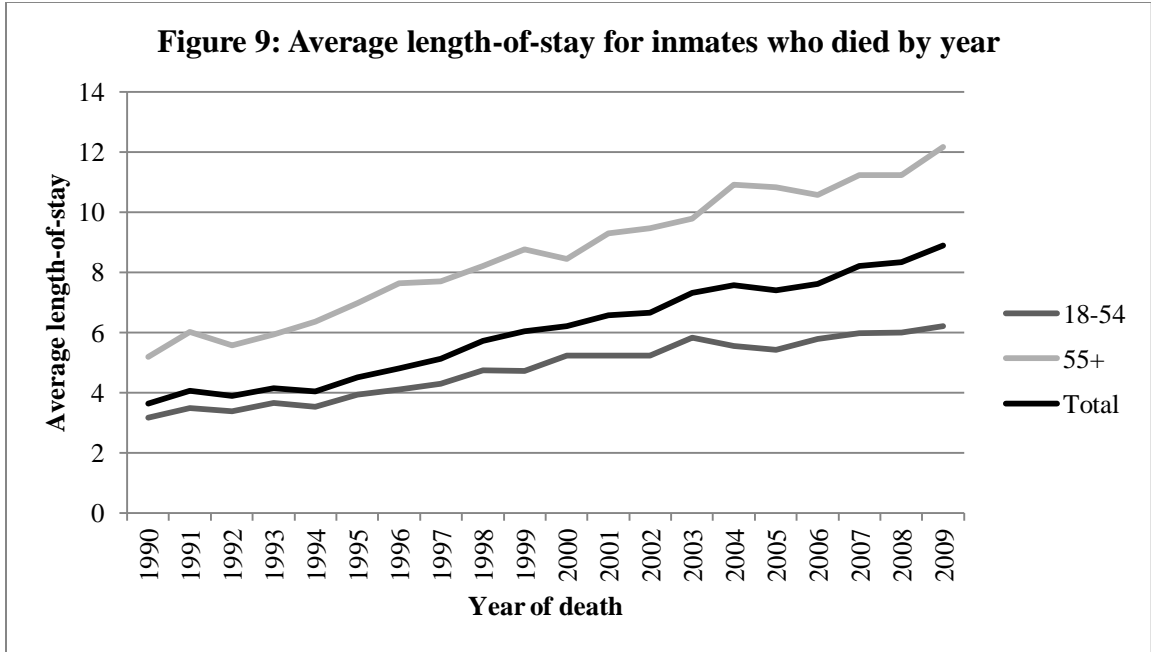












## Appendix

## States Included in the Analysis

Admission and release data from the NCRP between 1990 and 2009 included the following states: Alabama, Arkansas, California, Colorado, Florida, Georgia, Hawaii, Iowa, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin.