The Impact of Sleep Deficits in Incarceration Settings:

A Systematic Review and Meta-Analysis

Kathleen M. Pescasio

A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Public Health

University of Washington

2022

Committee:

Michelle Garrison

Marc Stern

Program Authorized to Offer Degree:

Department of Health Systems and Population Health

University of Washington

Abstract

The Impact of Sleep Deficits in Incarceration Settings: A Systematic Review and Meta-Analysis

Kathleen M. Pescasio

Chair of the Supervisory Committee:
Michelle Garrison
Department of Health Systems and Population Health

Background: Inadequate sleep has been an ongoing and large-scale health concern that disproportionately affects incarcerated populations. Because correctional health is an understudied area of research, there is a lack of comprehensive evidence on the exposure-response relationships and long-term health outcomes of chronic insufficient sleep that is specific to this population.

Research aim: This study aims to systematically synthesize the literature regarding sleep within the context of incarceration settings, and to quantitatively estimate the health impact of inadequate sleep on incarcerated populations.

Methods: A systematic review was conducted using multiple databases including MEDLINE, Project Muse, and Criminal Justice Abstracts, and data analysis was used to determine the morbidity and mortality burden that is attributable to inadequate sleep.

Results: A total of 15 peer-reviewed articles and 25 grey literature records were included for review. The most commonly reported factors associated with poor sleep include loud noise, bright lighting, inadequate bedding, and mental illness. Meta-analysis results found the incarcerated population's pooled mean sleep duration to be 5.7 hours (95% CI 5.56 - 5.84). Attributable risk calculations found an estimated 539 excess deaths (515 male, 24 female), 711

excess cardiovascular disease incident cases (692 male, 19 female), and 31 excess stroke incident cases (25 male, 6 female) due to insufficient sleep.

Conclusion: The average sleep duration of the U.S. incarcerated population is lower than that of the general population, and individuals in incarceration settings are at higher risk of poor health outcomes. The physical conditions and policies within prison and jail environments have considerable influence on sleep and restructuring these factors may be beneficial. Future research studies specifically focusing on risk factors and exploring potential solutions are necessary.

Introduction

Incarcerated individuals make up one of the most medically underserved populations in the United States, with disproportionately high rates of chronic disease and other health conditions as compared to the general population. There are several factors that serve as barriers to care, which include restrictive policies, medical infrastructure limitations, and limited access to health records.[1] Additionally, there is a lack of research studies focusing on health interventions specific to this population due to ethical concerns. Because incarcerated people are considered more vulnerable as research participants and are federally protected, there are greater restrictions on what types of studies can be performed in incarceration settings.[2] As a result, those who are incarcerated or have a history of incarceration suffer from unmet basic needs and sustained health issues.

A subject matter that is widely understudied in correctional health research is persistent inadequate sleep. There are reports that it is common for individuals to experience interrupted or reduced sleep while in jail or prison, though large-scale efforts to address this issue are yet to be carried out. Because constant supervision of individuals is required, physical conditions of the prison environment have been said to affect sleep. For example, constant exposure to light at night is known to disrupt the circadian system,[3] and there has been considerable litigation pursued by incarcerated individuals over bright illumination in their cells resulting in sleep deprivation.[4] Indeed, one prison study found that 53.9% of their sample reported poor sleep quality.[5] While the literature states that the mean sleep duration in the U.S. is seven hours,[6] the high prevalence of sleep problems in incarceration suggests that the averages are much lower.

Insufficient sleep is known to negatively impact quality of life, and there is substantial evidence that it is associated with poor health outcomes. For instance, it is known to affect mood and executive functioning, and can result in behavioral problems such as aggression[7], which can lead to issues such as conflicts between incarcerated individuals and officers in these settings. The long-term health outcomes and other downstream effects of inadequate sleep in this population, however, are less understood. In the general population, health conditions that are found to be significantly associated with inadequate sleep include diabetes mellitus, hypertension, cardiovascular diseases, coronary heart diseases, and obesity.[6] Thus, the implications of poor sleep in high-risk incarcerated populations are increased mortality and a higher burden of disease.

A higher prevalence of poor health outcomes will also have an exacerbating effect on other societal issues associated with incarceration. For example, poor health is known to be a risk factor for criminal recidivism and employment problems,[8] and the unemployment rate among formerly incarcerated people is nearly five times higher than that of the general population.[9] Therefore, this review aims to assess and critically discuss the available information on the factors associated as well as estimate the health outcomes of inadequate sleep in incarceration.

Research Objective and Methods

The objectives of this study are to examine the literature exploring incarceration-related sleep problems, and to estimate the mortality and morbidity burden of sleep deficits within incarcerated populations. The design chosen for this study was a systematic review, conducted

using the evidence-based PRISMA Guidelines[10] and completed over the course of five months from January to May 2022.

Eligibility Criteria

The populations included were incarcerated adults or youths in juvenile detention. Excluded populations were prison and jail employees, family members, and individuals in medical institutions, civil detention, or concentration camps. Studies that were eligible for review incorporated original data on incarcerated people's sleep within a correctional setting and were conducted in the US or Canada. Both peer-reviewed and grey literature were eligible. Articles that were written in any language other than English were excluded.

Search Strategy

The electronic databases that were searched include PubMed/MEDLINE, Project Muse (restricted to journal articles), and Criminal Justice Abstracts. The search was conducted with the use of BOOLEAN operators, and the following search query was developed:

- (jail* OR prison* OR detention* OR incarcerat* OR inmates*) AND sleep

The grey literature search was conducted using Google advanced search settings, with the following terms:

- all these words: *sleep*
- any of these words: *jail prison detention incarcerat inmates*
- site or domain: *.org*

  .gov
- file type: *.pdf*

Screening of records was limited to the first three pages of each domain search entry, with a total of 60 records screened.

Data Extraction

Data was extracted from included articles and recorded using Microsoft Excel, which allowed for systematic recording of key information and determining whether a study met all inclusion criteria. Information that was extracted include the study population, study design, variables measured, and main findings. This process was repeated for grey literature and included the item type and main findings of each record.

Statistical Methods

The studies included in the meta-analysis contained data on the average number of hours slept. For each study, the sample size, mean sleep duration, and the standard deviation were extracted. Stata version 17 was then used to calculate the pooled mean sleep duration and 95% CI using meta-analytic summary commands.

The impact of inadequate sleep on this population was estimated across age and sex strata as follows. Using data on the number of male and female incarcerated individuals by age in U.S. state and federal prisons[11] and age- and sex-stratified all-cause mortality rates,[12] the number of expected deaths per year among incarcerated individuals within each age and sex strata was calculated. An existing meta-analysis by Itani et al.[6] was used to provide sex-stratified relative risks of mortality due to inadequate sleep. These were then multiplied by the number of expected deaths within each age strata to find the number of deaths expected in the incarcerated

population, given the inadequate sleep on average. Finally, the excess number of deaths attributable to inadequate sleep among prison populations was calculated by subtracting the total expected deaths (*N*) from the attributable deaths (*n*) due to inadequate sleep. This process was repeated to estimate the excess cases of cardiovascular disease and stroke attributable to inadequate sleep, using stratified disease incidence rates[13,14] and corresponding relative risks. In cases where incidence rates were available stratified by age but not sex, the ratio between the sex-stratified rates was used and applied to the age-stratified rates. Likewise, in cases where age-stratified rates were available only in broader age strata than was being utilized, the same rate was applied to each age group that was nested within the broader one.

Results

Selection Process

The PRISMA flow diagram in **Figure 1** shows the screening process and reasons for exclusion of peer-reviewed articles. The initial search of the three databases yielded a total of 453 records, and 15 studies were deemed eligible. A second PRISMA flow diagram (**Figure 2)** was created to display the screening process for grey literature, in which 25 records were included for review.

Figure 1. Flow diagram of peer-reviewed articles

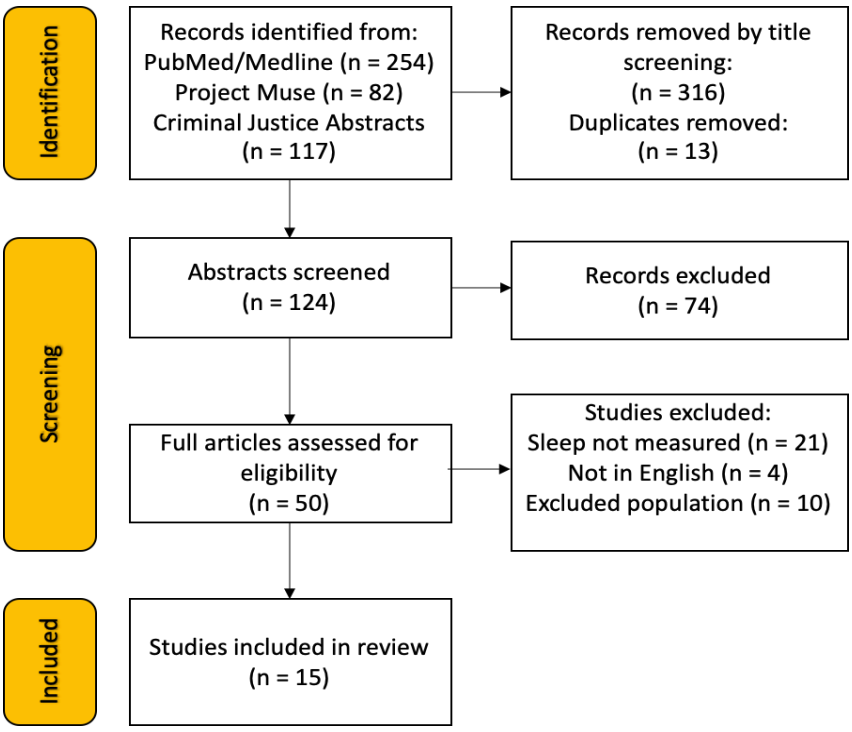
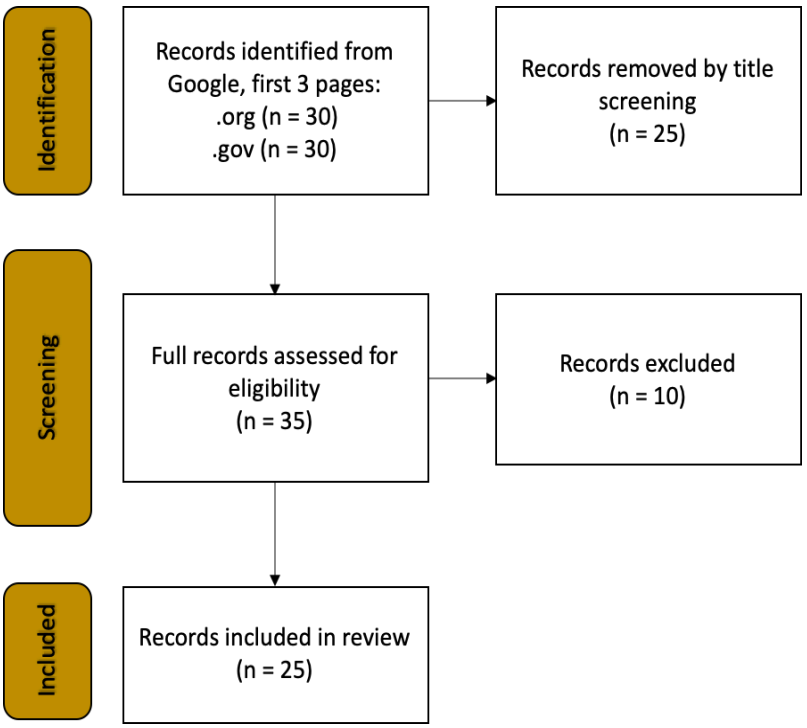


Figure 2. Flow diagram of grey literature



Study Characteristics

Peer-reviewed articles included for review are summarized in **Table 1**. The year of publication for each study ranged from 1980 to 2022. Study designs include randomized controlled trial (*n*=1), cohort (*n*=5), cross-sectional (*n*=4), mixed method (*n*=2), and pretest-posttest design (*n*=3). Grey literature are summarized in **Table 2** and publication years ranged from 1974 to 2021. Types of documents include reports (*n*=4), inmate handbooks (*n*=5), facility standard guidelines (*n*=8), journal articles (*n*=4), and court documents (*n*=4).

Table 1. Summary of descriptive characteristics of peer-reviewed articles (*n*=15)

Author (Year)	Population (N)	Design	Sleep Measure	Main Findings
Cameron et al. (2014)[15]	Male (104)	Retrospective cohort	Hours slept	Mean sleep duration increased 2.2 hours with nabilone
Eichelman & Dorava (2021)[16]	Female (81)	Retrospective cohort	PSQI, traumatic dreams	Normal sleep increased with prazosin
Ferszt et al. (2015)[17]	Female (33)	Pre-post uncontrolled trial	PSQI	Lower sleep quality after mindfulness-based program
Harner & Budescu (2014)[18]	Female (438)	Mixed method	PSQI, MAPS	72% met criteria for poor sleepers, mean sleep duration = 5.87 (SD = 1.68)
Harty et al. (2010)[19]	Adult (513)	Cross-sectional	PAI – Sleep Problems Index	BPD symptoms associated with sleep problems ($p < .01$)
Hughes & Boland (1992)[20]	Adult (144)	Cross-sectional	VAS – Sleep	High cigarette and caffeine consumption associated with sleep problems ($p < .05$)
Iftene (2016)[21]	Male (197)	Mixed method	Sleep problems	46.7% of participants reported sleep problems
Johnson et al. (2021)[22]	Adult (1420)	Retrospective cohort	Sleep apnea	Obesity associated with sleep apnea ($p = .003$)
Johnson et al. (2019)[23]	Adult (754)	Retrospective cohort	Hours slept	Sleep not associated with weight gain
Mahmood et al. (2012)[24]	Female (805)	Cross-sectional	Sleep problems (dichotomous)	Sleep problems associated with paranoid personality disorder ($p < .01$)
Nidich et al. (2016)[25]	Male (181)	RCT	TSC – Sleep disturbance subscale	Reduced sleep disturbance in transcendental meditation group ($r = 0.75$, $p < .001$)
Salley et al. (1980)[26]	Adult (23)	Prospective cohort	REM sleep – EEG recordings	No significant differences in sleep patterns between criminal psychopaths and non-psychopaths

Soenksen et al. (2015)[27]	Adolescent (93)	Cross-sectional	MWC – Sleep difficulty	Adolescents with heavy tobacco use prior to detention reported more difficulty sleeping when marijuana use was low
Sumter et al. (2022)[28]	Female (33)	Pretest-posttest	Likert scale – Sleep difficulties	No significant association between meditation and sleeping difficulties
Sylvia et al. (2021)[29]	Male (24)	Pre-post uncontrolled trial	PROMIS – Sleep disturbance	No significant difference between sleep disturbance and stress management program in incarcerated veterans

Survey Acronyms: PSQI = Pittsburgh Sleep Quality Index, MAPS = Multivariable Apnea Prediction Score, PAI = Personality Assessment Inventory, VAS = Visual Analog Scale, TSC = Trauma Symptoms Checklist, MWC = Marijuana Withdrawal Checklist, PROMIS = Patient-Reported Outcomes Measurement Information System

Table 2. Summary of descriptive characteristics of grey literature (*n*=25)

Author (Year)	Title	Item Type	Main Findings
Arkills (2016)	Message from the Chief Corrections Deputy[30]	Inmate Handbook	Disturbing the sleep of others considered a minor violation
Mai et al. (2019)	Broken Ground: Why America Keeps Building More Jails and What It Can Do Instead[31]	Journal Article	Inmates double or triple-bunked due to overcrowding
Morris et al. (2021)	Litigation Over Sleep Deprivation in U.S. Jails and Prisons[4]	Journal Article	Litigation over noise, constant illumination, early wake-up times, medication restrictions, inadequate bedding
Peguese & Koppel (2003)	Managing High-Risk Offenders in Prison Dormitory Settings[32]	Journal Article	Risk of being assaulted while sleeping, inmates taking turns sleeping to keep watch
(2019)	Grenning v. Miller-Stout[33]	Court Document	Appeal document - case of 24-hr bright lighting
(2020)	Rico v. Ducart[34]	Court Document	Case over whether excessive noise due to welfare checks violated the constitution
(2018)	AAPL Practice Resource for Prescribing in Corrections[35]	Journal Article	Sleep hygiene education, untreated insomnia linked to aggression
(2015)	ACLU Overcrowding and Overuse of Imprisonment in the United States[36]	Report	Prisoners reported to have been sleeping in gyms and hallways due to overcrowding
(2021)	Waukesha County Sheriff's Department County Jail Facility[37]	Inmate Handbook	Must sleep with head uncovered at all times, head toward window, eating in bed not permitted, loud noise not allowed
(2013)	Criminal Lockup Quota Report[38]	Report	Some inmates left sleeping on the floor due to overcrowding
N/A	Georgia Department of Corrections Inmate Handbook[39]	Inmate Handbook	Violation if unable to keep bed/cell clean

(2021)	Iowa Title IV Jail Inspection Standards[40]	Facility Standards	Noise control, variable lighting to allow sleep, clean bedding must be provided
(2010)	Know Your Rights: Prison and Jail Conditions[41]	Report	Eighth Amendment violations
(2005)	Maine Detention Standards[42]	Facility Standards	Rule against mattresses on the floor, light and noise levels must be controlled during sleep hours
(2018)	Tennessee Corrections Institute Minimum Standards[43]	Facility Standards	Temperature and light requirements
(2014)	Ohio Minimum Standards for Jails[44]	Facility Standards	50 square feet per occupant, lighting requirements during sleep hours
(2016)	Montana Detention Standards[45]	Facility Standards	Rule against mattress on the floor, dayrooms provided
(2008)	Peoria Regional Human Rights Authority Case #09-090-9017[46]	Court Document	Complaint statement: Inmate forced to sleep on floor without mattress
(2021)	Salt Lake County Prisoner Rules and Regulations[47]	Inmate Handbook	Head toward window while sleeping, rules against excessive noise
(2014)	Arkansas Criminal Detention Facility Standards[48]	Facility Standards	Minimum 35 square feet per inmate in sleeping area
(2021)	San Miguel County Jail[49]	Inmate Handbook	Must sleep with head exposed and toward door
(2016)	Report on Prison Interviews about Guard One 30 Minute Cell Checks[50]	Report	Nature of excessive noise and facility procedures impacting sleep
(1993)	Nebraska Title 83 Standards for Juvenile Detention Facilities[51]	Facility Standards	Lighting and noise control during sleep hours
(2021)	United States v. Vito Nuzzolilo[52]	Court Document	Motion for compassionate release; CPAP machine for sleep apnea
(1974)	California Laws and Guidelines for Local Detention Facilities[53]	Facility Standards	Day rooms provided, light accommodations to prevent interference with sleep

Prevalence of Insufficient Sleep

The prevalence of insufficient sleep among incarcerated individuals was explored in five studies, shown in **Table 3**. Participants in a study by Cameron et al.[15] slept five hours per night on average (SD = 1.4). Similarly, an article by Harner & Budescu found that women slept an average of five hours and 52 minutes per night.[18] The results of this study also found that based on the global sleep disturbances scale, 72% of the sample (*n*=316) met the criteria for poor sleep.[18] A 2019 study by Johnson and colleagues determined that 52% of individuals in their sample reported sleeping less than 7 hours per night, as compared to 30% in non-incarcerated adults.[23] In a mixed method study by Iftene, 46.7% of participants reported having trouble sleeping on a regular basis.[21] Finally, Mahmood and colleagues administered a questionnaire to a sample of incarcerated women and found that 51% of participants reported having sleep problems.[24] While these studies report different types of results, they provide evidence of insufficient sleep in incarcerated populations.

Table 3. Average sleep duration and prevalence of insufficient sleep

Study	**Sample size (*n*)**	**Design**	**Findings**
Cameron et al.[15] (2014)	104 - male	Retrospective cohort	Sleep duration (hours): M=5.0, SD=1.4
Harner & Budescu[18] (2014)	438 - female	Mixed method	Sleep duration (hours): M=5.87, SD=1.68
Johnson et al.[23] (2019)	754	Retrospective cohort	52% slept <7 hours per night
Iftene[21] (2016)	197 - male	Mixed method	46.7% reported sleep problems
Mahmood et al.[24] (2012)	805 - female	Cross-sectional	51% reported sleep problems

Factors Associated with Reduced Sleep

1. Prison Environment

A number of records explored elements of the prison environment that play a role in disrupting sleep. Factors that were consistently found to be disruptive are loud noise, bright lighting, and uncomfortable bedding. In one study, participants stated that loud, constant noise was affecting their sleep.[18] Similarly, older men in another study complained of loud noise and music at night by younger individuals.[21] In a summary of *Rico v. Ducart*, a claim for sleep deprivation was filed as a result of excessive noise, in what the plaintiff alleged was a Constitutional violation.[34] The loud noise was due to the sound of pod doors opening and closing every hour. Rico claimed that being deprived of sleep every night caused him to experience medical problems.

A 2016 report by Legal Services for Prisoners with Children describes the results of interviews conducted with individuals at a high security housing unit. As a result of cell checks 48 times each day, which are conducted to visually monitor individuals and ensure that no unsafe behavior is occurring, individuals consistently experienced disrupted sleep.[50] Sources of disruptive noise include opening and closing of pod doors, officers banging on doors, keys jangling, and officers loudly communicating with each other. The constant sleep interruptions reportedly had an impact on the daily functioning and mental state of incarcerated individuals within the facility.[50] In an article that discusses litigation over sleep deprivation, an individual stated that he was "placed in cells next to psychiatric patients who scream, beat on metal toilets, short out the power, flood the cells, throw feces, and light fires, resulting in his loss of sleep for days at a time."[4] From these findings, it is evident that sources of disruptive noise include loud doors, prison officers, and other incarcerated individuals.

Complaints of constant illumination were discussed in three records. In one study,[18] participants mentioned officers "shining flashlights in [their] faces every half hour" as a source of sleep disruption. Similarly, a court document of *Grenning v. Miller-Stout* summarizes an appeal in which the plaintiff discusses the 24-hour constant illumination in his cell, claiming that this violates the Eighth Amendment of the Constitution. Grenning reportedly suffered from "chronic sleep deprivation," "migraine headaches," and became very disoriented.[33] In the case of *Keenan v. Hall* summarized in an article,[3] a plaintiff pursued legal action over "large [fluorescent] lights . . . [that] shone into his cell 24 hours a day." It is evident that excessive lighting during sleep hours is a factor that directly disrupts the circadian rhythm, preventing a biological mechanism that is necessary for the ability to fall asleep.

Inadequate bedding was another common factor. To describe the beds, participants used words such as "hard," "noisy," and "disgusting," which contributed to their sleep difficulties.[21] In some cases, inadequate bedding is a result of overcrowding, in turn forcing individuals to sleep on the floor.[31,26,38] A complaint at the Henry County Jail in Illinois was filed in 2008 by three individuals who claimed to have been forced to sleep on the concrete floor without mattresses, which was considered a human rights violation by the Peoria Regional Human Rights Authority.[46] In one case,[4] a lawsuit was filed by a man who claimed to be "required to sleep on the floor among cockroaches and rats." Another case involved a mattress with a "large slit down its center and smelled of mildew," causing the plaintiff to experience pain and sleep loss.[4] This information suggests that more than one aspect of the facilities' physical conditions are regularly disruptive to sleep.

Three of the five inmate handbook documents obtained had some mention of rules against excessive noise during sleep hours. **Table 4** summarizes the facility standards obtained through the grey literature search. Of the eight records obtained, four of these contain a noise policy of no more than 45 decibels during sleep hours. However, these policies seem to be directed towards incarcerated people, though the literature provides evidence of other sources of noise such as prison officers, pod doors, etc. Illumination is measured in foot-candles, in which one foot-candle is defined as one lumen per square foot. Three of the guidelines limit illumination to no more than 5 foot-candles during sleep hours, and two state that bedtime lighting must allow for both sleep and constant supervision, though do not specify the amount of light intensity permitted. All but one of the records declare the provision of clean bedding as a requirement for facilities. In summary, some facilities have policies that address some of these factors while others do not, and there is a lack of information on whether the current policies are effective or whether they are being enforced.

Table 4. Noise, Lighting, and Bedding Policy During Sleep Hours by State

State	Noise	Lighting	Bedding
Iowa[40]	N/A	Must allow for sleep and supervision	Must provide clean bedding
Maine[42]	No more than 45 decibels	No more than 5 foot-candles	Must provide clean bedding
Tennessee[43]	N/A	N/A	Must provide clean bedding
Ohio[44]	No more than 45 decibels	2 to 4 foot-candles	Must provide clean bedding
Montana[45]	No more than 45 decibels	N/A	Must provide clean bedding
Arkansas[48]	N/A	N/A	Must provide clean bedding
Nebraska[51] (Juvenile Detention)	No more than 45 decibels	Must allow for sleep and supervision	N/A
California[53]	N/A	2 to 3 foot-candles	Must provide clean bedding

2. Mental and Physical Health

Five studies explored the associations between sleep and mental illness in incarcerated people. Three of the studies focused on personality disorders. Harty et al.[19] found Borderline Personality Disorder and its four subscales (identity problems, negative relationships, self-harm, and affective instability) to be significantly associated with sleep problems in those incarcerated, even when controlling for depression and substance dependence ($p < .01$). Mahmood and colleagues[24] found that women who were diagnosed with paranoid personality disorder were 62% more likely to experience sleep problems ($p < .01$). However, a study conducted in 1980 by Salley et al. examined the differences in REM sleep and EEG recordings between criminal

psychopaths and non-psychopaths[26] (renamed Antisocial Personality Disorder in the DSM-V). The study found no significant differences in sleep patterns between groups, which suggests that the sleep deficits in those with a personality disorder may be due to extrinsic factors rather than intrinsic factors.

Other types of mental illness were found to be associated with sleep problems. In one article,[21] 70.1% of the study population who reported a mental illness also reported experiencing sleep problems. More specifically, a higher percentage of those with depression or anxiety suffered from sleep problems than did not.[21] These findings are supported by Harner & Budescu, who found that those being treated for depression and/or anxiety were more likely to have poor sleep quality, as well as individuals who met the criteria for a PTSD diagnosis.[18]

Health conditions in relation to poor sleep were discussed in six studies. Three of the studies addressed substance abuse, the first being a 1992 study by Hughes & Boland where researchers found high levels of cigarette smoking and caffeine consumption to be associated with sleep problems. Study results showed that individuals smoking > 25 cigarettes per day experienced greater sleep problems than those smoking < 20 per day, but only at high caffeine levels.[20] Another study[19] found a significant association between opiate dependence and sleep problems, even when controlling for depression ($r = 0.17$, $p < .01$). One study by Soenksen et al.[27] also looked substance use and sleep difficulties with youths in juvenile detention and found an interaction between the level of marijuana and tobacco use on sleep difficulty. Results showed that adolescents who reported high levels of tobacco use before detention had significantly greater sleep problems when marijuana use was low, though no effect was found when marijuana

use was heavy.[27] From these findings it can be inferred that complex interactions between substances can have an impact on sleep.

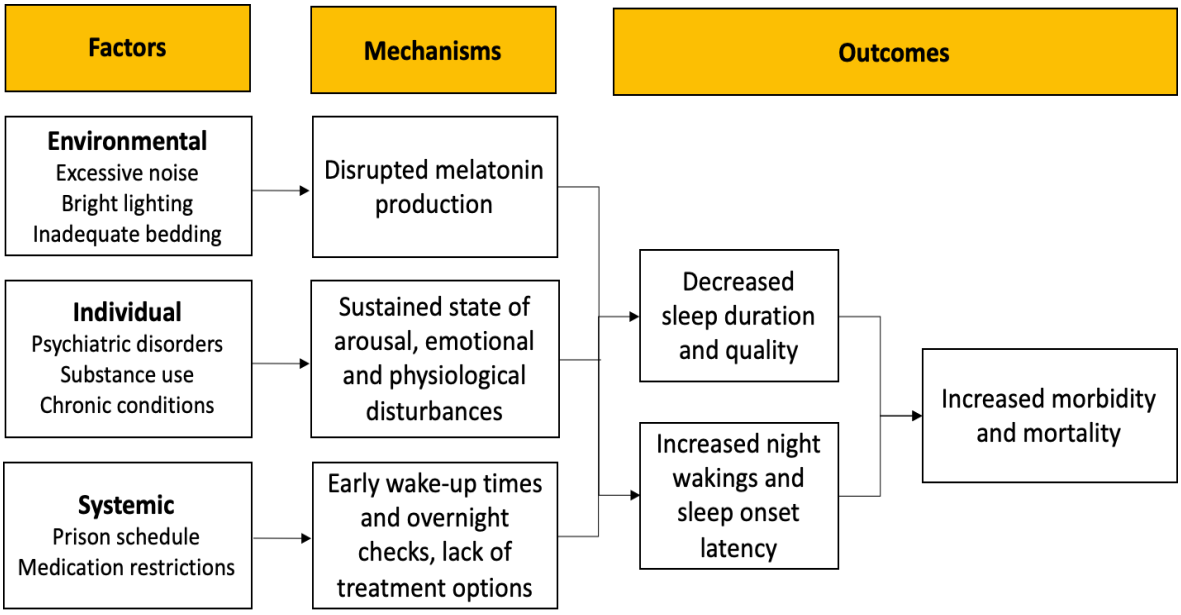
Other chronic conditions in relation to sleep problems were assessed. Results from a mixed method study[18] found that participants reported pain as a main factor that contributed to poor sleep. These included both chronic and acute pain such as from arthritis and menstrual cramps.[18] Chronic conditions were also explored by Johnson and colleagues. In a 2021 study[22], researchers found that sleep apnea and obesity were significantly associated (p = .003), though a 2019 study did not identify a significant correlation between sleep and weight gain.[23]

3. Systemic Factors

The following literature discusses systemic factors that have an effect on sleep, such as daily schedules and medication restrictions. Morris et al. highlights how early wake-up times do not allow for adequate sleep. One class action complaint over sleep deprivation was due to the jail's policy of lights on until 11:00 p.m. and lights on for breakfast at 4:00 a.m. Medications were also reported to be administered at 2:30 a.m.[4] Another common reason for night wakings is routine cell checks that are required as a part of jail and prison schedules. Hourly checks were stated in *Rico v. Ducart* as a source of the plaintiff's sleep deprivation.[34] Indeed, a 2016 report[48] on prison interviews describes how cell checks every 30 minutes resulted in persistently interrupted sleep for those incarcerated, and individuals were reported to be "suffering from headaches, fatigue… irritability, and other symptoms." These findings suggest that aspects of the prison schedule do not allow for healthy sleep.

Clinicians who practice in correctional facilities are often advised against or prohibited from prescribing medications that treat insomnia.[4] Reasons for this include potential for abuse or worries over incarcerated individuals "sleeping away their sentences."[4] However it is possible that this policy exacerbates the issue of inadequate sleep, because it restricts the availability of essential treatment options. Indeed, there were two studies looking at pharmacological interventions, and each study found that nabilone and prazosin significantly increased the number of hours slept as well as reduced the occurrence of nightmares for incarcerated individuals.[15,16] Researchers also reported that nabilone made an improvement for those who took the drug for chronic pain, a factor that interferes with sleep, and found no evidence of abuse within the population.[15] Thus, system policies that contribute to poor sleep and limit the use of potential pharmacological treatments warrant reconsideration.

Figure 3. Conceptual Model of Factors Associated with Sleep Deficits in Incarceration



Data Analysis

The pooled mean sleep duration shown in **Table 5** was 5.7 hours (95% CI 5.56 - 5.84), which is lower than the average sleep duration of 7.18 hours[6] for the US population.

Table 5. Characteristics of studies included in the meta-analysis

Study	Sample size (N)	Sampling method	Mean Sleep Duration (Hours), SD
Cameron et al.[15] 2014	104, Male	Convenience	5.0, SD = 1.4
Harner & Budescu[18] 2014	438, Female	Stratified	5.87, SD = 1.68
			Pooled mean: 5.70, SD = 1.66 (95% CI 5.56-5.84)

Morbidity and Mortality Estimates

Tables 6-8 show the expected mortality and morbidity burden in the U.S. incarcerated population and the estimated attributable excess deaths and disease incident cases due to inadequate sleep. Relative risks were obtained from a 2017 meta-analysis by Itani et al.[6] The estimated excess deaths due to inadequate sleep and its health consequences was 515 (95% CI 234 - 843) for incarcerated males and 24 (95% CI 11 - 36) for incarcerated females. An estimated 692 excess cases (95% CI 208 - 1,176) of cardiovascular disease among incarcerated males can be attributed to inadequate sleep, and 19 excess cases (95% CI 9 - 28) among incarcerated females. The attributable excess cases of stroke due to inadequate sleep was 515 (95% CI 234 - 843) for incarcerated males and 24 (95% CI 11 - 36) for incarcerated females. Since the data on the number of incarcerated people in the U.S. only includes state and federal prisons and does not include jails or other incarceration settings, these figures are likely an underestimate of the actual sleep-related excess mortality and disease incident cases among all incarceration settings.

Table 6. Excess Deaths in U.S. Prison Population Due to Inadequate Sleep

Age	Incarcerated (*N*), Year 2020		US Mortality Rates *per 100,000		Incarcerated Expected Deaths (*N*)		Male Attributable Deaths (*N*) (Expected x RR) Mortality RR = 1.11, 95% CI 1.05 – 1.18			Male Excess Deaths (*N*) (Attributable – Expected)			Female Attributable Deaths (*N*) Mortality RR = 1.15, 95% CI 1.07 – 1.23			Female Excess Deaths (*N*)		
	Male	Female	Male	Female	Male	Female		(LCI)	(UCI)		(LCI)	(UCI)		(LCI)	(UCI)		(LCI)	(UCI)
18-19	6,616	318	99.7	38.4	7	0	7	7	8	1	0	1	0	0	0	0	0	0
20-24	83,801	5,487	99.7	38.4	84	2	93	88	99	9	4	15	2	2	3	0	0	0
25-29	158,782	12,563	177.0	78.9	281	10	312	295	332	31	14	51	11	11	12	1	1	2
30-34	176,424	15,505	177.0	78.9	312	12	347	328	368	34	16	56	13	13	15	2	1	3
35-39	172,014	14,710	257.0	141.6	442	21	491	464	522	49	22	80	22	22	26	3	1	5
40-44	143,345	10,575	257.0	141.6	368	15	409	387	435	41	18	66	16	16	18	2	1	3
45-49	111,368	7,713	490.0	297.3	546	23	606	573	644	60	27	98	25	25	28	3	2	5
50-54	90,417	5,566	490.0	297.3	443	17	492	465	523	49	22	80	18	18	20	2	1	4
55-59	72,775	3,817	1111.9	669.8	809	26	898	850	955	89	40	146	27	27	31	4	2	6
60-64	45,209	1,908	1111.9	669.8	503	13	558	528	593	55	25	90	14	14	16	2	1	3
65+	40,798	1,431	2178.6	1402.0	889	20	987	933	1049	98	44	160	21	21	25	3	1	5
TOTAL	1,101,548	79,595			4,683	158	5199	4918	5526	**515**	234	843	182	169	194	**24**	11	36

Sources: Incarcerated (*N*) - Carson EA, Bureau of Justice Statistics 2021
US Mortality Rates - Statista, 2019
Relative Risks - Itani O, Jike M, Watanabe N, Kaneita Y 2017

Table 7. Excess Cardiovascular Disease Cases in U.S. Prison Population Due to Inadequate Sleep

Age	Incarcerated (*N*), Year 2020		US CVD Incidence Rates *per 1,000 person-years		CVD Expected Cases (*N*)		Male Attributable Cases (*N*) CVD RR = 1.10, 95% CI 1.03 – 1.17			Male Excess CVD Cases (*N*)			Female Attributable Cases (*N*) CVD RR = 1.14, 95% CI 1.07 – 1.21			Female Excess CVD Cases (*N*)		
	Male	Female	Male	Female	Male	Female		(LCI)	(UCI)		(LCI)	(UCI)		(LCI)	(UCI)		(LCI)	(UCI)
18-19	6,616	318	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20-24	83,801	5,487	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-29	158,782	12,563	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30-34	176,424	15,505	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35-39	172,014	14,710	3	-	516	-	568	532	604	52	15	88	-	-	-	-	-	-
40-44	143,345	10,575	3	-	430	-	473	443	503	43	13	73	-	-	-	-	-	-
45-49	111,368	7,713	10.1	4.2	1,125	32	1,237	1,159	1,316	112	34	191	37	35	39	5	2	7
50-54	90,417	5,566	10.1	4.2	913	23	1,005	941	1,068	91	27	155	27	25	28	3	2	5
55-59	72,775	3,817	21.4	8.9	1,557	34	1,713	1,604	1,822	156	47	265	39	36	41	5	2	7
60-64	45,209	1,908	21.4	8.9	967	17	1,064	996	1,132	97	29	164	19	18	21	2	1	4
65+	40,798	1,431	34.6	20	1,412	29	1,553	1,454	1,652	141	42	240	33	31	35	4	2	6
TOTAL	1,105,548	79,595			6,921	135	7,613	7,128	8,097	**692**	208	1,176	154	145	164	**19**	9	28

Sources: Incarcerated (*N*) - Carson EA, Bureau of Justice Statistics 2021
US CVD Incidence Rates - American Heart Association, 1980-2003
Relative Risks - Itani O, Jike M, Watanabe N, Kaneita Y 2017

Table 8. Excess Stroke Cases in U.S. Prison Population Due to Inadequate Sleep

Age	Incarcerated (*N*), Year 2020		US Stroke Incidence Rates *per 100,000		Stroke Expected Cases (*N*)		Male Attributable Cases (*N*) Stroke RR = 1.03, 95% CI 0.78 – 1.37			Male Excess Stroke Cases (*N*)			Female Attributable Cases (*N*) Stroke RR = 1.09, 95% CI 0.98 – 1.22			Female Excess Stroke Cases (*N*)		
	Male	Female	Male	Female	Male	Female		(LCI)	(UCI)		(LCI)	(UCI)		(LCI)	(UCI)		(LCI)	(UCI)
18-19	6,616	318	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20-24	83,801	5,487	26	31	22	2	22	17	30	1	-5	8	2	2	2	0	0	0
25-29	158,782	12,563	26	31	41	4	43	32	57	1	-9	15	4	4	5	0	0	1
30-34	176,424	15,505	26	31	46	5	47	36	63	1	-10	17	5	5	6	0	0	1
35-39	172,014	14,710	26	31	45	5	46	35	61	1	-10	17	5	4	6	0	0	1
40-44	143,345	10,575	26	31	37	3	38	29	51	1	-8	14	4	3	4	0	0	1
45-49	111,368	7,713	142	201	158	16	163	123	217	5	-35	59	17	15	19	1	0	3
50-54	90,417	5,566	142	201	128	11	132	100	176	4	-28	48	12	11	14	1	0	2
55-59	72,775	3,817	142	201	103	8	106	81	142	3	-23	38	8	8	9	1	0	2
60-64	45,209	1,908	142	201	64	4	66	50	88	2	-14	24	4	4	5	0	0	1
65+	40,798	1,431	482	546	197	8	203	153	269	6	-43	73	9	8	10	1	0	2
TOTAL	1,105,548	79,595			842	64	867	656	1,153	**25**	-185	311	70	63	78	**6**	-1	14

Sources: Incarcerated (*N*) - Carson EA, Bureau of Justice Statistics 2021
US Stroke Incidence Rates - Madsen TE, Khoury JC, Leppert M, et al. 2020
Relative Risks - Itani O, Jike M, Watanabe N, Kaneita Y 2017

Discussion

Summary of Findings

The most consistently reported factors associated with inadequate sleep were outside of the individuals' control, such excessive noise, constant illumination, and uncomfortable bedding. Mental health issues were also a commonly reported factor, however, the bi-directional relationship between mental illness and sleep difficulties should be taken into consideration. It is evident that incarcerated people would benefit from improved policies and a restructuring of the physical conditions of the prison environment. For example, soundproof walls would mitigate noise, and policies that require the provision of sleep masks may be advantageous.

Since prisoners are entitled to health care that is equivalent to that of the general population, policies restricting insomnia medication should be reconsidered. Future studies focusing on pharmacological treatments should ensure that a sleep medication's potential for abuse is measured. There were inconsistent findings regarding the effectiveness of program interventions on improving sleep. Two studies found no differences in sleep disturbance following a meditation program[24] and a stress management program,[25] one found a transcendental meditation program to be effective,[21] and a fourth study[13] found that a mindfulness-based program worsened the sleep of participants. However, it should be noted that none of the programs targeted sleep exclusively, and further research looking at non-pharmacological interventions is necessary.

While the review only yielded two studies eligible for the meta-analysis, it is important to acknowledge the implications of a pooled mean sleep duration of 5.7 hours. The study by Itani and colleagues highlights that less than six hours of sleep duration is significantly associated

with increased mortality, diabetes, cardiovascular disease, coronary heart disease, and obesity.[6] The excess deaths and incident cases of diseases as a result of inadequate sleep further exacerbate the long list of health inequities experienced by incarcerated populations. Since the data for the quantitative analysis portion only included state and federal prison populations, the results are a conservative estimate of the long-term health outcomes. There were a few reasons for excluding jail populations from the quantitative analysis. First, a large proportion of the jail population has relatively shorter stays, and the health effects being measured were as a result of long-term sleep deprivation. Though there are certainly health and behavioral outcomes as a consequence of short-term inadequate sleep such as increased aggression, impulsivity, etc., these are more difficult to measure and analyze, and would not have been feasible for this project given the time frame and resources. Nevertheless, both jail and prison populations were included in the review because there is a limited amount of research conducted specifically within prison settings, and the studies conducted in jails are applicable due to the underlying similarities in the environment, policy, and population.

Limitations

This study is not without limitations. Quality assessment ratings are conducted as a part of traditional systematic reviews, though due to the time constraints, this step was omitted to prioritize synthesizing the gathered information. Most of the peer-reviewed studies measuring sleep were observational in nature and used self-reported assessments. Though many of the sleep measures have been widely used and are validated, limitations with this approach such as recall bias should be considered. Additionally, limiting the geographical scope to United States and Canada leaves out additional data on mean sleep duration and other compelling evidence found

in international studies. Despite the limitations, this review sheds light on a pressing issue that is in need of further investigation and provides information that could be useful for determining targeted interventions.

Future Research

There are many other avenues to be explored within correctional health research. The data on attributable deaths and incident cases only included data from federal and state prisons, and future studies should consider whether there are differences in sleep issues experienced between prisons and jails. There was a notable absence of studies using objective measures and longitudinal methodology and utilizing a stronger approach in study designs would strengthen the evidence needed for actionable change. This review also did not explore the time spent in prison as a factor that affects sleep, though this undoubtedly has an impact. The issue of mass incarceration in the United States is evident—many more people are in prison than should be, which has taken a toll on the most disadvantaged of communities, particularly black communities and other people of color. However, the implications of keeping people in prison for longer than they should be and how this affects sleep patterns even after re-entering the community is overlooked and also warrants discussion. Examining the exposure-response relationships of sentence duration, sleep, and health outcomes both on an individual level and from a population perspective will be very important in future work and influencing policy.

Conclusion

This project sheds light on a small yet significant part of a much larger issue regarding health disparities experienced by those currently or formerly incarcerated. Inadequate sleep and its associated health outcomes is an issue that can be resolved, though combined efforts from public health leaders, researchers, and policymakers to expand the focus on incarcerated populations are necessary. Health disparities among disadvantaged communities, mass incarceration, and the prison-industrial complex are inextricably linked. Failing to find solutions for the health issues that disproportionately affect incarcerated people, and ultimately black and brown marginalized communities, means upholding the oppressive system the United States was built upon. Undoing systemic failures and advancing health equity begins with ensuring that the most vulnerable populations are taken care of.

References

1. Macleod A, Nair D, Ilbahar E, Sellars M, Nolte L. Identifying barriers and facilitators to implementing advance care planning in prisons: a rapid literature review. *Health & Justice*. 2020;8(1):22. doi:10.1186/s40352-020-00123-5
2. Using Prisoners as Research Subjects Raises Ethical Concerns. Accessed June 9, 2022.https://www.reliasmedia.com/articles/140733-using-prisoners-as-research-subjects-r raises-ethical-concerns
3. Touitou Y, Reinberg A, Touitou D. Association between light at night, melatonin secretion, sleep deprivation, and the internal clock: Health impacts and mechanisms of circadian disruption. *Life Sciences*. 2017; 173:94-106. doi:10.1016/j.lfs.2017.02.008
4. Morris NP, Holliday JR, Binder RL. Litigation Over Sleep Deprivation in U.S. Jails and Prisons. *PS*. 2021;72(10):1237-1239. doi:10.1176/appi.ps.202100438
5. Getachew Y, Azale T, Necho M. Poor sleep quality and associated factors among prisoners of the Diredawa correctional facility in eastern Ethiopia. *Ann Gen Psychiatry*. 2020; 19:40. doi:10.1186/s12991-020-00291-6
6. Itani O, Jike M, Watanabe N, Kaneita Y. Short sleep duration and health outcomes: a systematic review, meta-analysis, and meta-regression. *Sleep Med*. 2017; 32:246-256. doi:10.1016/j.sleep.2016.08.006
7. Barker LF, Ireland JL, Chu S, Ireland CA. Sleep and its association with aggression among prisoners: Quantity or quality? *Int J Law Psychiatry*. 2016; 47:115-121. doi:10.1016/j.ijlp.2016.02.014
8. Yukhnenko D, Blackwood N, Fazel S. Risk factors for recidivism in individuals receiving community sentences: a systematic review and meta-analysis. *CNS Spectrums*. 2020;25(2):252-263. doi:10.1017/S1092852919001056
9. Couloute L, Kopf D. *Out of Prison & Out of Work: Unemployment among Formerly Incarcerated People*. Prison Policy Initiative; 2018. Accessed March 23, 2022. https://www.jstor.org/stable/resrep27307
10. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71. doi:10.1136/bmj.n71
11. Carson EA. Prisoners in 2020 – Statistical Tables. *Statistical Tables*. Published online 2020:50.

12. Death rate by age and sex in the U.S. 2019 | Statista. Accessed June 9, 2022. https://www.statista.com/statistics/241572/death-rate-by-age-and-sex-in-the-us/
13. Go AS, Mozaffarian D, Roger VL, et al. Heart Disease and Stroke Statistics—2013 Update: A Report from the American Heart Association. *Circulation*. 2013;127(1). doi:10.1161/CIR.0b013e31828124ad
14. Madsen TE, Khoury JC, Leppert M, et al. Temporal Trends in Stroke Incidence Over Time by Sex and Age in the GCNKSS. *Stroke*. 2020;51(4):1070-1076. doi:10.1161/STROKEAHA.120.028910
15. Cameron C, Watson D, Robinson J. Use of a synthetic cannabinoid in a correctional population for posttraumatic stress disorder-related insomnia and nightmares, chronic pain, harm reduction, and other indications: a retrospective evaluation. *J Clin Psychopharmacol*. 2014;34(5):559-564. doi:10.1097/JCP.0000000000000180
16. Eichelman B, Dorava A. Open Outcome Study of Prazosin in a Prison Female Population with Traumatic Dreams. *Journal of Correctional Health Care*. 2021;27(4):238-244. doi:10.1089/jchc.19.07.0062
17. Ferszt GG, Miller RJ, Hickey JE, Maull F, Crisp K. The Impact of a Mindfulness Based Program on Perceived Stress, Anxiety, Depression and Sleep of Incarcerated Women. *Int J Environ Res Public Health*. 2015;12(9):11594-11607. doi:10.3390/ijerph120911594
18. Harner HM, Budescu M. Sleep quality and risk for sleep apnea in incarcerated women. *Nurs Res*. 2014;63(3):158-169. doi:10.1097/NNR.0000000000000031
19. Harty L, Forkner RebeccaD, Thompson A, Stuewig J, Tangney JuneP. Are inmates' subjective sleep problems associated with borderline personality, psychopathy, and antisocial personality independent of depression and substance dependence? *Journal of Forensic Psychiatry & Psychology*. 2010;21(1):23-38. doi:10.1080/14789940903194095
20. Hughes GV, Boland FJ. The effects of caffeine and nicotine consumption on mood and somatic variables in a penitentiary inmate population. *Addictive Behaviors*. 1992;17(5):447-457. doi:10.1016/0306-4603(92)90005-G
21. Iftene A. Unlocking the doors to Canadian older inmate mental health data: Rates and potential legal responses. *Int J Law Psychiatry*. 2016; 47:36-44. doi:10.1016/j.ijlp.2016.02.032

22. Johnson C, Bien-Aimé I, Dubois L. Weight gain and chronic disease progression among individuals incarcerated in Canadian federal penitentiaries: a retrospective cohort study. *IJPH*. 2021;17(2):128-141. doi:10.1108/IJPH-05-2020-0031
23. Johnson C, Chaput JP, Diasparra M, Richard C, Dubois L. Influence of physical activity, screen time and sleep on inmates' body weight during incarceration in Canadian federal penitentiaries: a retrospective cohort study. *Can J Public Health*. 2019;110(2):198-209. doi:10.17269/s41997-018-0165-z
24. Mahmood ST, Tripodi SJ, Vaughn MG, Bender KA, Schwartz RD. Effects of Personality Disorder and Impulsivity on Emotional Adaptations in Prison Among Women Offenders. *Psychiatry Q*. 2012;83(4):467-480. doi:10.1007/s11126-012-9215-5
25. Nidich S, O'connor T, Rutledge T, et al. Reduced Trauma Symptoms and Perceived Stress in Male Prison Inmates through the Transcendental Meditation Program: A Randomized Controlled Trial. *Perm J*. 2016;20(4):16-007. doi:10.7812/TPP/16-007
26. Salley RD, Khanna P, Byrum W, Hutt LD. REM Sleep and EEG Abnormalities in Criminal Psychopaths. *Percept Mot Skills*. 1980;51(3):715-722. doi:10.2466/pms.1980.51.3.715
27. Soenksen S, Stein L a. R, Brown JD, Stengel JR, Rossi JS, Lebeau R. Cannabis Withdrawal Among Detained Adolescents: Exploring the Impact of Nicotine and Race. *J Child Adolesc Subst Abuse*. 2015;24(2):119-124. doi:10.1080/1067828X.2013.770379
28. Sumter MT, Monk-Turner E, Turner C. The Benefits of Meditation Practice in the Correctional Setting. *Journal of Correctional Health Care*. 2009;15(1):47-57. doi:10.1177/1078345808326621
29. Sylvia LG, Chudnofsky R, Fredriksson S, et al. A Pilot Study of a Stress Management Program for Incarcerated Veterans. *Military Medicine*. 2021;186(11-12):1061-1065. doi:10.1093/milmed/usab121
30. Arkills C. *Message from the Chief Corrections Deputy.* Clark County Jail; 2016. 1-44. Accessed June 8, 2022. https://www.dfa.arkansas.gov/images/uploads/criminalDetentionOffice/proposedjailStandards.pdf
31. Mai C, Belaineh M, Subramanian R, Kang-Brown J. *Broken Ground: Why America Keeps Building More Jails and What It Can Do Instead*. Vera Institute of Justice; 2019.

Accessed June 8, 2022. http://www.vera.org/publications/broken-ground-jail-construction

32. Peguese J, Koppel R. *Managing High-Risk Offenders in Prison Dormitory Settings*. U.S. Department of Justice. Published July 2003. Accessed June 8, 2022. https://www.ojp.gov/ncjrs/virtual-library/abstracts/managing-high-risk-offenders-prison-dormitory-settings
33. *Grenning v. Miller-Stout.* United States Court of Appeals for the Ninth Circuit; April 2019. 1-19. Accessed June 8, 2022.
34. *Rico v. Ducart.* United States Court of Appeals for the Ninth Circuit; November 2020. 1-32. Accessed June 8, 2022.
35. AAPL Practice resource for prescribing in corrections. *The Journal of the American Academy of Psychiatry and the Law*; 2018. 46(2):50.
36. *Overcrowding and Overuse of Imprisonment in the United States.* American Civil Liberties Union; May 2015. Accessed June 9, 2022. https://www.ohchr.org/sites/default/files/Documents/Issues/RuleOfLaw/OverIncarceration/ACLU.pdf
37. *Inmate Rules, Regulations, and Information Packet.* Waukesha County Sheriff's Department County Jail Facility; July 2021. Accessed June 9, 2022. https://www.waukeshacounty.gov/globalassets/sheriff/jail-division/county-jail-information-and-rulebook---july-2021.pdf
38. *Criminal: How Lockup Quotas and "Low-Crime Taxes" Guarantee Profits for Private Prison Corporations.* In the Public Interest; September 2013. Accessed June 9, 2022. https://www.inthepublicinterest.org/wp-content/uploads/Criminal-Lockup-Quota-Report.pdf
39. *Orientation Handbook for Offenders.* Georgia Department of Corrections. Accessed June 9, 2022. http://gdc.ga.gov/sites/all/files/pdf/GDC_Inmate_Handbook.pdf
40. *Jail Inspection Standards Title IV.* Iowa Department of Corrections; 2021. 50;1-25. Accessed June 9, 2022. https://www.legis.iowa.gov/docs/iac/chapter/201.50.pdf
41. *Know Your Rights: Prison and Jail Conditions.* The Law Office of the Southern Center for Human Rights; 2010. Accessed June 9, 2022. https://www.schr.org/wp-content/uploads/2020/02/Know-Your-Rights-Prison-and-Jail-Conditions.pdf

42. *Detention and Correctional Standards for Maine Counties and Municipalities.* State of Maine Department of Corrections; September 2005. Accessed June 9, 2022. https://www.maine.gov/corrections/
43. *Minimum Standards for Local Adult Correctional Facilities.* Tennessee Corrections Institute; January 2018. Accessed June 9, 2022.
44. *Minimum Standards for Jails*. Ohio Department of Corrections. 5120;1-8. Accessed June 9, 2022. https://www.drc.ohio.gov/Portals/0/BAD/Minimum%20Standards%20for%20Jails.pdf?ver=2016-09-22-135837-547
45. *Detention Standards.* Montana Department of Corrections; 2017. Accessed June 9, 2022. https://leg.mt.gov/content/Committees/Interim/2017-2018/Law-and-Justice/Meetings/Nov-2017/Exhibits/montana-jail-standards-update-2016.pdf
46. *Peoria Regional Human Rights Authority Case #09-090-9017.* Illinois Guardianship & Advocacy Commission. Accessed June 9, 2022. https://www2.illinois.gov/sites/gac/HRA/Reports/2009/09-090-9017.pdf
47. *Prisoner Rules and Regulations Handbook*. Salt Lake County Jail; July 2021. Accessed June 9, 2022. https://slco.org/globalassets/1-site-files/sheriff/prisoner_rules_and_regulations.pdf
48. *Criminal Detention Facility Standards.* Arkansas Department of Corrections; 2014. Accessed June 9, 2022. https://www.dfa.arkansas.gov/images/uploads/criminalDetentionOffice/proposedjailStandards.pdf
49. *Inmate Handbook*. San Miguel County Jail; November 2021. Accessed June 9, 2022.
50. *Report on Prison Interviews about Guard One 30 Minute Cell Checks*. Legal Services for Prisoners with Children; 2016. Accessed June 9, 2022. https://www.prisonerswithchildren.org/wp-content/uploads/2012/05/Sleep-Report_January-2016.pdf
51. *Title 83 Standards for Juvenile Detention Facilities*. Nebraska Department of Corrections. Accessed June 9, 2022. https://www.nebraska.gov/rules-and-regs/regsearch/Rules/Law_Enforcement_and_Criminal_Justice/Title-83/Chapter-17.pdf

52. *Memorandum and Order on Defendant's Supplemental Motion for Compassionate Release*. United States District Court District of Massachusetts; 2021. Accessed June 9, 2022. https://www.govinfo.gov/content/pkg/USCOURTS-mad-4_17-cr-40035/pdf/USCOURTS-mad-4_17-cr-40035-1.pdf
53. *Laws and Guidelines for Local Detention Facilities*. State of California; 1974. Accessed June 9, 2022. https://www.ojp.gov/pdffiles1/Digitization/30022NCJRS.pdf