J Urban Health. 2010 May; 87(3): 486–503. PMCID: PMC2871081
Published online 2010 April 15. doi: 10.1007/s11524-010-9448-2

Prevalence of Chronic Medical Conditions among Inmates in the Texas Prison System

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Abstract

Given the rapid growth and aging of the US prison population in recent years, the disease profile and health care needs of inmates portend to have far-reaching public health implications. Although numerous studies have examined infectious disease prevalence and treatment in incarcerated populations, little is known about the prevalence of non-infectious chronic medical conditions in US prison populations. The purpose of this study was to estimate the prevalence of selected non-infectious chronic medical conditions among inmates in the Texas prison system. The study population consisted of the total census of inmates who were incarcerated in the Texas Department of Criminal Justice for any duration from September 1, 2006 through August 31, 2007 ($N = 234,031$). Information on medical diagnoses was obtained from a system-wide electronic medical record system. Overall crude prevalence estimates for the selected conditions were as follows: hypertension, 18.8%; asthma, 5.4%; diabetes, 4.2%; ischemic heart disease, 1.7%; chronic obstructive pulmonary disease, 0.96%; and cerebrovascular disease, 0.23%. Nearly one quarter (24.5%) of the study population had at least one of the selected conditions. Except for asthma, crude prevalence estimates of the selected conditions increased monotonically with age. Nearly two thirds (64.6%) of inmates who were ≥55 years of age had at least one of the selected conditions. Except for diabetes, crude prevalence estimates for the selected conditions were lower among Hispanic inmates than among non-Hispanic White inmates and African American inmates. Although age-standardized prevalence estimates for the selected conditions did not appear to exceed age-standardized estimates from the US general population, a large number of inmates were affected by one or more of these conditions. As the prison population continues to grow and to age, the burden of these conditions on correctional and community health care systems can be expected to increase.

Keywords: Prisoners, Prison health care, Hypertension, Heart disease, Asthma, Diabetes

Introduction

The number of persons confined to US prisons and jails has more than quadrupled since 1980, reaching 2.3 million in 2007.[1] Among state and federal inmates, the proportion of older inmates has also increased, with inmates over 45 years of age comprising 21.3% of inmates in 2007, up from 13.6% in 1997.[1,2] Nearly all inmates are ultimately released,[3] and more than 725,000 federal and state inmates were released in the USA in 2007.[1] As the prison population continues to grow and to age, timely prevalence estimates of chronic health conditions become increasingly important for quantifying the current and anticipated burden of these conditions on health care systems in correctional settings and in the communities to which inmates return.

Although elevated prevalence of several infectious chronic conditions—such as HIV, hepatitis C, and hepatitis B—has been well documented in prison populations, little is known about the prevalence of non-

infectious, chronic medical conditions in these populations. Studies assessing the prevalence of non-infectious, chronic medical conditions are few in number and disparate in methods. In a 1992 self-report, survey-based study of a small sample of older (≥50 years), male state prison inmates in Iowa, Colsher et al.[4] found elevated prevalence of hypertension (40%), myocardial infarction (19%), and emphysema (18%). In a later study using prison system medical records, Baillargeon et al.[5] found that crude and age-specific prevalence estimates for hypertension and diabetes among Texas state inmates were remarkably similar to general population estimates. Two recent studies,[6,7] based on self-reported census data from state and federal inmates,[8] found that age-adjusted prevalence estimates of hypertension, prior myocardial infarction, asthma, and diabetes mellitus among inmates were significantly higher than survey-based estimates for these conditions from the US non-elderly, non-institutionalized population.

Given the growth and aging of US prison populations, further assessment of the prevalence of non-infectious chronic medical conditions in these populations is needed. The purpose of this study was to estimate the prevalence of selected, non-infectious chronic conditions among inmates in the Texas prison system. Selected conditions included hypertension, ischemic heart disease, cerebrovascular disease, asthma, chronic obstructive pulmonary disease (COPD), and diabetes. These conditions were selected because of their fairly high prevalence and/or their tendency to increase in prevalence with age and because they require regular clinical monitoring and/or daily pharmacologic management. By estimating the prevalence of these chronic medical conditions in one of the largest prison systems in the US,[9] we may begin to better understand and predict the impact of these conditions on correctional and community health care systems.

Methods

Study Design and Population

Data for this cross-sectional study were retrospectively extracted from electronic medical records (EMR). The study population included the total census of inmates who were incarcerated in the Texas Department of Criminal Justice (TDCJ) prison system for any duration between September 1, 2006 and August 31, 2007 (Fiscal Year 2007, $N = 234,031$). Of these, 73,525 inmates were received into TDCJ facilities and 72,032 were released during the study period.[10] The study was reviewed and approved by the Institutional Review Board at the University of Texas Medial Branch (UTMB) and by the TDCJ Executive Services.

Data Source

The data source was the state-wide EMR database which is maintained by UTMB in collaboration with TDCJ and the Texas Tech University Health Science Center (TTUHSC). This database contains demographic information (sex, age, and race/ethnicity) and medical records of all TDCJ inmates. UTMB and TTUHSC provide health care services for all TDCJ inmates in a managed care model. Inmates in the eastern and southern portions of the state are medically served by UTMB's Correctional Managed Care division (CMC), while inmates in the western portion of the state are medically served by the TTUHSC's Correctional Health Care division.

All TDCJ inmates undergo standardized medical and mental health evaluations at the time of intake. This evaluation lasts approximately 60 minutes and consists of a detailed medical and mental health history, a comprehensive physical examination, and a number of screening and diagnostic procedures. Mandatory intake screening procedures include a rapid plasma reagin, Mantoux TB skin test, and antibody tests for HIV and hepatitis B virus surface antigen (anti-HBs). By policy, all inmates who report a personal or family history of diabetes or who have other risk factors for the disease are screened via a fasting glucose test. Inmates who report a prior diagnosis or current symptoms consistent with asthma or COPD are referred for spirometry testing. Inmates who report prior diagnosis or current symptoms consistent with heart disease receive further testing, including but not limited to electrocardiogram (EKG) and chest X-ray. Inmates who report a history of hypertension or who demonstrate elevated blood pressure upon repeated measurements are referred for further evaluation (e.g., EKG, laboratory testing, etc.). All inmates who have a prior diagnosis or clinical evidence of any of the selected conditions are referred to the chronic care program and receive further evaluation and treatment according to published disease-specific policies and guidelines.[11,12]

By policy, comprehensive physical examinations are given annually to all inmates referred to the chronic care program and, regardless of health status, to all female inmates and all male inmates who are ≥50 years of age.[11] Male inmates who are 40–49 years of age are entitled to a comprehensive physical examination every 3 years.[1] At any time during incarceration, inmates may request and receive a medical appointment.[11,12] Whether at intake or some other time during an inmate's incarceration, screening and diagnostic tests are performed as indicated by UTMB/TTUHSC correctional health care policies and comprehensive chronic disease management guidelines.[11,12] All inmates' medical records are reviewed annually to ensure compliance with policies and guidelines.[11,12] Policies and guidelines are based on published care guidelines from national correctional and non-correctional sources and on current medical literature.[13–16]

At the initial medical evaluation and/or subsequent medical encounters during an inmate's incarceration, diagnoses of medical conditions are made by physicians, physician assistants, or nurse practitioners according to standard care guidelines.[10,11] Medical diagnoses are classified using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM).[17] Diagnoses are then entered into the EMR system. The EMR is updated daily to reflect inmates' current health status.

Diagnostic Codes

Selected conditions along with their ICD-9-CM codes included the following: hypertension (401–405), ischemic heart disease (410–414), cerebrovascular disease (430–438), asthma (493), chronic obstructive pulmonary disease (494–496), chronic bronchitis (491), emphysema (492), and diabetes mellitus (250). Because preliminary analyses showed small numbers of cases of chronic bronchitis and emphysema, respiratory conditions were subsequently grouped into asthma (493) and other chronic obstructive pulmonary diseases (491–492, 494–496). The ICD-9-CM codes for the selected conditions listed here are intended to reflect all subordinate codes; for example, the range of codes for hypertension was 401–405, so hypertension included all codes from 401 to 405.99.

Statistical Analysis

Crude prevalence estimates were calculated as the percentage of inmates in the sample who had an active diagnosis of a selected condition, as indicated in the EMR. Crude prevalence estimates were calculated across strata of sex, race/ethnicity, age, sex by age, and race/ethnicity by age. Confidence intervals (CIs) for crude prevalence estimates were 95% approximate mid-*P* (Wilson) because of their overall statistical properties across proportion and sample sizes.[18] Stratum-specific prevalence estimates with non-overlapping confidence intervals were considered significantly different from one another at the 0.05 alpha level.

Age-standardized prevalence estimates for the study population overall and stratified by sex and by race/ethnicity were produced using the direct method based on the 2000 US standard population.[19] Age standardization procedures were restricted to inmates who were 18–64 years of age. Inmates who were ≥65 years of age comprised only 1% of the study population, such that age-specific estimates (which are needed for age standardization) from this age group would have been based on small numbers of cases, especially when further stratified, and potentially could have yielded unreliable or misleading age-standardized estimates. Limiting the age range in this manner also would allow for comparisons with recently published studies of health conditions in the national prison population.[6,7] Specific age categories used for age standardization were selected to parallel those commonly used in national survey data: 18–24, 25–44, 45–54, and 55–64 years.[20] Age-standardized estimates included approximate binomial 95% CIs, which are appropriate for age-standardized prevalence estimates across a range of values and sample sizes.[21] Because significant differences between age-standardized estimates may exist even when their CIs overlap,[22] we calculated standardized prevalence ratios (SPRs) with 95% CIs in cases where age-standardized prevalence estimates overlapped across strata.[21,23] SPRs were considered significant at the 0.05 alpha level if the 95% CI did not include 1.

Additionally, we calculated the proportions of inmates who had 0, 1, 2, or ≥3 of the selected conditions by sex, race/ethnicity, and age. We reported these proportions within strata of demographic categories as well as within strata of the number of conditions (i.e., both row and column percents).

Finally, in order to contextualize our findings within recently published, previously mentioned studies,[6,7]

we present age-standardized prevalence estimates from our study population alongside age-standardized estimates from the civilian, non-institutionalized, non-elderly population in the US (hereafter, the "US general population"). Age-standardized prevalence estimates for the US general population were produced using reported age-specific prevalence estimates[20] and the direct method based on the 2000 US standard population.[19] Except for hypertension, age-specific prevalence estimates from the US general population were from the National Health Information Survey (NHIS), 2005–2007.[20] Age-specific prevalence estimates for hypertension were from the National Health and Human Nutrition Examination Survey (NHANES), 2003–2006.[20] Age categories used for age standardization were those noted above, except for hypertension (20–44 and 45–64 years).[20] We do not provide direct statistical comparisons of age-standardized prevalence estimates from our study population to those from the US general population. Such comparisons would not be appropriate because of differences in case ascertainment and sampling and because age-standardized prevalence estimates from our study population were not weighted or further adjusted to the distribution of the US population.

Because inmates who were not identified as Hispanic, non-Hispanic White, or African American comprised <0.05% of the population, these inmates were included in the non-Hispanic White category in all analyses. Because some crude and age-standardized prevalence estimates were quite small (<0.1%), prevalence estimates and their confidence intervals are reported to at least two significant figures. SPSS 16.0 was used to calculate counts and percentages.[24] StatsDirect 2.7.2 was used to produce age-standardized estimates and all confidence intervals.[21]

Results

The study population was predominantly male (89.9%; Table 1). African American inmates comprised 36.7% of the sample, followed by non-Hispanic White inmates (33.8%), and Hispanic inmates (29.5%; Table 1). Nearly half of inmates were ≤34 years (47.6%), followed by 35–44 years (28.3%), 45–54 years (18.3%), and ≥55 years (5.8%). Notably, 15.8% were <25 years, and only 1% were ≥65 years of age (data not shown).

Crude prevalence estimates for the selected conditions were as follows: hypertension, 18.8%; asthma, 5.4%; diabetes, 4.2%; ischemic heart disease, 1.7%; COPD, 0.96%; and cerebrovascular disease, 0.23% (Table 1). Compared to female inmates, male inmates showed slightly higher crude prevalence of hypertension and ischemic heart disease (19.2% and 1.9% vs. 15.4% and 0.83%, respectively) and slightly elevated prevalence of cerebrovascular disease, COPD, and diabetes. Asthma prevalence was higher among female inmates than male inmates (8.8% vs. 5.0%). Prevalence by race/ethnicity, hypertension, and asthma revealed similar patterns, with African American inmates showing higher estimates than non-Hispanic White inmates and Hispanic inmates. Prevalence estimates of ischemic heart disease and COPD prevalence revealed similar patterns by race/ethnicity, with non-Hispanic White inmates showing higher prevalence than African American inmates and Hispanic inmates. The prevalence of cerebrovascular disease was similar among non-Hispanic White inmates and African American inmates, but was elevated in these groups compared to Hispanic inmates. Diabetes prevalence was remarkably similar among African American inmates (4.7%) and Hispanic inmates (4.6%), but was elevated in these groups compared to non-Hispanic White inmates. Except for diabetes, prevalence estimates for the selected conditions were lowest among Hispanic inmates.

With the exception of asthma prevalence, prevalence estimates for the selected conditions increased monotonically as age increased (Table 2). Notably, inmates who were ≥55 years of age demonstrated COPD prevalence estimates that were more than five times higher than inmates who were 45–54 years of age, as well as ischemic heart disease and cerebrovascular disease estimates that were more than three times higher. Within all age strata, male inmates showed higher crude prevalence of ischemic heart disease and lower prevalence of asthma than female inmates. Prevalence estimates of cerebrovascular disease and COPD were similar for male and female inmates within each age stratum. Prevalence estimates of hypertension and diabetes showed more variable patterns by sex and age. Crude prevalence estimates that were stratified both by race/ethnicity and age generally reflected the race/ethnicity patterns described below (Table 3). However, in all but the youngest age category (≤34 years), diabetes prevalence was highest among Hispanic inmates.

Given the results above, differences in age-standardized prevalence estimates of the selected chronic

conditions by sex and by race/ethnicity were generally as expected (Table 4). After age standardization, male inmates showed higher prevalence of ischemic heart disease, slightly higher prevalence of hypertension, and lower prevalence of asthma than female inmates. Age-standardized prevalence estimates for cerebrovascular disease, COPD, and diabetes were not significantly different by sex; for these conditions, respectively, female to male SPRs with 95% CIs were: 0.67 (0.38–1.16), 0.92 (0.74–1.15), and 0.94 (0.85–1.04). Differences in crude prevalence estimates by race/ethnicity persisted after age standardization, except for diabetes and cerebrovascular disease. The age-standardized prevalence of diabetes was higher among Hispanic inmates (7.3%) than among African American inmates (6.1%). The age-standardized prevalence of cerebrovascular disease was similar across racial/ethnic strata [African American to Hispanic SPR with 95% CI = 1.3 (0.93–1.7)].

Nearly one quarter (24.5%) of the study population had at least one of the selected chronic conditions (Table 5). The proportions of male and female inmates with one or more of the selected conditions were similar. Higher proportions of African American inmates had one or two of the selected conditions compared to other racial/ethnic subgroups, but a similar proportion of African American inmates and non-Hispanic White inmates had three or more conditions. African American inmates accounted for more than half of inmates who had one or two of the selected conditions and more than 40% of inmates who had three or more conditions. Although less than a fifth (17.9%) of inmates who were ≤34 years of age had at least one of the selected conditions, 40.9% of inmates who were 45–54 years of age and almost two thirds (64.6%) of inmates who were ≥55 years of age had at least one condition. Compared to other age subgroups, higher proportions of inmates who were ≥55 years of age had one, two, or three or more conditions. Although inmates who were ≥55 years of age accounted for almost half (46.7%) of those who had three or more conditions, inmates who were 45–54 years accounted for about one third of inmates with one or two conditions (28.9% and 36.4%, respectively).

Relative to the US general population, the study population appeared to have similar age-standardized prevalence estimates of hypertension and diabetes, slightly lower prevalence of asthma, and substantially lower prevalence of heart disease, COPD, and cerebrovascular disease, overall and across strata of sex and race/ethnicity (Table 6). Asthma prevalence among Hispanic inmates appeared considerably lower in the study population compared to Hispanics in the general population. The age-standardized prevalence of diabetes appeared highest in the Hispanic subgroup in the study population, but highest in the African American subgroup in the general population.

Discussion

The purpose of this study was to estimate the prevalence of selected, non-infectious chronic medical conditions in a large state prison population. In order of magnitude, crude prevalence estimates for the selected conditions were as follows: hypertension, 18.8%; asthma, 5.4%; diabetes, 4.2%; ischemic heart disease, 1.7%; COPD, 0.96%; and cerebrovascular disease, 0.23%. As discussed further below, prevalence estimates varied across demographic strata in expected ways, with a few notable exceptions. Visual (non-statistical) comparisons of age-standardized prevalence estimates from the study population with those from the US general population differed markedly from results of similar comparisons in recent studies.

Crude prevalence estimates of the selected conditions, except for asthma, increased substantially with increased age, as did the proportion of inmates with co-occurring chronic conditions. These findings must be considered in the context of an aging prison population. From 1997 to 2007, the proportion of inmates who were 45–54 years of age grew from 10% to 19% of the average census of the Texas state prison population, while the proportion of inmates who were ≥55 years of age grew from 3% to almost 7% (A.J. Harzke, August 27, 2008, unpublished data). If the age structure of the prison population continues to show increasing proportions of older inmates, then the prevalence of these chronic conditions and related health care costs can be expected to increase as well. In this regard, the eldest group of inmates, those who were ≥55 years of age, is of particular concern. Although this eldest group of inmates accounted for a relatively small proportion of the study population (5.8%), this age group showed prevalence estimates of COPD, ischemic heart disease, and cerebrovascular disease that were at least three times greater than younger inmates, and this age group was considerably more likely to have co-occurring conditions. Moreover, internal CMC financial data indicate that this age group accounts for a disproportionate share of health care costs. In Fiscal Year 2007, this age group accounted for 24.4% and 37.7% of inpatient and

outpatient hospital costs, respectively (D. Patel, September 1, 2009, personal communication). Therefore, although this eldest group comprised a small proportion of the study population, this group was large in absolute numbers (N = 13,472) and had a sufficiently great burden of morbidity to have a profound impact on health care delivery and costs in this prison system. We suggest that research on geriatric health and health care in correctional settings is an emerging and productive area of future research.

Given the known racial/ethnic disparities in the US population, prevalence estimates of the selected conditions generally varied by race/ethnicity in expected ways. However, the prevalence of diabetes by race/ethnicity presented a noteworthy exception. The age-standardized prevalence of diabetes was highest among Hispanics in our study population, but was highest among African Americans in the general population.[20] Moreover, the age-standardized prevalence of diabetes among Hispanic inmates appeared slightly higher than Hispanic adults in the general population, while the age-standardized prevalence of diabetes among African American inmates appeared modestly lower than African American adults in the general population. The prevalence of diabetes among Hispanic inmates relative to Hispanics in the general population may have appeared more similar if data were available on Hispanic subgroups by heritage and/or by nativity. Although the distribution of Hispanic subgroups in the Texas prison population is unknown, it is presumed to be predominantly Mexican or Mexican American, as in the Texas population (76%),[25] and persons of Mexican descent tend to show slightly higher prevalence of diabetes than other Hispanic subgroups, particularly in the older age groups (≥55 years).[20,26,27]

The apparently lower prevalence of diabetes among African American inmates compared to similarly aged African American adults in the US general population points toward a number of interesting questions. It is possible that these findings simply reflect that African American inmates who are healthy enough to commit crimes are simply healthier than African American adults in the general population (akin to the “healthy worker effect”). It also seems possible, although somewhat controversial, that incarceration itself reduces the prevalence or progression of some conditions for certain inmate subgroups. A recent study of former inmates in North Carolina showed that mortality due to diabetes, cardiovascular disease, lung cancer, and respiratory diseases was less among African American former prisoners than expected given age-specific mortality rates due to these conditions in that state.[28] In studies with HIV-infected inmates, markers of HIV disease progression ($CD4^+$ counts and viral load) indicate better health during incarceration compared to pre- or post-incarceration.[29,30] Thus, although some studies have emphasized the potential negative effects of incarceration on health,[31] for some inmates, incarceration may provide better access to preventive and therapeutic health care and/or a context that is more controlled and more conducive to disease self-management than the “free world” community. Examination of the unique factors and pathways that impede and promote health among persons involved in the criminal justice system promises to be a worthwhile area of further research.

Relative to the US general population, the study population showed similar age-standardized prevalence estimates of hypertension and diabetes and only slightly lower prevalence of asthma; however, prevalence estimates of heart disease, COPD, and cerebrovascular disease were dramatically lower in the study population than in the general population, overall and across strata of sex and race/ethnicity. There are a number of potential explanations for these substantially lower estimates. First, as previously mentioned, it is possible that inmates are simply healthier than adults in the general population, at least with respect to these particular conditions. Indeed, similar to the discussion above, it is possible that incarceration reduces certain behavioral risk factors associated with these conditions and their progression; for example, cigarette smoking, arguably the most important risk factor for these conditions, has been banned in TDCJ facilities since 1995. Second, our estimates may potentially be affected by detection biases. Disease detection may have been reduced because younger inmates (<50 years of age), who comprised the majority of our study population, did not receive comprehensive annual physical examinations beyond the initial intake examination. Disease detection may have been reduced further among those with shorter sentences, and more than 40% of the “on-hand” Texas prison population in Fiscal Year 2007 had a sentence of ≤5 years.[10] Finally, our estimates were based on diagnoses which resulted from clinical assessment of inmates, and to the extent these assessments were informed by inmate self-report of current symptoms or previous diagnoses, case ascertainment may have been reduced and prevalence underestimated. Based on the authors’ many collective years of experience

working with inmates, inmates may be distrustful of prison personnel, especially medical personnel, and may be hesitant to provide a full report of symptoms or prior diagnoses which may prompt additional diagnostic procedures. More broadly, because inmates are often from low socioeconomic backgrounds, inmates may have reduced access to and experience with community health care systems and may be more likely to have undiagnosed health conditions, especially those conditions that are often not detected without repeated examinations or extensive testing.

Our findings are inconsistent with two recently reported studies which found that prevalence estimates of hypertension, ischemic heart disease (specifically prior myocardial infarction), asthma, and diabetes mellitus among state inmates were significantly higher than estimates from the US non-elderly, non-institutionalized, civilian population after adjusting for age.[6,7] The data sources used for producing age-adjusted US population estimates in these studies were similar to those used in our study (NHANES and NHIS), so this is an unlikely source of the inconsistency. However, both of these studies relied on self-reported data from a national sample of state prison inmates—specifically from the Survey of Inmates in State and Federal Correctional Facilities, 2004.[8] So, two potential reasons for the inconsistency are the sample sources (the Texas prison system vs. state prisons nationally) and the ascertainment methods (clinical assessment vs. inmate self-report alone). It is possible that prevalence estimates for these conditions are simply lower in the Texas state prison population than in state prisons nationally. As discussed above, it is also possible that inmates underreport symptoms or prior diagnoses to prison medical personnel. Conversely, it is similarly possible that inmates are more likely to report symptoms, diagnoses, or self-diagnoses to non-medical data collectors who are not affiliated with the prison system. To our knowledge, the reliability or comparability of inmate self-report across different contexts regarding symptoms and conditions has not been investigated and may constitute a productive area of future research. Finally, it is possible that minor but non-trivial differences in analytic methods contributed to differences in findings across studies. Overall, there is a great need for prevalence studies in prison populations that utilize methods which are strictly comparable to national studies.

Although age-standardized prevalence estimates of the selected conditions did not appear to exceed age-standardized estimates from the US general population, the sheer number of inmates in our study population affected by one or more of these conditions (n = 57,412) suggests that these conditions place a substantial burden on correctional health care systems. Providing quality management of chronic conditions in the correctional setting is demanding both organizationally and financially, requiring well-coordinated efforts among numerous medical professionals as well as costly monitoring and treatment.[32] The organizational and financial stresses associated with chronic disease management can be expected to increase as the prison population continues to grow and to age.[1,2,32]

Moreover, especially given the large number of inmates released annually in the US, it seems reasonable to assume that chronic conditions among inmates may increasingly impact health care systems in the communities to which inmates are released.[32] As Hornung et al.[32] have noted, inmates with non-infectious, chronic conditions represent a different kind of threat to the health status of the general community when they are released than do inmates with communicable diseases. Chronically ill inmates who delay or fail to receive needed care—whether before or after release—are at increased risk of serious illness and hospitalization.[32] Thus, if released inmates are undertreated, community health care systems may be affected in the form of increased costs due to delivery of acute care and tertiary services.[32]

Ensuring continuity of care among released inmates with chronic conditions presents a tremendous set of challenges. Although few studies have examined continuity of care for non-infectious chronic conditions,[33] studies of HIV-infected inmates may be informative here; these studies suggest that without fairly intensive interventions, only a small proportion of inmates will establish or reestablish health care within the first year following release.[34] During their incarceration, many inmates are disenrolled from Medicare, Medicaid, VA, or other benefits programs, such that even those who are eligible for benefits may experience considerable lag times in reenrollment after release.[33] Moreover, during the immediate post-release period, the need to secure or reestablish reimbursement sources for primary care and medication may be eclipsed by the challenges of meeting basic subsistence needs (e.g., housing, clothing, and food) and resisting relapse into substance abuse.[34–37] The majority of inmates leave prison with no personal savings, no immediate entitlement to unemployment or other benefits, and limited job prospects—largely due to barriers experienced as a result of their criminal history.[36] Many

Texas inmates return to neighborhoods characterized by elevated rates of poverty, crime, and other measures of disadvantage.[36] Recently released inmates are at increased risk of death, especially deaths due to drug overdose, homicide, and suicide[38]—which is not surprising given that more than half of Texas inmates (59.7%) entered prison with a diagnosable substance abuse disorder and more than a tenth had major psychiatric disorder (10.5%).[35] Hispanic inmates may also be negatively affected by language and cultural barriers as they seek health care and other supportive services after release. Despite the apparent challenges, there is evidence that provision of supportive services, ranging in intensity from simple pre-release referrals to intensive post-release case management, can improve continuity of care among released inmates.[34,39,40] In addition to supportive services, however, policy changes are needed to ensure seamless access to medical and pharmaceutical benefits and, more generally, to better integrate publicly funded health care delivery systems.[36] Further studies are needed to identify the specific individual- and system-level factors which promote or impede post-release access to medical care and payment sources for those affected by chronic conditions—whether infectious or non-infectious.

The study had limitations which should be considered when interpreting the findings. As discussed above, prevalence estimates of some or all of the selected conditions could potentially have been underestimated as a result of detection biases, the effects of which may have varied in magnitude across inmate subgroups and/or the selected conditions. Also, although practitioners relied on standardized institutional clinical guidelines to make all diagnoses, there may have been some variability in diagnoses across the multiple practitioners and prison sites. However, we have no evidence which suggests that screening protocols or diagnostic guidelines were implemented in a systematically differential (bias-producing) manner. Similarly, there may have been random errors or variability in coding of diagnoses or entering codes into the EMR; however, because we considered fairly broad diagnostic categories (e.g., COPD) rather than specific diagnoses (e.g., emphysema), the effects of errors or variation in coding should be minimized. The findings reported here were from one state prison population and may not be generalizable to other state prison populations or to the national prison population, especially given that the distribution of the selected conditions and their risk factors vary by region in the general population.[20] As previously noted, because of differences in methods of case ascertainment, sampling, and resulting samples, comparisons of age-standardized prevalence estimates from the study population with age-standardized estimates from the US general population should be considered with caution.

Despite the aforementioned limitations, this study is among the first to provide prevalence estimates for several non-infectious, chronic medical conditions from a large prison population. Although age-standardized prevalence estimates for the selected conditions were similar to or lower than estimates from the general population, the absolute number of inmates who were affected by one or more of these conditions was substantial. As the prison population continues to grow and to age,[1,2] the burden of these conditions on correctional and community health care systems can be expected to increase.[32] Providing quality pre-release medical care and ensuring post-release continuity of care for chronically ill inmates may improve outcomes and reduce the burden of these conditions on correctional and community health care systems.[32]

Acknowledgments

The research described herein was coordinated in part by the Texas Department of Criminal Justice (TDCJ), research agreement no. 515-MR07. In accordance with this agreement and TDCJ guidelines, the manuscript was reviewed by the TDCJ committee which oversees external research. All publications resulting from research approved by TDCJ are required to include the following legal disclaimer: “The contents of this manuscript reflect the views of the authors and do not necessarily reflect the views or policies of the TDCJ.” Excluding Dr. Pruitt and Dr. Kelley, the authors are employed by and supported in full or in part by the University of Texas Medical Branch (UTMB), Correctional Managed Care Division (CMC), Galveston, TX. The UTMB CMC is a partner organization of the Correctional Managed Health Care program, which is legislatively mandated and funded by the state of Texas and is directed by an independently appointed committee. The UTMB CMC serves as the health care provider for inmates in all TDCJ facilities in the eastern and southern areas of Texas. Dr. Pruitt is supported by a postdoctoral fellowship from the Barnes Jewish Hospital Foundation, Alvin J. Siteman Cancer Center Prevention and Control Program. Dr. Kelley was employed by TDCJ as the Director of the Office of Preventive Medicine in the Health Services Division at the time the study was conducted (retired August 2009). Deeanne

Novakosky from UTMB CMC coordinated data management. Leonard Pechacek, also from UTMB CMC, provided editorial assistance.

References

1. West HC, Sabol WJ. Prisoners in 2007. Bureau of Justice Statistics Bulletin (NCJ 224280). Washington, DC: US Department of Justice; 2008. http://www.ojp.usdoj.gov/bjs/pub/pdf/p07.pdf. Accessed May 11, 2009.

2. Beck AJ, Mumola CJ. Prisoners in 1998. Bureau of Justice Statistics Bulletin (NCJ 175687). Washington, DC: US Department of Justice; 1999. http://www.ojp.usdoj.gov/bjs/pub/pdf/p98.pdf. Accessed May 12, 2009.

3. Hughes T, Wilson DJ. Inmates returning to the community after serving time in prison. In: Reentry Trends in the U.S. Washington: Department of Justice; 2003. http://www.ojp.usdoj.gov/bjs/reentry/reentry.htm. Accessed May 15, 2009.

4. Colsher PL, Wallace RB, Loeffelholz PL, Sales M. Health status of older male prisoners: a comprehensive survey. Am J Public Health. 1992;82:881–884. doi: 10.2105/AJPH.82.6.881. [PMCID: PMC1694178] [PubMed: 1533997]

5. Baillargeon J, Black SA, Pulvino J, Dunn K. The disease profile of Texas prison inmates. Ann Epidemiol. 2000;10:74–80. doi: 10.1016/S1047-2797(99)00033-2. [PubMed: 10691060]

6. Wilper AP, Woolhandler S, Boyd JW, et al. The health and health care of US prisoners: results of a nationwide survey. Am J Public Health. 2009;99:666–671. doi: 10.2105/AJPH.2008.144279. [PMCID: PMC2661478] [PubMed: 19150898]

7. Binswanger IA, Krueger PM, Steiner JF. Prevalence of chronic medical conditions among jail and prison inmates in the USA compared with the general population. J Epidemiol Community Health. 2009;63:912–919. doi: 10.1136/jech.2009.090662. [PubMed: 19648129]

8. US Department of Justice, Bureau of Justice Statistics. Survey of inmates in state and federal correctional facilities, 2004. [Computer file, ICPSR04572-v1]. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [producer and distributor]; 2007.

9. One in 100: Behind Bars in America 2008. Washington: Pew Center on the States; 2008. http://www.pewcenteronthestates.org/report_detail.aspx?id=35904. Accessed January 25, 2009.

10. Texas Department of Criminal Justice Statistical Report: Fiscal Year 2007. Huntsville: Texas Department of Criminal Justice, Executive Services. http://www.tdcj.state.tx.us/publications/executive/Fiscal%20Year%202007%20Statistical%20Report.pdf . Accessed January 14, 2010.

11. Correctional Managed Health Care Policy Manual. Huntsville: Correctional Managed Care; June, 2009. http://www.cmhcc.state.tx.us/CMHC_Policy_Manual/Table%20of%20Contents%20Oct%202006%20Updates.doc. Accessed November 10, 2009.

12. Zepeda S, Johnson MT, eds. Correctional Managed Care Formulary, 15th ed., 2008–2009. Huntsville: Correctional Managed Care, Pharmacy and Therapeutics Committee; 2009. http://www.cmhcc.state.tx.us/Files/FORMULARY%2015th%20Edition%20with%20Bookmark.pdf. Accessed November 10, 2009.

13. Standards for Health Services in Prisons. Chicago: National Commission on Correctional Health Care; 2008.

14. Performance-Based Standards for Correctional Health Care for Adult Correctional Institutions. Alexandria: American Correctional Association; 2002.

15. United States Preventive Services Task Force (USPSTF). Guide to clinical preventive services. Washington, DC: United States Department of Health and Human Services; 2009. http://www.ahrq.gov/CLINIC/cps3dix.htm. Accessed November 10, 2009.

16. National Heart, Lung, and Blood Institute. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. NIH Publication No. 04-5320. Washington, DC: United States Department of Health and Human Services; 2004. http://www.nhlbi.nih.gov/guidelines/hypertension/jnc7full.pdf. Accessed November 10, 2009.

17. International Classification of Diseases, Clinical Modification (ICD-9-CM) Hyattsville: National Center for Health Statistics; 2008.

18. Brown LD, Cai TT, Das Gupta A. Interval estimation for a binomial proportion. Stat Sci. 2001;16:101–133.

19. Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected population. *Healthy People Statistical Notes, No. 20*. Hyattsville: National Center for Health Statistics. January 2001. http://www.cdc.gov/nchs/data/statnt/statnt20.pdf. Accessed December 17, 2009.

20. Centers for Disease Control and Prevention/National Center for Health Statistics. *Health Data Interactive*. http://www.cdc.gov/nchs/hdi.htm. Accessed December 17, 2009.

21. StatsDirect Statistical Software, version 2.7.2. Cheshire, WA, UK: StatsDirect Ltd.; 2008.

22. Esteve J, Benhamou E, Raymond L. Statistical methods in cancer research, vol. IV. Descriptive epidemiology. Lyon: International Agency for Research on Cancer; 1994.

23. Sahai H, Khurshid A. Statistics in Epidemiology: Methods, Techniques, and Applications. Boca Raton: CRC; 1996.

24. SPSS for Windows, Rel. 16.0. Chicago, IL: SPSS Incorporated; 2008.

25. US Census Bureau. *Texas Profile of General Demographic Characteristics: 2000*, from Census 2000 Gateway. Washington, DC: US Census Bureau; 2004. http://factfinder.census.gov/servlet/QTTable?_bm=y&-geo_id=04000US48&-qr_name=DEC_2000_SF1_U_DP1&-ds_name=DEC_2000_SF1_U&-redoLog=false. Accessed December 17, 2009.

26. Simon PA, Zeng Z, Wold CM, Fielding JE, Burrows NR, Engelgau MM. Diabetes among Hispanics—Los Angeles County, California, 2002–2003. MMWR Morb Mortal Wkly Rep. 2003;52:1152–1155. [PubMed: 14647017]

27. Flegal KM, Ezzati TM, Harris MI, et al. Prevalence of diabetes in Mexican Americans, Cubans, and Puerto Ricans from the Hispanic Health and Nutrition Examination Survey, 1982–1984. Diabetes Care. 1991;14:628–638. doi: 10.2337/diacare.14.7.628. [PubMed: 1914812]

28. Rosen DL, Schoenback VJ, Wohl DA. All-cause and cause-specific mortality among men released from state prison, 1980–2005. Am J Public Health. 2008;98:2278–2284. doi: 10.2105/AJPH.2007.121855. [PMCID: PMC2636544] [PubMed: 18923131]

29. Springer SA, Pesanti E, Hodges J, Macura T, Doros G, Altice FL. Effectiveness of antiretroviral therapy among HIV-infected inmates: reincarceration and lack of sustained benefit after release to the community. Clin Infect Dis. 2004;38:1754–1760. doi: 10.1086/421392. [PubMed: 15227623]

30. Stephenson B, Wohl D, Golin DE, Tien HC, Steward P, Kaplan AH. Effect of release from prison and reincarceration on the viral loads of HIV-infected individuals. Public Health Rep. 2005;120:84–88. [PMCID: PMC1497683] [PubMed: 15736336]

31. Freudenberg N. Adverse effects of US jail and prison policies on the health and well-being of women of color. Am J Public Health. 2002;92:1895–1899. doi: 10.2105/AJPH.92.12.1895. [PMCID: PMC1447348] [PubMed: 12453803]

32. Hornung CA, Greifinger RB, Gadre S. A projection model of the prevalence of selected chronic diseases in the inmate population. In: *Health Status of Soon-to-be-Released Inmates: a Report to Congress, vol. 2*. Chicago: National Commission on Correctional Health Care; 2002.

33. Binswanger IA. Treatment for individuals with HIV/AIDS following release from prison [letter] JAMA. 2009;302:147. doi: 10.1001/jama.2009.919. [PubMed: 19584343]

34. Baillargeon J, Giordano TP, Rich JD, et al. Accessing antiretroviral therapy following release from prison. JAMA. 2009;301:838–857. doi: 10.1001/jama.2009.202. [PMCID: PMC2936238]

35. Baillargeon J, Penn JV, Knight K, Harzke AJ, Baillargeon G, Becker EA. Risk of reincarceration among prisoners with co-occurring severe mental illness and substance use disorders. *Adm Policy Ment Health*.; 2010. Published on-line October 22, 2009 (in press).

36. Watson J, Solomon AL, LaVigne NG, Travis J. A portrait of prisoner reentry. Washington: The Urban Institute Justice Policy Center; 2004.

37. Harzke AJ, Ross MW, Scott DP. Predictors of post-release primary care utilization among HIV-positive prison inmates: a pilot study. AIDS Care. 2006;18:290–301. doi: 10.1080/09540120500161892. [PubMed: 16809106]

38. Binswanger IA, Stern MF, Deyo RA, et al. Release from prison—a high risk of death for former inmates. N Engl J Med. 2007;356:157–165. doi: 10.1056/NEJMsa064115. [PMCID: PMC2836121] [PubMed: 17215533]

39. Rich JD, Holmes L, Salas C, et al. Successful linkage of medical care and community services for HIV-positive offenders being released from prison. J Urban Health. 2001;78:279–289. [PMCID: PMC3456358] [PubMed: 11419581]

40. Hammett T, Roberts C, Kennedy S. Linkages between in-prison and community-based health services. J Correct Health Care. 2004;10:333–368. doi: 10.1177/107834580301000306.

Figures and Tables

Table 1

Crude prevalence[a] of selected chronic conditions by sex and race/ethnicity among inmates in the Texas prison system[b]

Condition	All (*N* = 234,031)		Female (*n* = 23,530)		Male (*n* = 210,501)		African American (*n* = 85,924)		Hispanic (*n* = 69,001)		Non-Hispanic White (*n* = 79,106)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Hypertension	18.8	18.6–18.9	15.4	14.9–15.8	19.2	19.0–19.3	28.3	28.0–28.6	11.3	11.0–11.5	15.0	14.7–15.2
Ischemic heart disease	1.7	1.7–1.8	0.83	0.72–0.96	1.9	1.8–1.9	1.7	1.6–1.8	1.0	1.0–1.1	2.4	2.3–2.6
Cerebrovascular disease	0.23	0.21–0.25	0.11	0.07–0.16	0.24	0.22–0.26	0.24	0.21–0.28	0.15	0.13–0.18	0.27	0.24–0.31
Asthma	5.4	5.3–5.5	8.8	8.4–9.2	5.0	4.9–5.1	7.6	7.4–7.7	2.4	2.3–2.5	5.5	5.4–5.7
COPD[c]	0.96	0.92–0.10	0.69	0.59–0.80	0.99	0.95–1.0	0.75	0.70–0.81	0.31	0.27–0.36	1.8	1.7–1.8
Diabetes	4.2	4.1–4.3	3.6	3.3–3.8	4.2	4.1–4.3	4.7	4.5–4.8	4.6	4.5–4.8	3.2	3.1–3.4

[a]Crude prevalence estimates reflect the percentage of inmates who had an active diagnosis of a selected condition as indicated in the EMR

[b]Sample includes the total census of inmates who were incarcerated in the Texas Department of Criminal Justice for any duration from September 1, 2006 through August 31, 2007 (Fiscal Year 2007)

[c]COPD includes conditions coded as chronic obstructive pulmonary disease, chronic bronchitis, or emphysema

Table 2

Age-specific prevalence[a] of selected chronic conditions among inmates in the Texas prison system[b] by sex

Condition/age category (years)	All (*N* = 234,031)			Female (*n* = 23,530)			Male (*n* = 210,501)		
	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI
Hypertension									
≤34	8,288	7.4	7.3–7.6	551	5.0	4.6–5.4	7,737	7.7	7.5–7.9
35–44	13,214	20.0	19.7–20.3	1,324	16.6	15.8–17.4	11,890	20.4	20.1–20.8
45–54	14,707	34.3	33.8–34.7	1,364	34.6	33.1–36.1	13,343	34.2	33.7–34.7
≥55	7,739	57.4	56.6–58.3	376	60.8	56.9–64.6	7,363	57.3	56.6–58.1
Ischemic heart disease									
≤34	166	0.15	0.13–0.17	3	0.03	0.01–0.08	163	0.16	0.14–0.19
35–44	667	1.0	0.93–1.1	53	0.67	0.51–0.87	614	1.1	0.98–1.1
45–54	1,475	3.4	3.3–3.6	89	2.6	1.8–2.8	1,386	3.6	3.4–3.7
≥55	1,783	13.2	12.7–13.8	51	8.3	6.3–10.7	1,732	13.5	12.9–14.1
Cerebrovascular disease									
≤34	29	0.03	0.02–0.04	2	0.02	0.01–0.07	27	0.03	0.02–0.04
35–44	99	0.15	0.12–0.18	7	0.09	0.04–0.18	92	0.16	0.13–0.19
45–54	191	0.44	0.22–0.30	11	0.28	0.16–0.50	180	0.46	0.40–0.53
≥55	208	1.5	1.3–1.8	6	1.0	0.45–2.1	202	1.6	1.4–1.8
Asthma									
≤34	5,803	5.2	5.1–5.3	806	7.3	6.9–7.8	4,997	5.0	4.8–5.1
35–44	3,802	5.8	5.6–5.9	792	9.9	9.3–10.6	3,010	5.2	5.0–5.4
45–54	2,319	5.4	5.4–5.7	418	10.6	9.7–11.6	1,901	4.9	4.7–5.1
≥55	649	4.8	4.5–5.2	58	9.4	7.3–11.9	591	4.6	4.2–5.0
COPD[c]									
≤34	138	0.12	0.10–0.15	12	0.11	0.06–0.19	126	0.13	0.10–0.15
35–44	310	0.47	0.42–0.52	42	0.53	0.39–0.71	268	0.46	0.41–0.52
45–54	792	1.8	1.7–2.0	73	1.9	1.5–2.3	719	1.8	1.7–2.0
≥55	1,011	7.5	7.1–8.0	35	5.7	4.1–7.8	976	7.6	7.1–8.1
Diabetes									
≤34	1,106	0.99	0.93–1.1	151	1.4	1.2–1.6	955	1.0	0.89–1.0
35–44	2,618	4.0	3.8–4.1	307	3.9	3.5–4.3	2,311	4.0	3.8–4.1
45–54	3,708	8.6	8.4–8.9	280	7.1	6.3–8.0	3,428	8.8	8.5–9.1
≥55	2,342	17.4	16.8–18.0	104	16.8	14.1–20.0	2,238	17.4	16.8–18.1

[a]Crude, stratified prevalence estimates reflect the percentage of inmates who had an active diagnosis of a selected condition as indicated in the EMR within the given stratum (sex by age)

[b]Sample includes the total census of inmates who were incarcerated in the Texas Department of Criminal Justice for any duration from September 1, 2006 through August 31, 2007 (Fiscal Year 2007)

[c]COPD includes conditions coded as chronic obstructive pulmonary disease, chronic bronchitis, or emphysema

Table 3

Age-specific prevalence[a] of selected chronic conditions by race/ethnicity among inmates in the Texas prison system[b]

Condition/age category	African American (*n* = 85,924)	Hispanic (*n* = 69,001)	Non-Hispanic White (*n* = 79,106)

(years)	No.	%	95% CI	No.	%	(95% CI)	No.	%	(95% CI)
Hypertension									
≤34	5,300	13.4	13.1–13.7	1,609	4.1	3.9–4.3	1,379	4.2	4.0–4.4
35–44	7,788	32.0	31.4–32.6	2,372	13.3	12.8–13.8	3,054	12.7	12.3–13.1
45–54	8,068	46.5	45.8–47.3	2,288	25.0	24.1–25.9	4,351	26.5	25.8–27.1
≥55	3,161	67.5	66.2–68.9	1,512	50.0	48.3–51.8	3,066	53.1	51.8–54.4
Ischemic heart disease									
≤34	88	0.22	0.18–0.27	37	0.09	0.07–0.13	41	0.12	0.09–0.17
35–44	272	1.1	0.99–1.3	129	0.72	0.61–0.86	266	1.1	0.98–1.2
45–54	562	3.2	3.0–3.5	231	2.5	2.2–2.9	682	4.1	3.9–4.5
≥55	512	10.9	10.1–11.9	324	10.7	9.7–11.9	947	16.4	15.5–17.4
Cerebrovascular disease									
≤34	14	0.04	0.02–0.06	5	0.01	0.01–0.03	10	0.03	0.01–0.06
35–44	5	0.02	0.01–0.04	24	0.14	0.09–0.20	33	0.14	0.10–0.19
45–54	83	0.48	0.39–0.59	28	0.31	0.21–0.44	80	0.49	0.39–0.61
≥55	70	1.5	1.2–1.9	48	1.6	1.2–2.1	90	1.6	1.3–1.9
Asthma									
≤34	3,106	7.8	7.6–8.1	1,000	2.6	2.4–2.7	1,697	5.2	4.9–5.4
35–44	1,999	8.2	7.9–8.6	423	2.4	2.2–2.6	1,380	5.7	5.5–6.0
45–54	1,121	6.5	6.1–6.8	202	2.2	1.9–2.5	996	6.1	5.7–6.4
≥55	271	5.8	5.2–6.5	64	2.1	1.7–2.4	314	5.4	4.9–6.1
COPD[c]									
≤34	68	0.17	0.14–0.22	30	0.08	0.05–0.11	40	0.12	0.09–0.17
35–44	97	0.40	0.33–0.49	50	0.28	0.21–0.37	163	0.68	0.58–0.79
45–54	217	1.3	1.1–1.4	48	0.52	0.40–0.69	527	3.2	2.9–3.5
≥55	266	5.7	5.1–6.4	87	2.9	2.3–3.5	658	11.4	10.6–12.2
Diabetes									
≤34	409	1.0	0.93–1.1	446	1.1	1.0–1.3	251	0.76	0.67–0.86
35–44	1,025	4.2	4.0–4.5	983	5.5	5.2–5.9	610	2.5	2.4–2.7
45–54	1,696	9.8	9.3–10.2	1,087	11.9	11.2–12.6	925	5.6	5.3–6.0
≥55	888	19.0	17.9–20.1	676	22.4	20.9–23.9	778	13.5	12.6–14.4

[a]Crude, stratified prevalence estimates reflect the percentage of inmates who had an active diagnosis of a selected condition as indicated in the EMR within the given stratum (race/ethnicity by age)

[b]Sample includes the total census of inmates who were incarcerated in the Texas Department of Criminal Justice for any duration from September 1, 2006 through August 31, 2007 (Fiscal Year 2007, *N*

= 234,031)

[c]COPD includes conditions coded as chronic obstructive pulmonary disease, chronic bronchitis, or emphysema

Table 4

Age-standardized prevalence[a] of selected chronic conditions by sex and race/ethnicity among adult, non-elderly inmates in the Texas prison system[b]

Condition	All (*N* = 231,308)		Female (*n* = 23,449)		Male (*n* = 207,859)		African American (*n* = 85,144)		Hispanic (*n* = 68,266)		Non-Hispanic White (*n* = 77,898)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Hypertension	22.8	22.6–22.9	21.8	21.1–22.5	22.9	22.7–23.1	32.2	31.8–32.5	16.6	16.2–17.0	17.5	17.2–17.7
Ischemic heart disease	2.6	2.5–2.7	1.7	1.4–2.1	2.7	2.6–2.8	2.4	2.3–2.6	2.0	1.8–2.2	3.1	3.0 –3.3
Cerebrovascular disease	0.32	0.29–0.36	0.22	0.10–0.33	0.33	0.30–0.37	0.35	0.29–0.41	0.28	0.21–0.35	0.33	0.27–0.38
Asthma	5.3	5.2–5.4	8.9	8.4–9.4	4.9	4.8–5.0	7.3	7.1–7.5	2.3	2.2–2.5	5.5	5.4–5.7
COPD[c]	1.4	1.3 –1.5	1.3	1.0–1.6	1.4	1.3–1.5	1.1	0.99–1.2	0.48	0.39–0.56	2.3	2.1–2.4
Diabetes	5.5	5.4–5.6	5.2	4.7–5.7	5.5	5.4–5.7	6.1	5.9–6.3	7.3	7.0–7.5	3.9	3.7–4.0

[a]Age-standardized prevalence estimates were based on the composition of the 2000 US standard population,[18] using the following age categories: 18–24, 25–44, 45-54, and 55–64 years[19]

[b]Age-standardized estimates were based on the subset of prisoners 18–64 years of age from the total census of inmates who were incarcerated in the Texas Department of Criminal Justice (TDCJ) for any duration from September 1, 2006 through August 31, 2007 (Fiscal Year 2007)

[c]COPD includes conditions coded as chronic obstructive pulmonary disease, chronic bronchitis, or emphysema

Table 5

Number of selected chronic conditions[a] by sex, race/ethnicity, and age among inmates in the Texas prison system[b]

	0 (*n* = 176,619)		1 (*n* = 44,210)		2 (*n* = 11,001)		≥3[c] (*n* = 2,201)	
	Row %	Col %	Row %	Col %	Row %	Col %	Row %	Col %
Sex/gender								
Female (*n* = 23,530)	76.2	10.2	19.1	10.2	3.9	8.4	0.8	8.4
Male (*n* = 210,501)	75.4	89.8	18.9	89.8	4.8	91.6	1.0	91.6
Race/ethnicity								
African-American (*n* = 85,924)	65.5	31.8	27.1	52.6	6.4	50.3	1.0	40.4
Hispanic (*n* = 69,001)	84.5	33.0	11.8	18.4	3.2	20.0	0.5	17.2
White (*n* = 79,106)	78.5	35.1	16.2	29.0	4.1	29.7	1.2	42.4
Age								
≤34 (*n* = 111,503)	87.4	55.2	11.3	28.5	1.2	12.3	0.1	3.2
35–44 (*n* = 74,540)	74.1	27.7	21.0	31.4	4.4	26.4	0.5	14.9

45–54 (n = 42,937)	59.1	14.4	29.7	28.9	9.3	36.4	1.8	35.1
≥55 (n = 13,472)	35.4	2.7	36.6	11.1	20.4	25.0	7.6	46.7
Total (N = 234,031)	75.5	100	18.9	100	4.7	100	0.9	100

[a]Selected chronic conditions included hypertension, ischemic heart disease, cerebrovascular disease, asthma, other chronic obstructive pulmonary disease, and diabetes

[b]Sample includes the total census of inmates who were incarcerated in the Texas Department of Criminal Justice for any duration from September 1, 2006 through August 31, 2007 (Fiscal Year 2007)

[c]Of inmates with three or more conditions: three conditions, n = 1892; four conditions, n = 270; five conditions, n = 38; six conditions, n = 1

Table 6

Age-standardized prevalence[a] of selected chronic conditions in the Texas prison population[b] and in the US non-institutionalized, non-elderly, civilian population[c]

Condition	All		Female		Male		African American		Hispanic		Non-Hispanic White	
	TDCJ	US	TDCJ	US	TDCJ	US	TDCJ	US	TDCJ	US	TDCJ	US
Hypertension[d]	22.3	22.6	20.5	20.7	22.5	24.4	32.0	33.8	15.7	17.9	16.8	21.4
Ischemic heart disease	2.6	7.1	1.7	7.2	2.7	7.0	2.4	6.8	2.0	5.1	3.1	7.7
Cerebrovascular disease	0.32	1.1	0.22	1.1	0.33	1.0	0.35	2.1	0.28	1.0	0.33	0.95
Asthma	5.3	7.2	8.9	9.1	4.9	5.3	7.3	7.6	2.3	5.1	5.5	7.7
COPD[e]	1.4	4.2	1.3	5.2	1.4	3.1	1.1	4.2	0.48	2.6	2.3	4.5
Diabetes	5.5	5.3	5.2	5.2	5.5	5.4	6.1	8.4	7.3	7.0	3.9	4.5

[a]Age-standardized prevalence estimates were based on the composition of the 2000 US standard population

[b]Sample includes the total census of inmates who were incarcerated in the Texas Department of Criminal Justice (TDCJ) for any duration from September 1, 2006 through August 31, 2007 (Fiscal Year 2007)

[c]Age-standardized prevalence estimates for the selected conditions from the US general population were calculated using reported age-specific estimates overall and stratified by gender and by race/ethnicity. Except for hypertension, age-specific estimates were reported from the National Health Information Survey, 2005–2007. Age categories used for standardization were 18–24, 25–44, 45–54, and 55–64 years[19]

[d]Age-standardized prevalence estimates for hypertension were similarly calculated using data from the National Health and Nutrition Examination Survey, 2003–2006. Age categories for age-standardization of hypertension estimates were 20–44 and 45–64 years[19]

[e]COPD includes conditions coded as chronic obstructive pulmonary disease, chronic bronchitis, or emphysema