



HHS Public Access

Author manuscript

J Aging Health. Author manuscript; available in PMC 2018 May 01.

Published in final edited form as:

J Aging Health. 2016 September ; 28(6): 935–956. doi:10.1177/0898264315614007.

Growing Old Behind Bars: Health Profiles of the Older Male Inmate Population in the United States

Kathryn M. Nowotny, MA¹, Alice Cepeda, PhD², Laurie James-Hawkins, PhD³, and Jason D. Boardman, PhD¹

¹University of Colorado Boulder, USA

²University of Southern California, Los Angeles, USA

³Emory University, Atlanta, GA, USA

Abstract

Objective—This study examines patterns of multimorbidity among elderly male inmates across four domains of health (chronic medical conditions, drug- and alcohol-related diseases, impairments, and mental and behavioral health) to understand the complex health care needs of this growing population.

Method—We use the 2004 Survey of Inmates in State Correctional Facilities and Latent Class Regression Analysis to examine 22 health problems among 1,026 men aged 50 and older.

Results—There are four groups of elderly male inmates: (a) relatively healthy (45.1%), (b) substance users with behavioral health issues (23.4%), (c) chronic unhealthy with impairments and violence/ injury (23.6%), and (d) very unhealthy across all domains (7.9%). These groups have unique sociodemographic background and incarceration history characteristics.

Conclusion—This study demonstrates the complexity of health for elderly inmates. Prison health should continue to be monitored to aid correctional and community health programs in understanding clinical risks, exposures, and health care needs for this population.

Keywords

prisons; prisoners; aging; comorbidity; mental health; injuries; chronic illness

The U.S. population of older adults grew by more than one-half from 1990 to 2009. While the overall prison population more than doubled during this time, the population of incarcerated older adults increased nearly eightfold (Human Rights Watch, 2012) creating an “aging crisis” in prisons as documented in recent national news media (Belluck, 2012;

Reprints and permissions: sagepub.com/journalsPermissions.nav

Corresponding Author: Kathryn M. Nowotny, Department of Sociology, Institute of Behavioral Science, University of Colorado Boulder, 1440 15th Street, Boulder, CO 80309, USA. Kathryn.Nowotny@Colorado.edu.

The National Institute of Child Health and Human Development (NICHD), the National Institute on Drug Abuse (NIDA), and the National Science Foundation (NSF) had no role in study design; in the collection, analysis, and interpretation of data; in the writing of the report; or in the decision to submit the article for publication.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Horwitz, 2015; Palazzolo, 2015). There are now 124,900 prisoners aged 55 and older behind bars compared with just 8,853 in 1981 with projections estimating more than 400,000 by 2030 (American Civil Liberties Union [ACLU], 2012). The changing age structure of the prison population suggests a new urgency to understand the specific health care needs of older prisoners (Lemieux, Dyeson, & Castiglione, 2002; Linder & Meyers, 2007; Reimer, 2008). A recent ACLU (2012) report finds that US\$16 billion is spent annually on prisoners aged 50 years and older due largely to high health care expenditures. The health of this population is relevant for not only correctional health systems but also community health systems as most prisoners will return to their communities and will return without health coverage (Iglehart, 2014). The purpose of this article is to document the multiple health problems and unique health profiles among elderly male inmates by examining 22 health conditions across four domains of health: chronic medical conditions, drug- and alcohol-related diseases, impairments, and mental and behavioral health.

Trends in the “Graying” of Prisons

Older prisoners are comprised of three groups (Beckett, Peternelj-Taylor, & Johnson, 2003): prisoners who are serving extended sentences, prisoners who are repeat offenders entering prison at old age, and prisoners who are first-time offenders late in life. This pattern of aging prisoners is the result of multiple trends. The policies and initiatives enacted by the War on Drugs, including mandatory minimum sentences, truth in sentencing (limiting parole so inmates serve their sentences in prison), three strikes (mandatory life sentence for third violent or serious felony conviction), and increased sentence lengths have led to a rate of incarceration unprecedented in world history. The number of individuals serving life without parole sentences increased 22% between 2003 and 2008, nearly 4 times the rate of growth of the parole-eligible life sentenced population (Nellis, 2010). One out of every 11 individuals in prison are serving life sentences, and just over 29% of them will never be eligible for parole. The majority of older adults in prison are serving sentences of 20 years or more for drug and other nonviolent crimes (ACLU, 2012).

An unforeseen consequence of the War on Drugs, compounded by the overall aging of the U.S. population, is the increase of persons growing old and dying behind bars. From 2001 to 2011, 15,113 state prison inmates aged 55 or older died in prison accounting for 42.8% of all deaths during that time (Noonan & Ginder, 2013). The percent of deaths attributed to older adults, however, increased from 33.8% in 2001 to 52.8% in 2011. Despite this, palliative medicine, which emphasizes advanced care planning at an earlier stage than end-of-life hospice care, is scarce in prisons and many barriers exist for initiating this type of care (Williams, Goodwin, Baillargeon, Ahalt, & Walter, 2012). For newly incarcerated elderly prisoners, reaction to incarceration later in life is characterized by family conflict, depression, thoughts of suicide, and fear of dying in prison (Aday, 1994; Leigey, 2015). Older prisoners view the stressors of coping with death and dying, especially if it happens in prison, as compounding the stress of prison life, although high levels social support while incarcerated help alleviate these feelings of distress (Aday, 2003).

Overall, the criminal-justice-involved population has significantly higher rates of chronic and infectious diseases (Binswanger, Krueger, & Steiner, 2009; Wilper et al., 2009), mental

and behavioral health conditions (Baillargeon, Binswanger, Penn, Williams, & Murray, 2009), and trauma and injury (DeHart, 2008) than the general population as well as only episodic care from correctional facilities and emergency rooms (Boutwell & Freedman, 2014; Patel, Boutwell, Brockmann, & Rich, 2014). Having ever been imprisoned is also associated with long-term elevated mortality risk (Spaulding et al., 2011). Although knowledge on the health of older prisoners is limited, research has documented that older adults in prison are not a healthy group. In the general population, age 65 is most often used to characterize the life stage of elderly. In the prison population, age 50 is most often used (Loeb & AbuDagga, 2006). This age cut-off is lower for prisoners because many incarcerated persons experience accelerated aging due to lifestyle factors such as poor diet, stress, and drug and alcohol abuse, and factors such as head trauma, poor health care, and low educational attainment and socioeconomic status (Aday, 2003; Loeb & AbuDagga, 2006). On average, prisoners are physiologically 10 to 15 years older than their community counterparts (Falter, 2006), which has led some to question whether age-grading based on biological/physiological assessments or functional assessments would be a more reliable indicator of age (Rikard & Rosenberg, 2007). Nevertheless, the National Institute of Corrections and the National Commission on Correctional Health Care define “elderly” at age 50 or 55 (Anno, Graham, Lawrence, & Shansky, 2004).

Elderly prisoners have worse health than their community-dwelling counterparts (Aday, 2003; Fazel, Hope, O’Donnell, Piper, & Jacaby, 2001; Loeb, Steffensmeier, & Lawrence, 2008; Williams & Abraldes, 2007; Williams et al., 2006). Older prisoners are significantly more likely to have one or more chronic condition or disability (Williams et al., 2006) than their non-incarcerated counterparts and consistently report health declines since incarceration (Loeb & AbuDagga, 2006). On average, older prisoners have three chronic medical conditions (Chiu, 2010). Research on male prisoners aged 60 or older in England and Wales documents that older prisoners have worse health than older individuals in the general population (Fazel et al., 2001). A study of incarcerated and community living elderly men in the United States found that these groups did not differ by health status even though the community sample was on average 15 years older (Loeb et al., 2008). Falter (1999) examined utilization of health services by elderly prisoners (50 years or older) in the U.S. Federal Bureau of Prisons. They found that a sample of 1,051 elderly prisoners accounted for 11,388 encounters with medical services over a 6-month period. Wangmo and colleagues (2015) assessed health care utilization among aging and younger prisoners in Switzerland and argue that prison systems must develop solutions to address the needs of an aging population, particularly for those with physical and mental health problems. Not surprising, older prisoners are the largest consumer of health care within prisons making them the most expensive subpopulation to incarcerate (Aday, 2003; Mitka, 2004). A 2012 American Civil Liberties Union (ACLU) report found that it costs US\$31,135 per year to house an average prisoner, but it costs US\$68,270 per year to house a prisoner age 50 and older.

Research on serious mental illness, functional impairment, geriatric syndromes, and cognitive impairment among elderly prisoners is also limited. But existing research documents that even though rates of serious mental illness in older prisoners are similar to older persons in the community (Caverly, 2006), it is likely that psychiatric conditions are underdiagnosed and undertreated in the incarcerated population (Aday, 2003). A study of

functional impairment in geriatric women in prison found that 16% reported at least one impairment in activities of daily living (Williams et al., 2006). However, the authors developed a prison-specific activities of daily living questionnaire that included dropping to the floor for alarms, standing for count, getting to meals, hearing orders, and climbing to a top bunk. Sixty-nine percent reported at least one impairment in prison activities of daily living, and 29% of elderly women were assigned to a top bunk. Studies of geriatric syndromes, common conditions associated with aging, experienced by prisoners have found that rates of vision and hearing impairment, incontinence, and falls are high (Williams & Abralde, 2007; Williams, Ahalt, & Greifinger, 2014). Finally, a study of cognitive impairment among prisoners aged 55 and older found that 40% had cognitive impairment, a rate far higher than found in the community living population (Williams et al., 2014). Dementia in particular can be especially difficult to manage in prisons and raises ethical concerns about the safety of elderly prisoners.

If left untreated, these health conditions can result in repeated cycling through the correctional system, exacerbation of disease, and avoidable and expensive hospitalizations, and emergency room visits (Conklin, Lincoln, & Tuthill, 2000; Frank et al., 2013; Shah, Edmonds-Myles, Anderson, Shapiro, & Chu, 2009; Somers et al., 2014). In a national study of hospital and emergency department utilization, Frank, Linder, Becker, Fiellin, and Wang (2014) found that individuals with recent criminal justice involvement make up 4.2% of adults, yet account for an estimated 7.2% of hospital expenditures and 8.5% of emergency department expenditures. Most patients leave prison without a sufficient supply of medication, a primary care follow-up, or health insurance (Wakeman, McKinney, & Rich, 2009), although results from a randomized trial show that patients leaving prison with a chronic illness will engage in primary care if provided early access in a transitional care setting (Wang et al., 2012). Research conducted in Baltimore found that 10% of ex-offenders had any kind of private health coverage while less than 5% had public health coverage (e.g., Medicaid, Medicare, veteran's benefits) even though almost all of those surveyed had a chronic health condition that required treatment (Hawkins, O'Keefe, & James, 2010; Visher, La Vigne, & Travis, 2004).

Barriers to treatment often exist for newly released prisoners due to high rates of poverty and unemployment, unstable housing and homelessness, low literacy, and family problems (Binswanger, Nowels, et al., 2011; Kulkarni, Baldwin, Lightstone, Gelberg, & Diamant, 2010; Patel et al., 2014; Wang et al., 2010). Even if ex-offenders have health coverage, it does not guarantee that they will know how to access services due to a lack of knowledge about and understanding of the health care system (Hawkins et al., 2010). Older prisoners, in particular, have difficulties enrolling in health benefits programs and have higher rates of mortality, hospitalization and emergency room visits, and homelessness after leaving prison (Ahalt, Trestman, Rich, Greifinger, & Williams, 2013; Binswanger et al., 2007; Williams et al., 2010). The majority of prisoners return to a small number of disadvantaged urban neighborhoods (Drucker, 2011), which affects the public health of those communities and strains local health care systems (Binswanger, Redmond, Steiner, & Hicks, 2011; Freudenberg, 2001).

However, with the passage of the Affordable Care and Patient Protection Act (ACA), as many as 2.86 million, or 22% of the newly Medicaid eligible, are criminal-justice-involved persons (Cuellar & Jehanzeb, 2014; Patel et al., 2014). Although the ACA does not change Medicaid's prohibition against paying for services during incarceration (Cuellar & Jehanzeb, 2014; Iglehart, 2014), it does present an opportunity to enroll previously underrepresented populations into coverage. A large proportion of the newly eligible under the expansion are men, a population that managed care plans have little experience serving. Because a disproportionate number of incarcerated men are from racial minority groups, a focus on reentry health care provides new possibilities to reduce long-standing race disparities in health and health care access (Dumont, Allen, Brockmann, Alexander, & Rich, 2013; Iguchi, Bell, Ramchand, & Fain, 2005; Wang et al., 2010). Thus, there exists a great need to understand the unique epidemiology and health care needs of the older male prison population who is more likely to now be eligible for Medicaid or dually eligible for Medicare upon release from prison.

To date, most existing research has described the health of incarcerated adults in terms of single morbidities. It is increasingly clear that addressing public health concerns cannot be accomplished one morbidity at a time because behavioral health comorbidity more adequately describes the health profile of those at greatest risk (Williams, Steinberg, Griffiths, & Cooperman, 2013). The limited number of studies that have focused on comorbidities among incarcerated adults have not characterized the range and prevalence of different health profiles (Bishop & Merten, 2011). This study examines patterns of co- and multimorbidity (U.S. Department of Health and Human Services, 2010) among elderly male prisoners. The percentage of older adults with two or more chronic conditions has significantly increased over the previous 10 years (Freid, Bernstein, & Bush, 2012). But there is little information about the specific composition of comorbid health profiles including physical, functional, mental, and behavioral health. This information is critical because the increasing age of prisoners needs to be accompanied by information about health composition, describing health with discrete classes rather than simple indicators of prevalence. As such, the objective of this article is to move beyond the single-disease framework by which most health care is configured (Barnett et al., 2012) to provide clinicians, researchers, and administrators, both within and outside of prison, health information for program planning (Jarrett, Adeyemi, & Huggins, 2006) for the multitude of health conditions that elderly male prisoners are living with and how these conditions cluster into specific health profiles across chronic medical conditions, drug- and alcohol-related diseases, impairments, and mental and behavioral health.

Method

We used data from the Bureau of Justice Statistics (BJS) 2004 Survey of Inmates in State Correctional Facilities (SISCF), which provided a nationally representative sample of prisoners (U.S. Department of Justice, BJS, 2007). These data were de-identified and publicly available. Although these data were 10 years old, they were the best epidemiologic data available to assess the health of the prison population nationwide. Health information on prisoners is not widely available because incarcerated persons are excluded from national health surveys (Ahalt, Binswanger, Steinman, Tulskey, & Williams, 2011) and clinical

research (Wang & Wildeman, 2011), former inmates are often not identified in national health surveys (Ahalt et al., 2011), correctional facilities often have inadequate surveillance systems for providing valid and reliable data on inmate health (Greifinger, 2006), and research among prisoners is difficult due to a long history of medical abuses (Gostin, 2007).

The sample was collected in a stratified, two-stage selection process. A sample of prisons was selected from a universe of 1,585 state prisons. Overall, 301 prisons were randomly selected for inclusion in the study and a total of 287 prisons participated. In the second stage of the sampling process, prisoners were randomly selected for participation. A total of 14,499 prisoners participated for an overall response rate of 89.1%. The computer-assisted personal interview (CAPI) asked respondents about their incarceration history, offense characteristics, family and background characteristics, drug and alcohol use and abuse, prison activities, and self-reported health, mental health, and treatment. Participation in the study was voluntary.

The study sample included only men aged 50 or older ($n = 1,160$). A list-wise deletion dropped cases that had missing values. Although latent class analysis is designed to use full information, concomitant variables must be fully observed (see “Statistical Analysis” below; Linzer & Lewis, 2011). Eighty-nine percent of cases ($n = 1,026$) had no missing data. Patterns of missingness were examined, and there was no evidence to suggest that the deleted cases were significantly different from the study sample. In this sample of elderly state inmates, 63.9% were convicted of a violent offense while 13.8% were convicted of a property offense and 11.1% of a drug offense. Half had no previous prison sentence (52.9%), and 3.6% were serving a life sentence. Women were excluded from the study because inadequate sample sizes limited our ability to estimate reliable models for older incarcerated women. The study was reviewed by the university Institutional Review Board and was found exempt and not human participants research.

Measures

There were four health domains examined in this study: chronic medical conditions, drug- and alcohol-related diseases, impairments, and mental and behavioral health. All health items were represented by dichotomous variables (0 = *no*, 1 = *yes*). The seven chronic medical conditions were assessed based on respondents’ self-reports of current diagnoses with all-cause cancer, hypertension or high blood pressure, diabetes, heart problems, kidney problems, arthritis, and asthma.

There were four drug- and alcohol-related diseases. Cirrhosis, hepatitis, and HIV/AIDS were based on self-report lifetime diagnosis. Having a sexually transmitted infection (STI) was assessed as a current diagnosis. The four impairments were vision impairment even with the use of glasses, hearing impairment even with the use of a hearing aid, mental impairment, and requiring an aid for daily living (e.g., walker, cane, etc.).

Mental and behavioral health was assessed with a series of indicators. There were two serious mental illnesses included: lifetime diagnosis with depression and or post-traumatic stress disorder (PTSD). A Substance Use Scale determined retrospectively whether prisoners met the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American

Psychiatric Association, 1994) criteria for alcohol and or drug dependence in the year prior to their admission to prison. History of injecting drug use was represented by never/ever. Finally, three measures of trauma and injury were included: intentional injury (i.e., assault) or accidental injury during their current incarceration episode and experiencing childhood trauma (unwanted sexual contact or physical abuse before the age of 18).

A number of demographic factors were included as covariates in the latent class regression analysis including age (50–84), race/ethnicity (White, Black, and Latino), marital status (never married, separated/divorced/widowed, and married), education (high school diploma), and veteran status. There were two continuous measures of incarceration: the total number of past incarceration episodes and the number of years served to date during their current incarceration episode.

Statistical Analysis

We analyzed these data using Latent Class Regression Analysis in R (poLCA package) to determine health profiles of older male inmates (Linzer & Lewis, 2011). Latent Class Analysis uses polytomous variables to identify patterns that indicate underlying groups (classes) of respondents. These classes provide a picture of how the manifest variables cluster among respondents. We used an extension of this basic model that allows for the inclusion of covariates to predict latent class membership. This technique is preferred for estimating the effect of covariates because the coefficients on the covariates are estimated in a multinomial logistic regression simultaneously as part of the latent class model (Hagenaars & McCutcheon, 2002; Linzer & Lewis, 2011). Assigning class membership and then regressing class membership on covariates as a separate analysis has been found to produce biased estimates (Bolck, Croon, & Hagenaars, 2004). Based on an analysis of the study's manifest and concomitant variables, each inmate was assigned to a best-fitting class and overall class membership shares were generated based on the model posterior probabilities.

The poLCA command provided several fit statistics which can be used to determine the appropriate number of classes. The log likelihood and chi-square test were unreliable as there were likely a number of cells with no data, given the large number of variables used in this analysis. Therefore, we used the Akaike Information Criterion (AIC; Akaike, 1973) and Bayesian Information Criterion (BIC; Schwarz, 1978) to determine the best-fitting model. Substantial improvement in fit occurred for the AIC until four classes were reached, with little change from four to six classes. The BIC was lowest at three classes, but there was little substantive difference between three and four classes at which point the BIC increased. Given this, we decided that the four-class solution was both the most parsimonious class and the best-fitting class as it provided us with distinct and interpretable classes that allow for a novel way to understand risk in this older population. Once a four-class solution was determined, the model was estimated 100 times to find the global maximum likelihood solution. Because latent class analysis uses the expectation-maximization (EM) algorithm (Dempster, Laird, & Rubin, 1977), it is essential to run the model multiple times until you can be reasonably certain that you have found the parameter estimates that produce the global maximum likelihood solution (Linzer & Lewis, 2011). In this case, the global

maximum likelihood solution occurred with an AIC equal to 15169 as this model fit occurred most often.

Results

Table 1 presents the descriptive statistics for each of the four classes. Table 2 presents the corresponding results from the multinomial logistic regression. Table 3 presents the percentages and means for the concomitant variables across classes. The first class presented in Table 1 was the largest, comprising 45.1% of inmates. This class was relatively healthy and serves as the reference class (Table 2). The remaining three classes (54.9% of inmates) have poor health but across different domains with different etiologies.

Class 2 was characterized as substance users with behavioral health issues. Inmates in this group have a high burden of diseases related to drug and alcohol use (Table 1). Of particular concern were the high rates of HIV/AIDS (3.5%) and hepatitis (27.3%). Inmates in this group also reported a high level of behavioral health issues including substance use dependence (56.6%), injecting drug use (64.6%), intentional injuries (16.6%), and accidental injuries (20.8%). Compared with the healthy group (Table 2), Class 2 was significantly younger ($OR = 0.89$; $p < .001$), and had significantly greater criminal justice involvement as evidenced by past incarceration episodes ($OR = 1.28$; $p < .001$) and total number of years served to date ($OR = 1.03$; $p < .05$). This group had a mean age of 53.9 and has the highest percentage of Black men (45.4%; Table 3).

Class 3 was characterized as chronically unhealthy with multiple impairments and suffering from trauma and injury (Table 1). This class had the highest prevalence rates for five out of seven chronic health conditions including 10.1% cancer, 60.0% hypertension, 30.1% diabetes, 40.1% heart problems, and 12.4% kidney problems. They also had the second highest rates of asthma (17.7%) and arthritis (65.2%). About one third of these men reported vision and hearing impairments with about one quarter requiring an aid for daily living such as a cane or a walker. Finally, these men reported high rates of accidental (28.3%) and intentional injuries (14.5%) while in prison as well as high rates of childhood trauma (12.7%). This group was older than the healthy group ($OR = 1.14$, $p < .001$; Table 2) with the oldest average age of all the classes at 61.0 years (Table 3). They appeared to have poor health related to aging, given their low rates of drug- and alcohol-related diseases and mental health problems.

The final group, Class 4, was characterized by their very unhealthy status across all four health domains (Table 1). They reported among the highest rates for all health conditions except for cancer, HIV/AIDS, and STI. In particular, Class 4 reported the highest prevalence rate for cirrhosis (14.8%) and all four of the impairments. Almost half reported a hearing impairment and vision impairment even with the use of an aid. Notably, this group was the only one to report mental impairment with one third reporting this condition. Of unique concern is that this group reported the highest rates for all the mental and behavioral health problems, some by a large margin, except for injecting drug use which was still quite high (53.5%). More than half of these inmates had depression, one third suffered from PTSD, and three fourths had a substance use dependence disorder. Rates of trauma and injury were

relatively high with 22.9% suffering intentional injury and 35.7% suffering accidental injury while in prison. Almost one third experienced childhood physical and or sexual assault. Given the myriad of chronic health conditions and impairments, it is notable that this group was significantly younger than the healthy group of older inmates (OR = 0.87, $p < .01$; Table 2). In fact, they had the lowest mean age of all four groups (53.7 years; Table 3). Compared with the healthy group, the very unhealthy group had almost 2.5 times the odds of being a veteran (OR = 2.40, $p < .05$) with half reporting having served in the military. They also had significantly higher odds of being incarcerated more times (OR = 1.34, $p < .001$), which may indicate a pattern of serial incarceration. While this was a small group of older inmates comprising only 7.9% of the sample, they are a group with substantive and complex treatment needs given their high level of multimorbidity across different domains of health.

Discussion

There are four subgroups of elderly male inmates defined by their health care needs across multiple domains including chronic medical conditions, drug- and alcohol-related diseases, impairments, and mental and behavioral health. Healthy inmates make up 45.1% of the older male inmate population. This group is characterized by relatively low rates of health conditions across the domains examined. The remaining health subgroups have a high level of multimorbidity. The second group identified is characterized by their substance use and behavioral issues as indicated by high rates of drug- and alcohol-related diseases and experience with substance use and injuries. This group is significantly younger and has a greater criminal justice involvement history compared with the healthy group. The third health profile has the highest mean age, the highest prevalence of chronic medical conditions, and reports high levels of impairments and trauma and injury. The final group is the smallest yet unhealthiest. These inmates report very poor health for all four health domains. They are also the only group to report substantive levels of mental impairment, depression, and PTSD. Despite their multitude of health problems, they are the youngest of the groups and about half of the inmates in this group are veterans.

In addition to the clustering of men into subgroups, there are four key points that require further discussion. First, the findings demonstrate the necessity of considering medical, psychiatric, and behavioral health when assessing the health of older criminal justice-involved men. Traditionally, medicine and psychiatry have existed in separate diagnostic and treatment spaces (Geyman, 2014). It is clear that a more integrated approach is needed. Findings also suggest community reintegration may be more complicated for some aging prisoners. Recent research has documented that longer incarceration times and serious drug use histories negatively affect optimism about life after incarceration (Visher & O'Connell, 2012). This is likely to be exacerbated as most prisoners return to urban disadvantaged communities characterized by low levels of formal resources. Holistic service needs of chronically/ terminally ill men may not be readily available in prison or the community and the seriousness of criminal offense may make it difficult to find housing or nursing home placement. Prisoners serving long sentences may have become institutionalized—the inmates in this study served sentences averaging longer than 8 to 10 years. As a result, changes in the key institutions during their absence may make it difficult to reintegrate seamlessly and some of their work connections, family support systems, and social networks

may simply not exist anymore. Finally, the prominent histories of chronic drug use, especially injecting drug use, may make pain management difficult (Darnall & Sazie, 2012), an issue that may become more prevalent as the population of older drug users continues to increase (Torres, Kaplan, & Valdez, 2011).

Second, this study found that health profiles varied by race. Whites comprised the highest percentage of the chronic unhealthy group while Blacks comprised the highest percentage of substance abusers with behavioral health issues, although Blacks are overrepresented in all four subgroups. Previous research has documented lower quality of care (Trivedi, Zaslavsky, Schneider, & Ayanian, 2005), lower health literacy (Sudore et al., 2006), and lower intentions toward seeking mental health services (Conner et al., 2010) for older Blacks compared with Whites. This study's findings reinforce the need to focus on holistic reentry health care as a potential way to reduce these long-standing racial disparities in health and health care access for older adults (Wang et al., 2010; Wildeman, 2011).

Third, this study found that veterans are overrepresented at older ages in prison. Overall veterans account for 10% of the state prison population (Noonan & Mumola, 2007); however, this study found that 39% of state inmates above the age of 50 are veterans, largely representing the Vietnam War era. Other studies of older inmates have found little difference between veterans and nonveterans in terms of psychological distress and physical functioning (Kopera-Frye et al., 2013), and medical conditions and disability (Williams et al., 2010). Williams and colleagues (2010) did find, however, that older veteran inmates had higher rates of PTSD, asthma, and hearing disabilities than older nonveteran inmates. Our findings offer a more nuanced understanding of the relationship between veteran status and health among older inmates. While the rates of military service were high for each of the four health classes, veterans were overrepresented in the two unhealthiest classes. A more focused analysis is needed to explicate the varieties of health issues facing older veteran inmates (Blue-Howells, Clark, van den Berk-Clark, & McGuire, 2013).

Fourth, the high rates of impairment found in this study are concerning. Prison environments typically do not allow for modifications for functional impairments, which may impede a prisoners' ability to engage in activities of daily living including necessary prison activities such as getting into a top bunk or laying on the floor for alarms (Williams et al., 2006). Vision and hearing impairment may also inhibit a prisoners' ability to comply with orders leading to increased risk for violent victimization and rule violations. Indeed, the men in this study report high rates of injuries, which are among the top 10 causes of death among older adults (Dellinger & Stevens, 2006). An evaluation of functional impairment needs to be included for elderly men in prison to provide effective correctional health care (MacDonald, Parsons, & Venters, 2013) as prison environmental stressors and other comorbid health conditions likely exacerbate issues of impairment.

Limitations

There are three limitations that need to be considered. First, as with any study on the older adult population mortality selection may bias estimates. This may especially be the case for research on the older incarcerated population, given the higher rates of mortality for inmates (Binswanger, Blatchford, Lindsay, & Stern, 2011; Spaulding et al., 2011). Second, this study

relies on self-reported health status instead of clinical diagnoses. Nationally representative objective indicators are not available for this population. However, all prisoners have access to the same health care while they are incarcerated so there is likely no bias regarding the social demographic analysis in our study. It is of utmost importance that the health of prisoners continued to be surveyed. Third, this study does not explicitly examine causal pathways of disease onset and clustering. Research is needed to understand the causal pathways and to develop and test clinical and population interventions targeting multimorbidity among these groups. In particular, the pathological mechanisms behind the identified clusters, which are only suggested here, need further elaboration to identify possible preventive strategies.

Conclusion

Determining subgroups among persons living with multiple morbid conditions is an important step in improving the health status of the total population (U.S. Department of Health and Human Services, 2010) and has only recently begun to be addressed by researchers (Marengoni et al., 2011). Clinicians working with criminal-justice-involved persons both within and outside of prisons need to be aware of their unique health profiles and health care needs (Wangmo et al., 2015). Providers working in federally qualified health centers are likely to see patients with a history of criminal justice involvement, perhaps recently released from prison, and need to develop cultural competence when dealing with this population to “understand not only the conditions faced by inmates while incarcerated and upon release but also the pressures faced by criminal justice professionals” (National Research Council and Institute of Medicine of the National Academies, 2013). Stigma and perceived discrimination in medical settings is a major barrier to formally incarcerated patients disclosing clinically relevant information (Fox et al., 2014). Overall, the findings demonstrate the complexity of health for this population and can aid correctional and community health plans in understanding clinical risks, exposures, and health care needs, and in establishing ways to engage these patients through enhanced coordination and integration of care (Bartels, 2004; Cuellar & Jehanzeb, 2014; Grazier, Smith, Song, & Smiley, 2014; Hammett, Roberts, & Kennedy, 2001; Retchin, 2008) and in the transition from correctional health care to community health (Centers for Disease Control and Prevention, 2001; Cuellar & Jehanzeb, 2014; Hammett et al., 2001).

Acknowledgments

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Support for this study was provided to the lead author by the National Institutes of Health (NIH) Ruth L. Kirschstein National Research Service Award Individual Fellowship (F31 DA037645) funded by the National Institute on Drug Abuse (NIDA), the NIDA-funded National Hispanic Science Network Interdisciplinary Research Training Institute on Drug Abuse at the University of Southern California (R25 DA026401), and the National Science Foundation (NSF) Sociology Doctoral Dissertation Improvement Grant (1401061). Additional support was provided by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)-funded University of Colorado Population Center (R24 HD066613).

References

- Aday RH. Aging in prison: A case study of new elderly offenders. *International Journal of Offender Therapy and Comparative Criminology*. 1994; 38:79–91.
- Aday, RH. *Aging prisoners: Crisis in American corrections*. Santa Barbara, CA: Praeger; 2003.
- Ahalt C, Binswanger IA, Steinman M, Tulsy J, Williams BA. Confined to ignorance: The absence of prisoner information from nationally representative health data sets. *Journal of General Internal Medicine*. 2011; 27:160–166. [PubMed: 21922160]
- Ahalt C, Trestman RL, Rich JD, Greifinger R, Williams BA. Paying the price: The pressing need for quality, cost, and outcomes data to improve correctional health care for older prisoners. *Journal of the American Geriatrics Society*. 2013; 61:2013–2019. [PubMed: 24219203]
- Akaike, H. Information theory and an extension of the maximum likelihood principle. In: Petrov, B., Csake, F., editors. *Second international symposium on information theory*. Budapest, Hungary: Akademiai Kiado; 1973. p. 267-281.
- American Civil Liberties Union. *At America's expense: The mass incarceration of the elderly*. New York, NY: Author; 2012.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4. Washington, DC: Author; 1994.
- Anno, BJ., Graham, C., Lawrence, JE., Shansky, R. *Correctional health care: Addressing the needs of elderly, chronically ill, and terminally ill inmates*. Washington, DC: U.S. Department of Justice, National Institute of Corrections; 2004.
- Baillargeon J, Binswanger IA, Penn JV, Williams BA, Murray OJ. Psychiatric disorders and repeat incarcerations: The revolving prison door. *American Journal of Psychiatry*. 2009; 166:103–109. [PubMed: 19047321]
- Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie C. Epidemiology of multimorbidity and implications for health care, research, and medical education: A cross-sectional study. *The Lancet*. 2012; 380:37–43.
- Bartels SJ. Caring for the whole person: Integrated health care for older adults with severe mental illness and medical comorbidity. *Journal of the American Geriatrics Society*. 2004; 52:S249–S257. [PubMed: 15541165]
- Beckett J, Peternelj-Taylor C, Johnson RL. Growing old in the correctional system. *Journal of Psychosocial Nursing & Mental Health Services*. 2003; 41(9):12–18.
- Belluck, P. Life, with dementia. *The New York Times*. 2012 Feb 25. Retrieved from http://www.nytimes.com/2012/02/26/health/dealing-with-dementia-among-aging-criminals.html?_r=0
- Binswanger IA, Blatchford PJ, Lindsay RG, Stern MF. Risk factors for all-cause, overdose and early deaths after release from prison in Washington state. *Drug and Alcohol Dependence*. 2011; 117:1–6. [PubMed: 21295414]
- Binswanger IA, Krueger PM, Steiner JF. Prevalence of chronic medical conditions among jail and prison inmates in the USA compared with the general population. *Journal of Epidemiology & Community Health*. 2009; 63:912–919. [PubMed: 19648129]
- Binswanger IA, Nowels C, Corsi KF, Long J, Booth RE, Kutner J, Steiner JF. “From the prison door right to the sidewalk, everything went downhill,” a qualitative study of the health experiences of recently released inmates. *International Journal of Law and Psychiatry*. 2011; 34(4):249–255. [PubMed: 21802731]
- Binswanger IA, Redmond N, Steiner JF, Hicks LS. Health disparities and the criminal justice system: An agenda for further research and action. *Journal of Urban Health*. 2011; 89:98–107.
- Binswanger IA, Stern MF, Deyo RA, Heagerty PJ, Cheadle A, Elmore JG, Koepsell TD. Release from prison—A high risk of death for former inmates. *The New England Journal of Medicine*. 2007; 356:157–165. [PubMed: 17215533]
- Bishop AJ, Merten MJ. Risk of comorbid health impairment among older male inmates. *Journal of Correctional Health Care*. 2011; 17:34–45. [PubMed: 21278318]
- Blue-Howells JH, Clark SC, van den Berk-Clark C, McGuire JF. The U.S. Department of Veterans Affairs Veterans Justice programs and the sequential intercept model: Case examples in national

- dissemination of intervention for justice-involved veterans. *Psychological Services*. 2013; 10:48–53. [PubMed: 22924802]
- Bolck A, Croon M, Hagenaaers J. Estimating latent structure models with categorical variables: One-step versus three-step estimators. *Political Analysis*. 2004; 12:3–27.
- Boutwell A, Freedman J. Coverage expansion and the criminal justice-involved population: Implications for plans and service connectivity. *Health Affairs*. 2014; 33:482–486. [PubMed: 24590949]
- Caverly SJ. Older mentally ill inmates: A descriptive study. *Journal of Correctional Health Care*. 2006; 12(4):262–268.
- Centers for Disease Control and Prevention. *Helping inmates return to the community*. Washington, DC: US Department of Health and Human Services; 2001.
- Chiu, T. *It's about time: Aging prisoners, increasing costs, and geriatric release*. New York: Vera Institute of Justice; 2010.
- Conklin TJ, Lincoln T, Tuthill RW. Self-reported health and prior health behaviors of newly admitted correctional inmates. *American Journal of Public Health*. 2000; 90:1939–1941. [PubMed: 11111273]
- Conner KO, Copeland VC, Grote NK, Koeske G, Rosen D, Reynolds CF III, Brown C. Mental health treatment seeking among older adults with depression: The impact of stigma and race. *The American Journal of Geriatric Psychiatry*. 2010; 18(6):531–543. [PubMed: 20220602]
- Cuellar AE, Jehanzeb C. Health care reform, behavioral health, and the criminal justice population. *The Journal of Behavioral Health Services & Research*. 2014; 41:447–459. [PubMed: 24807645]
- Darnall BD, Sazie E. Pain characteristics and pain catastrophizing in incarcerated women with chronic pain. *Journal of Health Care for the Poor and Underserved*. 2012; 23:543–556. [PubMed: 22643606]
- DeHart D. Pathways to prison: Impact of victimization in the lives of incarcerated women. *Violence Against Women*. 2008; 14:1362–1381. [PubMed: 19008544]
- Dellinger AM, Stevens JA. The injury problem among older adults: Mortality, morbidity, and costs. *Journal of Safety Research*. 2006; 37:519–522. [PubMed: 17140602]
- Dempster AP, Laird NM, Rubin DB. Maximum likelihood from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society: Series B (Methodological)*. 1977; 39(1):1–38.
- Drucker, E. *A plague of prisons: The epidemiology of mass incarceration in America*. New York, NY: The New Press; 2011.
- Dumont DM, Allen SA, Brockmann BW, Alexander NE, Rich JD. Incarceration, community health, and racial disparities. *Journal of Health Care for the Poor and Underserved*. 2013; 24:78–88. [PubMed: 23377719]
- Falter RG. Selected predictors of health service needs of inmates over age 50. *Journal of Correctional Health Care*. 1999; 6:149–175.
- Falter RG. Elderly inmates: An emerging correctional population. *Correctional Health Journal*. 2006; 1:52–69.
- Fazel S, Hope T, O'Donnell I, Piper M, Jacaby R. Health of elderly male prisoners: Worse than the general population, worse than younger prisoners. *Age and Ageing*. 2001; 30:403–407. [PubMed: 11709379]
- Fox AD, Anderson MR, Bartlett G, Valverde J, MacDonald RF, Shapiro LI, Cunningham CO. A description of an urban transitions clinic serving formerly incarcerated persons. *Journal of Health Care for the Poor and Underserved*. 2014; 25(1):376–382. [PubMed: 24509032]
- Frank JW, Andrews CM, Green TC, Samuels AM, Trinh TT, Friedmann PD. Emergency department utilization among recently released prisoners: A retrospective cohort study. *BMC Emergency Medicine*. 2013; 13 Article 16.
- Frank JW, Linder JA, Becker WC, Fiellin DA, Wang EA. Increased hospital and emergency department utilization by individuals with recent criminal justice involvement: Results of a national survey. *Journal of General Internal Medicine*. 2014; 29:1226–1233. [PubMed: 24817280]
- Freid, VM., Bernstein, AB., Bush, MA. *Multiple chronic conditions among adults aged 45 and over: Trends over the past 10 years*. Washington, DC: US Department of Health and Human Services; 2012.

- Freudenberg N. Jails, prisons, and the health of urban populations: A review of the impact of the correctional system on community health. *Journal of Urban Health*. 2001; 78:214–235. [PubMed: 11419576]
- Geyman JP. Challenges to the future of psychiatry: Parallels with primary care. *Psychiatric Annals*. 2014; 44:61–64.
- Gostin LO. Biomedical research involving prisoners: Ethical values and legal regulation. *Journal of the American Medical Association*. 2007; 297:737–740. [PubMed: 17312293]
- Grazier KL, Smith JE, Song J, Smiley ML. Integration of depression and primary care: Barriers to adoption. *Journal of Primary Care & Community Health*. 2014; 5:67–73.
- Greifinger RB. Inmates as public health sentinels. *Journal of Law & Policy*. 2006; 22:253–264.
- Hagenaars, J., McCutcheon, AL. *Applied latent class analysis*. Cambridge, UK: Cambridge University Press; 2002.
- Hammett TM, Roberts C, Kennedy S. Health-related issues in prisoner reentry. *Crime & Delinquency*. 2001; 47:390–409.
- Hawkins AS, O’Keefe AM, James X. Health care access and utilization among ex-offenders in Baltimore: Implications for policy. *Journal of Health Care for the Poor and Underserved*. 2010; 21:649–665. [PubMed: 20453363]
- Horwitz, S. The painful price of aging in prison. *The Washington Post*. 2015 May 2. Retrieved from <http://www.washingtonpost.com/sf/national/2015/05/02/the-painful-price-of-aging-in-prison/>
- Human Rights Watch. *Old behind bars: The aging prison population in the united states*. Washington, DC: Author; 2012. Retrieved from http://www.hrw.org/sites/default/files/reports/usprisons0112webwcover_0.pdf
- Iglehart JK. The ACA opens the door for two vulnerable populations. *Health Affairs*. 2014; 33:358. [PubMed: 24590930]
- Iguchi MY, Bell J, Ramchand RN, Fain T. How criminal system racial disparities may translate into health disparities. *Journal of Health Care for the Poor and Underserved*. 2005; 16(4 Suppl B):48–56. [PubMed: 16327107]
- Jarrett NC, Adeyemi SA, Huggins T. Bridging the gap: Providing health care to newly released men. *Journal of Health Care for the Poor and Underserved*. 2006; 17:70–80.
- Kopera-Frye K, Harrison MT, Iribarne J, Dampsey E, Adams M, Grabreck T, ... Harrison WO. Veterans aging in place behind bars: A structured living program that works. *Psychological Services*. 2013; 10(1):79–86. [PubMed: 23421362]
- Kulkarni SP, Baldwin S, Lightstone AS, Gelberg L, Diamant AL. Is incarceration a contributor to health disparities? Access to care of formerly incarcerated adults. *Journal of Community Health*. 2010; 35:268–274. [PubMed: 20127504]
- Leigey, ME. *The forgotten men: Serving a life without parole sentence*. New Brunswick, NJ: Rutgers University Press; 2015.
- Lemieux CM, Dyeson TB, Castiglione B. Revisiting the literature on prisoners who are older: Are we wiser. *The Prison Journal*. 2002; 82:440–458.
- Linder JF, Meyers FJ. Palliative care for prison inmates: “Don’t let me die in prison. *Journal of the American Medical Association*. 2007; 298:894–901. [PubMed: 17712073]
- Linzer DA, Lewis JB. PoLCA: An R package for polytomous variable latent class analysis. *Journal of Statistical Software*. 2011; 42(10):1–29.
- Loeb SJ, AbuDagga A. Health-related research on older inmates: An integrative review. *Research in Nursing & Health*. 2006; 29:556–565. [PubMed: 17131280]
- Loeb SJ, Steffensmeier DJ, Lawrence F. Comparing incarcerated and community-dwelling older men’s health. *Western Journal of Nursing Research*. 2008; 30:234–249. [PubMed: 17630382]
- MacDonald R, Parsons A, Venters HD. The triple aims of correctional health: Patient safety, population health, and human rights. *Journal of Health Care for the Poor and Underserved*. 2013; 24:1226–1234. [PubMed: 23974393]
- Marengoni A, Angleman S, Melis R, Mangialasche F, Karp A, Garmen A, ... Fratiglioni L. Aging with multimorbidity: A systematic review of the literature. *Ageing Research Reviews*. 2011; 10:430–439. [PubMed: 21402176]

- Mitka M. Aging prisoners stressing health care system. *Journal of the American Medical Association*. 2004; 292:423–424. [PubMed: 15280325]
- National Research Council and Institute of Medicine of the National Academies. *Health and incarceration: A workshop summary*. Washington, DC: The National Academies Press; 2013.
- Nellis A. Throwing away the key: The expansion of life without parole sentences in the United States. *Federal Sentencing Reporter*. 2010; 23:27–32.
- Noonan, ME., Ginder, S. Mortality in local jails and state prisons, 2000–2011—Statistical tables. Washington, DC: Bureau of Justice Statistics, US Department of Justice; 2013.
- Noonan, ME., Mumola, CJ. *Veterans in state and federal prison, 2004*. Washington, DC: Bureau of Justice Statistics, US Department of Justice; 2007.
- Palazzlo, J. U.S. prisons grapple with aging population: More middle-age offenders are entering or re-entering facilities, research shows. *The Wall Street Journal*. 2015 Jan 28. Retrieved from <http://www.wsj.com/articles/u-s-prisons-grapple-with-aging-population-1422498946>
- Patel K, Boutwell A, Brockmann BW, Rich JD. Integrating correctional and community health for formerly incarcerated people who are eligible for Medicaid. *Health Affairs*. 2014; 33:468–473. [PubMed: 24590947]
- Reimer G. The graying of the U.S. prisoner population. *Journal of Correctional Health Care*. 2008; 14:202–208.
- Retchin SM. A conceptual framework for interprofessional and co-managed care. *Academic Medicine*. 2008; 83:929–933. [PubMed: 18820522]
- Rikard RV, Rosenberg E. Aging inmates: A convergence of trends in the American criminal justice system. *Journal of Correctional Health Care*. 2007; 13:150–162.
- Schwarz G. Estimating the dimension of a model. *The Annals of Statistics*. 1978; 6:461–464.
- Shah MP, Edmonds-Myles S, Anderson M, Shapiro ME, Chu C. The impact of mass incarceration on outpatients in the Bronx: A card study. *Journal of Health Care for the Poor and Underserved*. 2009; 20:1049–1059. [PubMed: 20168017]
- Somers SA, Nicolelle E, Hamblin A, McMahan SM, Heiss C, Brockmann BW. Medicaid expansion: Considerations for states regarding newly eligible jail-involved individuals. *Health Affairs*. 2014; 33:455–461. [PubMed: 24590945]
- Spaulding AC, Seals RM, Mccallum VA, Perez SD, Brzozowski AK, Steenland NK. Prisoner survival inside and outside of the institution: Implications for health-care planning. *American Journal of Epidemiology*. 2011; 173:479–487. [PubMed: 21239522]
- Sudore RL, Mehta KM, Simonsick EM, Harris TB, Newman AB, Satterfield S, ... Yaffe K. Limited literacy in older people and disparities in health and healthcare access. *Journal of the American Geriatrics Society*. 2006; 54:770–776. [PubMed: 16696742]
- Torres LR, Kaplan CD, Valdez A. Health consequences of long-term injection heroin use among aging Mexican American men. *Journal of Aging and Health*. 2011; 23:912–932. [PubMed: 21451118]
- Trivedi AN, Zaslavsky AM, Schneider EC, Ayanian JZ. Trends in the quality of care and racial disparities in Medicare managed care. *The New England Journal of Medicine*. 2005; 353:692–700. [PubMed: 16107622]
- U.S. Department of Health and Human Services. *Multiple chronic conditions—A strategic framework: Optimum health and quality of life for individuals with multiple chronic conditions*. Washington, DC: 2010. Retrieved from http://www.hhs.gov/ash/initiatives/mcc/mcc_framework.pdf
- U.S. Department of Justice, Bureau of Justice Statistics. *Survey of inmates in state and federal correctional facilities, 2004*. Ann Arbor, MI: Inter-University Consortium for Political and Social Research [Distributor]; 2007 Feb 28. (Icpsr04572–V1)
- Visher, CA., La Vigne, N., Travis, J. *Returning home: Understanding the challenges of prisoner reentry—Maryland Pilot Study: Findings from Baltimore*. Washington, DC: Urban Institute; 2004.
- Visher CA, O'Connell DJ. Incarceration and inmates' self perceptions about returning home. *Journal of Criminal Justice*. 2012; 40:386–393.
- Wakeman SE, McKinney ME, Rich JD. Filling the gap: The importance of Medicaid continuity for former inmates. *Journal of General Internal Medicine*. 2009; 24:860–862. [PubMed: 19381728]

- Wang EA, Hong CS, Samuels L, Savit S, Sanders R, Kushel M. Transitions clinic: Creating a community-based model of health care for recently released California prisoners. *Public Health Reports*. 2010; 125:171–177. [PubMed: 20297743]
- Wang EA, Hong CS, Shavit S, Sanders R, Kessel E, Kushel MB. Engaging individuals recently released from prison into primary care: A randomized trial. *American Journal of Public Health*. 2012; 102:E22–E29.
- Wang EA, Wildeman C. Studying health disparities by including incarcerated and formerly incarcerated individuals. *Journal of the American Medical Association*. 2011; 305:1708–1709. [PubMed: 21521854]
- Wangmo T, Meyer AH, Handtke V, Bretschneider W, Page J, Sommer J, ... Elger BS. Aging prisoners in Switzerland: An analysis of their health care utilization. *Journal of Aging and Health*. 2015; Advance online publication. doi: 10.1177/0898264315594137
- Wildeman C. (Mass) imprisonment and (inequities in) health. *American Journal of Epidemiology*. 2011; 173:488–491. [PubMed: 21239521]
- Williams, BA., Abalades, R. Growing older: Challenges of prison and reentry for the aging population. In: Greifinger, R., editor. *Public health behind bars: From prisons to communities*. New York, NY: Springer; 2007. p. 56-72.
- Williams, BA., Ahalt, C., Greifinger, R. The older prisoner and complex chronic medical care. In: Enggist, S., Møller, L., Galea, G., Udesen, C., editors. *Prisons and health*. Copenhagen, Denmark: World Health Organization Regional Office for Europe; 2014. p. 165-170.
- Williams BA, Goodwin JS, Baillargeon J, Ahalt C, Walter LC. Addressing the aging crisis in U.S. criminal justice health care. *Journal of American Geriatric Society*. 2012; 60:1150–1156.
- Williams BA, Lindquist K, Sudore RL, Strupp HM, Willmott DJ, Walter LC. Being old and doing time: Functional impairment and adverse experiences of geriatric female prisoners. *Journal of American Geriatric Society*. 2006; 54:702–707.
- Williams BA, Mcguire J, Lindsay RG, Baillargeon J, Cenzer IS, Lee SJ, Kushel M. Coming home: Health status and homelessness risk of older pre-release prisoners. *Journal of General Internal Medicine*. 2010; 25(10):1038–1044. [PubMed: 20532651]
- Williams JM, Steinberg ML, Griffiths KG, Cooperman N. Smokers with behavioral health comorbidity should be designated a tobacco use disparity group. *American Journal of Public Health*. 2013; 103:1549–1555. [PubMed: 23865661]
- Wilper AP, Woolhandler S, Boyd JW, Lasser KE, McCormick D, Bor DH, Himmelstein DU. The health and health care of us prisoners: Results of a nationwide survey. *American Journal of Public Health*. 2009; 99(4):666–672. [PubMed: 19150898]

Table 1

Results for Four-Class Solution From Latent Class Regression Analysis: Health Profiles of Older Male Inmates.

	Class 1	Class 2	Class 3	Class 4
	Healthy (Reference class)	Substance users with behavioral health issues	Chronic unhealthy with impairments and violence/injury	Very unhealthy for all health domains
Chronic health conditions				
All-cause cancer (%)	0.6	5.2	10.1	2.8
Hypertension	29.4	28.1	60.0	47.2
Diabetes	5.7	10.5	30.1	20.5
Heart problems	5.8	4.1	40.5	34.8
Kidney problems	1.1	6.1	12.4	12.3
Arthritis	17.9	29.7	65.2	75.9
Asthma	2.6	10.0	17.7	18.0
Drug- and alcohol-related diseases				
Cirrhosis (%)	0.1	7.5	0.0	14.8
Hepatitis	0.0	27.3	2.1	27.8
HIV/AIDS	1.1	3.5	0.8	0.0
STI	0.0	0.8	0.4	0.0
Impairments				
Mental impairment (%)	1.8	0.0	0.0	31.3
Vision impairment	11.6	12.5	33.4	46.6
Hearing impairment	5.2	6.8	30.6	44.3
Require aid for daily living	0.7	1.0	23.4	23.8
Mental and behavioral health				
Depression (%)	8.0	9.2	15.8	57.9
Post-traumatic stress disorder	5.2	1.5	4.6	34.2
Substance use dependence	13.8	56.6	9.5	76.5
Injecting drug use	0.0	64.6	1.4	53.5
Intentional injury	9.7	16.6	14.5	22.9
Accidental injury	13.5	20.8	28.3	35.7
Childhood trauma	4.1	6.2	12.7	28.3
Percent in class	45.1	23.4	23.6	7.9
Fit statistics				
AIC	15,169.4			
BIC	15,751.6			
Observations	1,026			

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; STI = sexually transmitted infection.

Table 2
Results From Latent Class Analysis Multinomial Logistic Regression of Concomitant Variables.

	Class 2-1 ^a		Class 3-1 ^b		Class 4-1 ^c	
	OR	p	OR	p	OR	p
Age	0.89	***	1.14	***	0.87	**
Black	1.33		0.69		0.35	*
Latino	1.22		0.21	**	1.05	
Married	1.65		1.56		2.09	
Separated/divorced/widowed	1.31		2.15		2.33	
High school education	0.88		0.78		0.73	
Veteran	1.15		1.13		2.40	*
Incarceration episodes	1.28	***	0.95		1.34	***
Years incarcerated	1.03	*	0.99		1.02	

Note. OR = odds ratio.

^aSubstance users with behavioral health issues compared with healthy.

^bChronic unhealthy with impairments & violence/injury compared with healthy.

^cVery unhealthy for all health conditions compared with healthy.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Percentages and Means for Concomitant Variables by Class.

	Class 1	Class 2	Class 3	Class 4
	Healthy (Reference class)	Substance users with behavioral health issues	Chronic unhealthy with impairments and violence/injury	Very unhealthy for all health domains
Age (mean)	55.5	53.9	61.0	53.7
Black (%)	35.2	45.4	23.1	14.8
Latino (%)	14.2	14.5	4.9	17.2
Married (%)	57.2	61.3	63.2	64.2
Separated/divorced/widowed (%)	21.1	19.1	25.6	25.9
High school education (%)	52.0	47.5	47.5	49.3
Veteran (%)	31.7	28.3	44.6	49.3
Incarceration episodes (mean)	1.1	2.4	0.8	2.7
Years incarcerated (mean)	9.0	10.8	8.6	8.5