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BOILING BEHIND BARS: EXPLORING THE HIDDEN TOLL OF EXTREME HEAT ON
MENTAL HEALTH IN TEXAS PRISONS

by

SANDRA KATHLEEN MILLER

THESIS

Submitted in partial fulfillment of the requirements
for the degree of Master of Social Work at
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Arlington, Texas

Supervising Committee:

Allison Tomlinson, Supervising Professor
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Jaya Davis

ABSTRACT

Boiling Behind Bars: Exploring the Hidden Toll of Extreme Heat on Mental Health in Texas

Prisons

Sandra Kathleen Miller, MSW

The University of Texas at Arlington, 2024

Supervising Professors: Allison Tomlinson, Anne Nordberg, Jaya Davis

The State of Texas supports the largest prison system in the US and held 132,859 people in 100 units scattered across the state as of December 2023. Approximately 70% of Texas prison beds are not air conditioned, despite the state's reputation for dangerously hot, humid summers. The State has officially recorded temperatures inside Texas prison facilities as high as 120 degrees with heat index values of over 150. Although there is a growing body of research on the negative physiological and psychological consequences of extreme heat among the general public, little is known about the physical and emotional toll of extreme indoor heat on the incarcerated population. This study analyzes TDCJ unit-level longitudinal quantitative data from 2012 through 2023 supplied by the Texas Department of Criminal Justice to determine if a correlational relationship exists between inmate suicide rates and hot summer temperatures within the Texas prison system.

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2024

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Introduction

It is said that no one truly knows a nation until one has been inside its jails. A nation should not be judged by how it treats its highest citizens, but its lowest ones (Mandela, 1995, p. 215).

Historical weather data shows our world has steadily grown warmer since 1880, the year standardized global temperature recording began (Wang, et al., 2023). World climatological organizations have noted the past eight years (2015-2022) as the warmest consecutive period in recorded history (World Meteorological Organization [WMO], 2023c). According to the National Aeronautics and Space Administration [NASA], July of 2023 was Earth's hottest month ever recorded (O'Shea, 2023). In Texas, the primary area of focus for this study, the summer of 2023 tied with 2011 as the hottest summer since 1893, the year standardized daily temperature record-keeping began for the State (National Oceanic and Atmospheric Administration- National Weather Service, 2023). Overall global temperature is expected to continue to rise, despite any measures humans collectively take to mitigate its impact (NOAA Climate, 2023; Wang, et al., 2023). While air conditioning was once seen as a luxury, the ability to regulate indoor environments has become a necessity for human survival as temperatures continue to rise and extreme heat days (over 105 degrees F) become more common (Schultz, et al., 2023).

Incarcerated persons rely on the State for their every human need: nutrition, hydration, adequate shelter, sanitation, and medical treatment, as well as their spiritual needs and mental health care. This should include basic protection from the elements, including the risk of death or illness from extreme temperatures. In 2015, the United Nations voted to establish the "Mandela Rules," officially known as the "United Nations Standard Minimum Rules for the Treatment of Prisoners", which repeatedly addresses adequate temperature control as a basic human right of prisoners (McCall-Smith, 2016; United Nations, 2015). In addition, the 8th Amendment to the

U.S. Constitution specifically protects prison inmates from “cruel and unusual punishments” (Ford-Plotkin, 2023). In compliance with these basic human and legal rights, the Texas Commission on Jail Standards requires the indoor temperature of municipal and county jails be maintained between 65 and 85 degrees (Texas Administrative Code, 2023a) and the Federal Bureau of Prisons Facilities Operations Manual (2017, Ch 16, p. 5) necessitates occupied inmate areas be kept between 68 and 76 degrees. Additionally, the Texas Administrative Code (2023b) mandates that the temperature inside animal shelters should not exceed 85 degrees for more than two hours. Despite these standards for stray pets, no such heat-related safeguards are required within the Texas State prison system, known as the Texas Department of Criminal Justice Correctional Institutions Division (TDCJ-CID, or simply TDCJ).

Statement of the Problem

TDCJ prison units currently support 43,375 inmate beds with air conditioning and 94,678 with none. Only 31% of all 138,053 available beds are air conditioned, and interior summer temperatures are frequently recorded at over 100 degrees (Purdum, et al., 2022; Texas Prisons Community Advocates, 2023). Of the 100 active units administered by TDCJ, 30 are climate-controlled in all areas, including all inmate housing blocks. Forty-nine are considered “partially” air conditioned, which includes 11 facilities with as few as seven of 1000 or more “cooled” beds and some respite areas, such as the barber shop, chapel, and law library. The cooled beds in these partially air-conditioned facilities are generally reserved either for prisoners in transition between facilities or the medically fragile. There are 21 units that TDCJ deems “non-airconditioned” facilities, which have no climate control at all, with the exception of administrative offices, infirmaries, and some educational classrooms. (Texas Prisons Community Advocates, 2023).

Purpose of the Study

The negative impact of extreme seasonal heat on the human brain and body within the non-carceral population has been widely explored (Thompson et al., 2023). Extended exposure to temperatures more than 90 degrees has been shown to facilitate heat stroke, acute cardiovascular events, kidney failure, and respiratory problems, as well as adverse psychological events, such as depression and enhanced aggression. Overall heat-related deaths among the incarcerated population have also been researched in recent years; however, significant gaps in the consequences of extreme heat on prisoners' mental health remain. This study aims to explore the possible psychological consequences of extreme temperatures within Texas State prisons. Detailed data regarding inmate suicides are reported monthly to the State by each unit and accessible through public records requests. A comprehensive analysis of the relationship between excessive heat and the mental health of incarcerated people may supply policymakers, prison administrators, and taxpayers a more comprehensive understanding of this issue and could possibly facilitate life-saving legislative change.

Key Terms

1. **Meteorological Summer.** A meteorological summer is universally defined by US climatologists as June, July, and August: generally the warmest months of the year (NCEI, 2023).
2. **TDCJ.** The Texas Department of Criminal Justice is the governing body over the Texas prison system. The specific division of TDCJ that oversees prisons is the Correctional Institutions Division, or TDCJ-CID.

3. **TJI.** The Texas Justice Initiative is a non-profit online repository of criminal justice data for researchers in Excel format and obtained through public records requests.
4. **TPCA.** Texas Prisons Community Advocates is a non-profit criminal justice advocacy and research group that uses public record TDCJ data to publish journal articles and reports in conjunction with university researchers.
5. **State Prison.** Facilities maintained by the Texas Department of Criminal Justice for the incarceration of people convicted of felony offenses. Includes State-run Substance Abuse Felony Punishment Facilities, as well as State Jails, which are designed for short-term incarceration of low-level felony offenders.
6. **Federal Prison.** Facilities maintained by the US Department of Justice Bureau of Prisons for the incarceration of persons convicted of both Federal felony and misdemeanor crimes.
7. **Jail.** Municipal and county facilities intended to incarcerate convicted misdemeanor offenders and temporarily hold other persons awaiting trial.
8. **Heat Index.** The heat index is how temperatures “feel” when combined with humidity levels, according to the National Weather Service. Higher humidity levels increase discomfort in warm temperatures.
9. **NOAA.** National Oceanic and Atmospheric Administration, the official weather reporting and recording agency of the US government.

Literature Review

During the three-month meteorological summer of 2023, the official NOAA weather station in Austin registered a record 69 days of temperatures above 100 degrees, and an

unprecedented 40 of those days were considered *extreme heat warning days* with temperatures over 105 degrees (NOAA- National Oceanic and Atmospheric Administration, 2023).

Temperatures inside un-airconditioned Texas prisons have been documented by TDCJ as high as 120 degrees and heat index values over 150 degrees (McCollum v. Livingston, 2017). As stated previously, overall global temperatures are expected to continue to increase (NOAA Climate, 2023). Many studies have explored the physical and psychological impacts excessive heat can have upon the general population, and a growing body of research is exploring the excessive temperatures inside our non-air-conditioned penal institutions, as well as its impact on the physical and mental health of incarcerated persons.

Medical Effects of Extreme Heat in the General Population

The negative effects of excessive heat on human health have been examined extensively by the medical research community for many years. Without respite, extended exposure to extreme heat, (generally defined as above 85 degrees for days without adequate intermediary measures), has been shown to cause fatal dehydration, mineral imbalances, and heat stroke. Continued exposure to extreme heat can potentially damage the lungs, liver, brain, kidneys, and heart, leading to stroke, cardiovascular crisis, and sudden, irreversible renal failure (Jones, 2019).

One of the first groundbreaking studies regarding the impact of excessive heat and physical health was conducted by Lye and Kamal (1977). Their study was the earliest to show a highly significant correlation between outside temperatures and mortality rates in “uncooled” hospital wards. In addition, they also found a highly significant increase in the mortality rates between “warm” and “cooled” beds at the same hospital during the corresponding time period.

Contemporary medical studies have also demonstrated the specific detrimental effects of heat on physical health. A recent study at the University of Roehampton, England, used healthy

human subjects to determine that the human cardiovascular system experiences considerable stress at temperatures between 104- and 122-degrees Fahrenheit at 50% humidity. Participants were limited to one hour of observation at those temperatures due to the risk of complications (Evans, 2023; Henderson et al., 2021). Another team of researchers at Pennsylvania State determined ambient temperatures above 87 degrees at near 100% humidity can cause body temperatures to rise to deadly levels at between 5 and 7 hours of exposure (Lawler, 2023; Wolf et al., 2022). Both human subject studies used people with no pre-existing medical conditions. A systematic review by Tham, et al. (2020) found that ambulance calls for people in respiratory distress in institutional settings increased significantly when indoor temperatures rose above 78.8 degrees. Particularly affected were those with pre-existing respiratory diseases such as asthma and Chronic Obstructive Pulmonary Disorder (COPD).

Medical Impact of Heat in Prisons

Many un-airconditioned Texas prison units are located in hot, humid geographic areas, potentially complicating the chronic health issues that are abundant within the incarcerated population. The prison population suffers from many chronic diseases that make them particularly vulnerable to heat-related illness, such as heart disease, lung disease, and diabetes (CMHA Ontario, 2017; Jones, 2019). The negative effects of these three conditions in particular are exacerbated by excess heat. Furthermore, a double-edged sword exists in that many of the medications commonly prescribed in prison affect the body's resilience to extreme heat, including anti-hypertensives and antidepressants. Compounding this further, elevated body temperatures negatively impact the efficacy of the medications used to treat them, creating a precarious combination of reduced heat tolerance, aggravated symptoms, and poor medication absorption (Harzke et al., 2010; Ratter-Reick et al., 2023).

Psychological Effects of Extreme Heat in the General Population

While little debate remains over the toll of heat on human physical health, a growing body of literature also links extreme heat to psychological distress, namely anxiety, depressive disorders, schizophrenia, and aggressive behavior: all known precursors to increased suicide risk (Maes et al., 1994; Anderson & Anderson, 1998; Hansen et al., 2008; Tham et al., 2020c).

A 2018 contemplative review by Swedish environmental researcher Lohmus focused on heat and its effects on human brain functioning. They concluded that mental illnesses can be exacerbated or even *initiated* by excessive ambient heat. Extreme temperatures can cause sleep disruptions and problems in neurological signaling. This study also demonstrated that extreme high temperatures can negatively affect the balance of the mood-regulating hormones dopamine, serotonin, and aldosterone, which are all essential to positive mental health. Additionally, heat can affect the efficacy of certain common psychotropic medications, as well as worsen their potential negative side effect of tardive dyskinesia (TD) (Lohmus, 2018). TD is a distressing, often irreversible motor disorder that causes involuntary muscle tics and twitches, particularly in the facial area (Cornett, 2017).

Finally, in an extensive 2023 meta-analysis, Thompson et al., determined a *significant 1% increase in suicide risk for every 1-degree Celsius increase (1.8 degrees Fahrenheit) in heat above monthly “normal” average temperatures*. Using their analysis, the record-breaking heat wave of 2023 would be expected to result in a considerable rise in suicides among the general population.

Chronic Illness and Heat - Impact on Psychological Health

As previously described, exposure to excessively hot temperatures can adversely affect both physical and psychological health. In addition, the link between poor physical health from

chronic illness has been shown to lead to a greater risk of anxiety and depressive disorders (CMHA Ontario 2017; Fernandez 2021; Ratter-Reick 2023), both of which are identified as precursors to suicide (Maes et al., 1994; Anderson & Anderson, 1998; Hansen et al., 2008; Tham et al., 2020c).

Thirty-eight percent of TDCJ inmates have cardiovascular problems, respiratory disease, or diabetes (Harzke et al., 2010b; Purdum et al., 2022). All of these can be negatively impacted by heat, and in turn, result in adverse mental health. For example, poor insulin control in diabetics due to heat exposure can cause fluctuations in temperament and energy levels, resulting in anxiety, agitation, and depressed mood. Likewise, heart and respiratory diseases, exacerbated by extreme heat and humidity, can also cause anxiety and depression (Ratter-Rieck et al., 2023). When combined with the feelings of hopelessness and helplessness experienced by incarcerated people, one would expect to see an increase in suicides in un-airconditioned facilities. This is particularly applicable to medically vulnerable populations in facilities where inside summer temperatures exceed 100 degrees or higher.

Heat-Related Suicides in Prisons

Suicide is considered the most extreme consequence of adverse mental health; however, heat-related prison suicides have not been extensively studied in scientific literature. According to Maruschak, et al., (2021), 43% of US state prisoners report a history of at least one prior or current mental health diagnosis. One of the few research projects to explore heat-related prison suicide incidents was a longitudinal case study involving suicide-watch incidents in un-airconditioned Louisiana prisons by Cloud et al., (2023). Louisiana, like Texas, maintains many prisons without climate control systems. Their analysis revealed a strong association between “extreme heat days” and suicide watch events. Cloud and colleagues’ research noted a 36%

increase in suicide watch incidents when outside daily temperatures rose above 90 degrees when compared to more temperate days of 60-69 degrees.

Skarha et al. (2023) used mortality data reported to the US Bureau of Justice Statistics (BJS) to analyze every state and federal prison death in the US between 2001 and 2019. Using external daily maximum temperatures at each facility, they calculated a 23% increase in daily suicides on “extreme heat days.” These were defined as days with a high temperature above the 90th percentile when compared to the historical average daily temperature in each location. Their project did not include data on the air-conditioning status of individual prison units.

Heat Extremes in Texas Prisons

While 37 US states require controlled temperatures in prisons, 13 do not, including Texas, where hot and humid summers are common (Jones, 2019). Although 95% of Texas households have air conditioning (U.S. EIA, 2023), only 30 of the currently active 100 TDCJ units are fully climate controlled. (Purdum et al., 2022, TDCJ, 2023). All facilities are equipped with heating systems for cold weather (Bingamon, 2024). However, as of August 2023, 70% of all 137,852 TDCJ available inmate beds are not air conditioned (Texas Prisons Community Advocates, 2023). TDCJ internal temperature logs from the meteorological summer of 2023 reveal many daily mandated 3:00 pm temperature readings at above 100 degrees inside partial- and non-air-conditioned units (TDCJ, 2023; Texas Prisons Community Advocates, 2023). Internal temperature logs have also recorded heat index values as high as 149 degrees (Fig 4). Although many anecdotal reports of heat-related suicides have been recorded, (Blakinger, 2021; Pilkington, 2023) no quantitative research has been conducted on the subject using TDCJ’s own unit-level data.

Legal and Legislative Actions Regarding Texas Prison Heat

Although the historical cost of heat-related death and injury lawsuits is unknown, in 2018 and 2019 alone, TDCJ paid over \$12 million to victims and their families in such claims. As of November 2020, the state reported there had been 35 heat-related legal cases with 16 still pending (Texas Prisons Community Advocates, 2020). Cost estimates to install air conditioning in all Texas prisons range between \$545 million and \$1 billion dollars (Berry, 2022; McCullough, 2024).

Although the Texas House of Representatives overwhelmingly passed legislation to require prisons be climate-controlled to a minimum of 85 degrees during both the 2021 and 2023 legislative sessions, both stalled in the Senate's Finance Committee without a final Senate vote (*Texas HB1971 | 2021-2022 | 87th Legislature. (2021); Texas HB1708 | 2023-2024 | 88th Legislature, 2023*). This was despite overall state budget surpluses of \$12 billion in 2021 and \$32.7 billion in 2023.

Research Questions

1. Are the suicide rates in Texas prisons higher during meteorological summer compared to non-summer months?
2. Are the suicide rates in Texas prisons associated with air conditioning in prison units?
3. Does the effect of air conditioning on suicide rates vary between meteorological summer and non-summer months?

Hypotheses

The hypothesis statements address all three research questions. It was hypothesized that the suicide rate in summer months would be higher than non-summer months. It was also hypothesized that the percentage of cool beds would influence suicide rates. This effect was expected to vary with the season.

1. Suicide rates in meteorological summer months are higher than non-summer months within Texas prisons.
 - 1 a. With year as the level of analysis, suicide rate in meteorological summer months are higher than non-summer months within Texas prisons.
 - 1 b. With prison units as the level of analysis, suicide rate in meteorological summer months are higher than non-summer months within Texas prisons.
2. Suicide rates are associated with the percentage of cool beds in Texas prisons.
3. The correlations between suicide rates and the percentage of cool beds vary between meteorological summer and non-summer months.

Methodology

This study used quantitative methods to analyze all documented Texas inmate suicide deaths from 2012 through 2023 to test correlational and relationship between the effect of hot weather and access to cooling on suicide incident rates.

Data Collection

Data collection and sorting occurred during January and February of 2024, and data analysis was completed between February and March 2024. This project utilized mandatory reports supplied by TDCJ to the Texas Attorney General's office on every in-custody death between January of 2005 and December 2023 (*currently 658 total as of December 2023*). This information is collected and published online by the Texas Justice Initiative (TJI), a non-profit 501c(3) repository of criminal justice statistics curated for researchers and updated through monthly open records requests (Moravec, E.R., 2024). Data regarding the climate control status of each TDCJ facility was obtained from the TDCJ website and is available without a public records request. Detailed information describing the specific number of "cooled vs. uncooled"

beds in each facility was provided by Texas Prisons Community Advocates, another non-profit organization that publishes and analyzes TDCJ open records data online. The prison units in the data varied considerably in terms of access to cool beds. Some were 0%, some 100%, or a value between the two, ranging from .5% to 79%.

Deaths before January 2012 were excluded due to inconsistencies in reporting practices and an increase in the number of air-conditioned housing units since that time. TJI's dataset includes information such as the name, age, conviction offense, and sentence length, as well as the place, time, and manner of death for every prisoner who has died in TDCJ custody during that period. These data were extracted and sorted by date, mode, and location of incidents. Since the overall TDCJ capacity can vary widely, suicide deaths are represented as ratios per 100,000 rather than discrete numbers.

Sample Selection

Between 2012 and 2022, The State of Texas maintained 103 prison units scattered throughout the state for persons convicted of felony offenses. Of these 103 prisons, 100 were in use as of December 2023. Thirty-one are fully air conditioned in all areas, 21 are considered non-air-conditioned (with some common respite areas), and 48 have partial air conditioning in their housing units, ranging between .5% and 79% (Texas Prisons Community Advocates, 2023). Of the 48 partially air-conditioned units, 26 have fewer than 10% cooled beds, which are generally reserved for medically fragile and older adult inmates. Incidents in two recently closed non-air-conditioned facilities (Neal and Gurney) were included. One closed facility, East Garza, was not, as its AC status could not be determined.

A total of 438 suicide incidents were deemed suitable for analysis over the 12-year period between January of 2012 and December of 2023. Of the 102 TDCJ units with available data, 77

facilities with available bedspace for 135,587 individuals were utilized for study purposes.

Twenty-five units were omitted from the study due to the following conditions:

1. Psychiatric units reserved solely for persons with severe mental health issues (Scott, Skyview, and Montford) were omitted due to their high suicide-risk populations and resulting disproportionate frequency of incidents. The Hodge Unit, which houses inmates with developmental disabilities, was also excluded, as their deaths are reported in conjunction with those of the neighboring Skyview psychiatric unit. Hodge would have otherwise been appropriate for inclusion.
2. The Garza East Unit was omitted, as it was shuttered in August of 2020 as a result of reduced inmate population due to an increase in paroles in response to the Covid-19 pandemic (Blakinger, 2020). Its AC status was unknown prior to closure.
3. The five Substance Abuse Felony Treatment Facilities (SAFPFs) (East Texas, Glossbrenner, Sayle, Halbert, and Johnston) were excluded. SAFPF units are model therapeutic treatment communities for probation and parole violators, as well as for prison inmates with a history of substance abuse issues who are awaiting parole. Only one SAFPF suicide incident was reported within the twelve-year analysis period.
4. The 15 TDCJ-administered State Jails were also excluded. These “mixed AC” facilities are designed for low-level, non-violent felony offenders with relatively short sentences of six months to two years. The mean State Jail sentence length is 1.02 years, with a mean TDCJ incarceration time of six months due to credit for time served in county jails while awaiting sentencing or transfer (Texas Criminal Justice Coalition & Leete, 2012). There were four suicide deaths in State Jail facilities out of 20,249 available beds during the twelve-year period under review.

Data Analysis

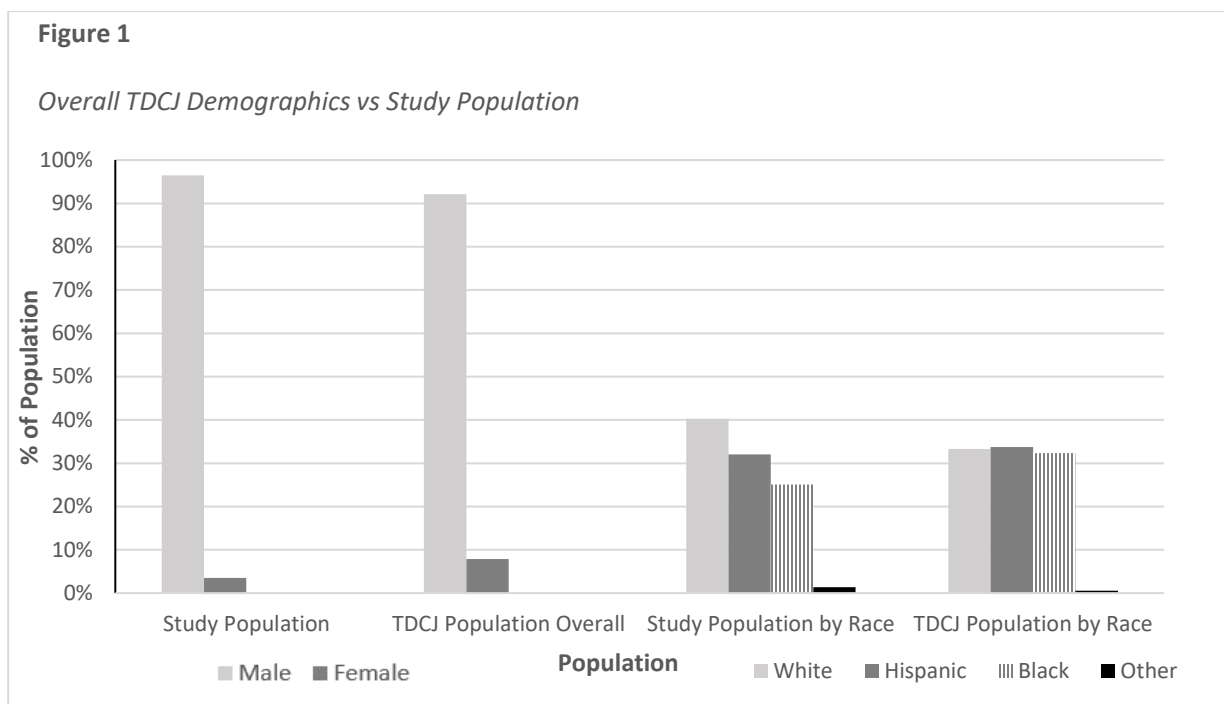
To answer the first research question, suicide deaths within their respective facilities between 2012 and 2023 were recorded and sorted in Microsoft Excel and analyzed using IBM SPSS (v.29) software. The summer rate and non-summer rates were calculated by dividing the number of suicides by total Texas prison population for each year. Because the overall prison population varies from month to month, death rates were calculated and reported as monthly deaths per 100,000 inmates using published monthly TDCJ population statistics.

To address the next two research questions, death rates were calculated for each prison unit based on the percentage of air-conditioned beds. For instance, the total death rate, the non-summer death rate, and the summer death rate were calculated by dividing the corresponding number of deaths by the number of beds in the unit. The resulting death rates were divided by the corresponding number of months to calculate death rate per month. For each unit, the percentage of cool beds was calculated by dividing the number of cool beds by the total number of beds.

Results and Findings

The mean age at time of death in the analysis group was 37 years, and time in custody at death averaged 2554 days (6.99 years). The racial makeup of the deceased was 40.4% White, 32% Hispanic/Latine, 25.1% Black, and 1.4% other races. Gender distribution was 96.3 % male and 3.7% female.

Overall TDCJ inmate demographics as of August 31, 2023, show a mean age of 41 years, with 33.3% White, 33.8%, Hispanic/Latine, 32% Black, and .58% other races, as well as 92.12% male and 7.87% female. As shown in Figure 1, individuals who are white, male, or both appear over-represented in the suicide incident population for the study years.



Summer vs Non-Summer Incident Rates

Hypothesis 1a was tested with a paired-samples t-test with *year* as the level of analysis for reliability purposes. This test compared monthly rates of all facility-level suicide incidents during meteorological summer and non-summer months. Suicide rates during summer months ($M= 26$ per 100,000, $SD = .000014$) were greater than non-summer months ($M= 21.7$ per 100,000, $SD = .000011$). Although in the expected direction, this difference failed to reach statistical significance $t(11)= 1.31, p= .217$. However, this difference is equivalent to a statistical excess of 2.16 suicides per year per 100,000 inmates over the twelve-year analysis period. This points toward 18.47 potential heat-related suicide deaths per 100,000 during the analysis period, or 26 total using TDCJ's monthly population count.

Hypothesis 1b was tested with a paired-samples t-test with *prison unit* as the level of analysis. This test compared the monthly rates of all facility-level suicide incidents during

meteorological summer and non-summer months. Suicide rates during summer months ($M = .000259$, $SD = .000397$) were greater than non-summer months ($M = .000190$, $SD = .000265$). This difference was statistically significant at $t(77) = 2.29$, $p = 0.02$.

Correlations between Death Rates and Cool Beds

Hypotheses 2 and 3 were examined using multiple Pearson correlation tests to assess the linear relationship between the percentage of “cooled beds” vs. (a) the non-summer monthly death rate, (b) the summer monthly death rate, and (c) the total monthly death rate among all bed types. These correlations are reported in Table 1.

Pearson Correlation of Monthly Suicide Incidents

Table 1

Intercorrelations for Study Variables Disaggregated by AC Status

Variable	Total Rate Per Month	Non-Sum Rate Per Month	Summer Rate Per Month	Percent Cool Beds
Total Rate Per Month	—	.972**	.881**	-.187
Non-Sum Rate Per Month	.972	—	.744**	-.220
Sum Rate Per Month	.881**	.744**	—	-.089
Percent Cool Beds	-.187	-.220	-.089	—

Note. $N = 78$

First, the monthly death rate and overall percentage of cooled beds were minimally inversely correlated at $r(76) = -.187$, $p = .103$. Second, the non-summer monthly death rate and percentage of cool beds were weakly negatively correlated, $r(76) = -.220$, $p = .055$. Third, the *summer* monthly death rate and percentage of cool beds also demonstrated a weak inverse correlation, at $r(76) = -.089$, $p = .442$.

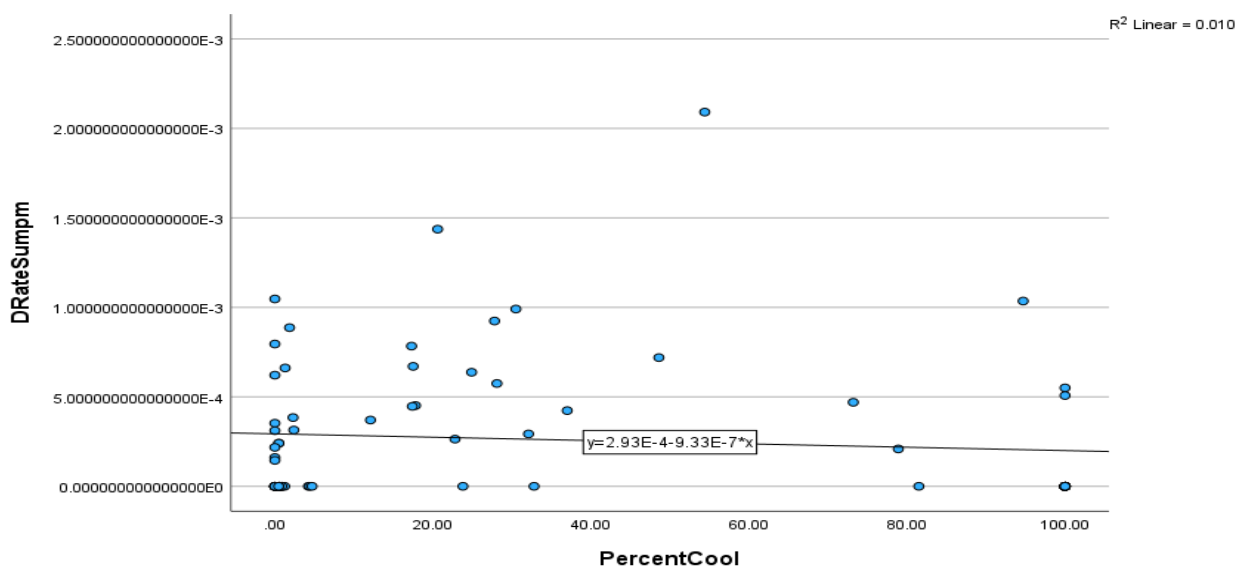
Findings

The current study compared and correlated all prison deaths from 2012 through 2023 by year, unit, and the availability of cooled beds. The strongest and most significant T-test comparison occurred after disaggregation at the prison unit level *without* consideration of AC status. This pointed toward a 36% increase in mean monthly suicides during meteorological summer months within TDCJ overall.

Additional correlational tests conducted at the level of suicide ratios in “cooled” vs. “warm” beds did not reveal the same level of strength or significance as the T-test comparisons, but still followed the same general trend. All pointed to the conclusion that suicide rates do indeed increase in the summer months but failed to meet the standard significance level of 95%.

Figure 2 below delineates the ratio of suicides per month in all 78 units on the y-axis, as compared to their respective percentage of cool beds on the x-axis. Note the regression line *does* trend downward as cool beds increase, but not significantly. The highest percentage of suicides did occur in units with 40% or fewer air-conditioned beds; however, statistical outliers may have impacted the slope of the overall trend.

Cool Bed Incidents in Summer Months 2012-2023



Although the statistical significance of the relationship between cooled beds and prison suicides in this study was marginal, the numbers are placed in perspective when translated into potential human lives lost.

Discussion

To reiterate, Texas maintains the largest state prison system in the country, housing over 130,000 people for various felony offenses. Like many states in the southern US, a large percentage of its prison facilities do not have air conditioning, despite the high temperature and humidity extremes plagued by residents every summer. Climatologists predict such extreme summer conditions will continue to become more intense over time due to continued rising global temperatures. Air conditioning, once a luxury, has become necessary for human survival in many parts of the state. Many people have died from heat-related illness over the years in Texas' un-airconditioned prisons, and the state has paid millions of dollars in fines and wrongful death suits over the 12-year study period.

Existing (but limited) research, as well as anecdotal reports, point toward an upward trend in suicide deaths during the hot meteorological summers in Texas' un-airconditioned prisons; however, no study thus far has used TDCJ's unit-level data to determine if a relationship exists between summer heat and inmate suicide deaths.

Limitations

This study does have significant limitations. First, Texas encompasses eight distinct climatological zones with prisons scattered throughout the state (WeatherSTEM, 2017). The temperatures of non-air-conditioned facilities in the cooler, mountainous areas of far West Texas or the Panhandle region can differ significantly from the traditionally hot and humid southern and southeast regions of the state. Texas also experiences an extended season of hot temperatures that often begins in the spring months and into the fall, far longer than the official definition of "meteorological summer." Previous researchers were able to associate unit-level daily climatological data with suicide incidents; however, this was not an option for the current study due to economic and time constraints. Additionally, the population within a unit can fluctuate from day to day, and there is no way to discern the AC status of the occupied beds for incidents in "mixed status" facilities. Only the total number of "cooled" vs. "hot" beds per facility is available at the unit level, but these were weighted and analyzed accordingly. Furthermore, the monthly population count for each facility was not available online or through open records requests; therefore, only aggregate monthly population data for the entire TDCJ system were utilized in ratio calculations. Finally, the original dataset contains many deaths by hanging, the most common form of suicide in prisons. However, many of these are classified as either "other" causes of death, accidents, or homicides with no listed suspects in the final detailed report to the

Attorney General's Office. While TDCJ may strive to provide accurate data, the possibility of human error in reporting practices exists.

Implications

In Texas, with its reputation as a “tough on crime” state, prison air conditioning is not a popular topic among many taxpayers or legislators. Again, cost estimates to install air conditioning in Texas prisons range from \$545 million to \$1 billion (although the funds to do so are readily available in the state budget). Future research that combines information in this study with unit-level daily climatological data may help generate a more detailed analysis into possible heat-related suicides within the Texas prison system. Additionally, a mixed-methods or qualitative analysis consisting of questionnaires and interviews of currently or previously-incarcerated persons may shed additional light onto this issue. Perhaps this current study or future research could be used as a tool for the shaping of public policy and education in the realm of Texas prison climate control, potentially saving human lives.

Conclusion

The research questions posed in this study explore if there is a significant correlation between summer suicide rates and the other months of the year in Texas prison units from 2012 through 2023. Additionally, the impact of climate-controlled environments on suicide rates throughout the year was investigated. Although statistical testing measures showed a consistent inverse correlation between air conditioning and suicides, as well as a general summertime increase in suicides, none reached statistical significance based on conventional thresholds. Note that the strongest correlation was between the ratio of cool beds and suicides during the *non-summer* months of the year. This may lead one to surmise there may be more factors to be investigated which may influence seasonal suicides *other than, or in addition to*, seasonal heat.

These factors could include the availability and quality of internal programs, overall unit “culture,” the use of solitary confinement, staffing ratios, and as stated previously, further correlation of suicide rates based on average daily external temperatures at the facility level.

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