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PANDEMIC AND SLEEP HEALTH: A CROSS-SECTIONAL ANALYSIS AMONG COLLEGE STUDENTS

Jasmine Mitchell

PANDEMIC AND SLEEP HEALTH: A CROSS-SECTIONAL ANALYSIS AMONG COLLEGE STUDENTS

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Public Health

by

Jasmine A. Mitchell

May 2022

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Approved by:

Monideepa B. Becerra, Committee Chair, Health Science and Human Ecology

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ABSTRACT

Background: The purpose of this study seeks to address sleep health among college students during the COVID-19 pandemic.

Methods: The study used a cross-sectional design. Data in this study were collected from college students through a virtual survey at a public university in Southern California. Data was collected with SPSS version 28 to conduct crosstabs and chi-square, as well as descriptive statistics.

Results: The study presented key findings that call attention to college students and poor sleep health. Results showed most of the participants (62.8%) reported getting less than 7 hours of sleep on an average school night. 45.7% of the study population reported feeling their sleep quality has gotten worse since before the pandemic. There was a significant association between participants' report of average sleep hours and feeling sleep quality has declined since before the pandemic. In addition, there was a significant association between participants' report of average hours of sleep and reporting often feeling tired/fatigued/sleepiness during the daytime.

Conclusion: Recommendations are presented to mitigate negative sleep health burdens and improve sleep health. Programs and interventions are suggested as an effort to improve sleep health literacy, in addition to education on sleep disorders. Sleep pods are proposed to reduce the negative effects of daytime tiredness, sleepiness, and fatigue. Lastly, virtual videos and information on sleep health and overall health are recommended.

ACKNOWLEDGEMENTS

I would like to express my deepest appreciation to my committee chair Dr. Monideepa Becerra for your continued support, guidance, and enthusiasm throughout this entire process. I would also like to thank the rest of my committee members: Dr. Robert M. Avina and Dr. Benjamin J. Becerra for their time and knowledge.

I am extremely grateful and blessed for my family's endless prayers, love, and support that have sustained me throughout my life and educational career. A special thank you to my parents for your sacrifice.

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CHAPTER ONE

LITERATURE REVIEW

Overview

The purpose of this section is to define social determinants of health and how these determinants can affect sleep health in young adults. This section will introduce different social determinants of health and show a correlation between social determinants of health and health outcomes. Social determinants are grouped into three categories: behaviors, clinical, and COVID-19. Furthermore, a connection between social determinants of health and the topic of sleep health will be established. Young adults are defined and presented as a vulnerable population.

Social Determinants of Health

The Centers for Disease Control and Prevention (CDC), defined social determinants of health (SDOH) as, “conditions in the places where people live, learn, work and play that affect a wide range of health risks and outcomes” (CDC, 2021a). Key areas of focus for SDOH are neighborhood and the surrounding environment, economic status, health access and quality, education, as well as social and community conditions (CDC, 2021a). In recent years, there has been a growing amount of research and policies surrounding SDOH. For example, community gardens, farm-to-school programs, and the emphasis on important healthy corner stores in low-income communities can promote health while social determinants are addressed (*Catalyst*, 2017). The public health

community has increasingly brought attention to social determinants of health (Braveman and Gottlieb, 2014). These factors impact health and influence society significantly.

SDOH must be addressed to improve overall health and reduce health disparities. Health disparities are preventable differences in the burden or the opportunity to attain ideal overall health experienced by socially disadvantaged populations, groups, or communities (CDC, 2021b). Social determinants of health affect health outcomes. These health outcomes could influence life expectancy, morbidity, mortality, and status of health; health outcomes can also be behavioral or clinical. For example, a population living in a low-income area may experience factors such as crime and violence, limited access to healthy foods, water quality, and quality housing. These factors can affect the health outcomes of the population, as they may experience a higher rate of obesity, exposure to lead, and lack of physical activity.

Behaviors

Brady (2020) showed a correlation between social determinants of health and health behavior outcomes. The author explored data that showed socioeconomic status as an important factor in morbidity and mortality in connection to smoking cessation. While extensive control efforts have been made and maintained regarding a tobacco control effort, social determinants of health had contributing factors in certain populations. The author found socioeconomic factors are linked to factors that influence smoking like

race/ethnicity, stress, and cultural characteristics, correlating social determinants of health and negative health impacts. Although low income was a main SDOH that determined a higher usage of tobacco, other factors that contributed include unequal distribution of resources and services leading to inequalities in prevention and intervention. A committed effort to address social determinants of health, thus address health inequalities and targets populations who are disproportionately affected by negative health outcomes.

Mills et al., (2017) systematically reviewed health and social determinants and the outcomes of home cooking. The article stated that many of the dietary interventions assumed that home cooking has a positive influence on a diet, health, and social outcomes. After extensive research, a model was developed that mapped determinants of home cooking. The authors found key determinants discovered were female gender, more time availability and employment, and culture and ethnic background. The authors used qualitative and quantitative data to demonstrate their findings. Data revealed determinants are more complex than the ability to cook, and key themes affecting behavior that emerged from research were gender, personal relationships, time availability, and ethnicity and culture. Potential outcomes were at a personal level and had short-term dietary effects. The authors found determinants such as household makeup, greater resources, and ethnic and cultural background resulted in in-home cooking, which led to noted benefits. Such results identified determinants, like ethnicity and culture, influence positive and negative health outcomes.

In the qualitative analysis study, researchers' (Aceijas et al., 2017) aimed to examine the health-related lifestyles of students and identify barriers and social determinants of healthier lifestyles. The study involved two focus groups that took an online survey with in-depth interviews. It involved a random sample size of 468 students. The authors found that 60% of the respondents lacked physical activity, 47% had an unbalanced diet, and 30% had poor mental well-being. A total of 42% of alcohol drinkers reported getting drunk at least once a month. In addition, smokers were 16% of the respondents. The themes identified concerning health-related lifestyles among students were transition to new life, university environment and the systems, academic pressure, health promotion on campus, and recommendations. The study reiterated an abundance of evidence that revealed that health-related lifestyles among students suggest that it could lead to chronic diseases in the future. The evidence showed that social determinants of health play a major role in influencing the negative health outcomes in students currently and possibly in the future. Social determinants such as an unbalanced diet, distress, and lack of seeking contributed to poor mental health outcomes. These barriers must be addressed and drive institutions to promote positive health values.

Clinical

Similar to health behaviors, research revealed that social determinants of health could also impact clinical outcomes. The systematic review (Butler, 2017) explored the disparities in type two diabetes (T2DM) among minority adults, with

a close examination of the role social determinants of health have on disparities. This review summarized current literature on racial and ethnic disparities with onset type two diabetes and the social determinants of health that are common among this study population. The author followed data from the TODAY study in one trial, which encompassed treatment options for youth living with T2DM. Data from the trial determined that 25% of parents of children living with T2DM had the highest education level less than high school. In addition, 40% of families had a yearly family income of less than $25,000 per year. Findings concluded that low-income families, parent education levels, and high-stress levels among youth were all determined to be negative social determinants of health among families with youth living with T2DM. While this review provided strong evidence that social determinants of health are important to consider when discussing contributing factors to negative health impacts; the author suggested more research should be done to see if social determinants of health contribute to disparities in the prevalence of T2DM and psychosocial outcomes among minority youth with T2DM.

Alegría et al. (2018) synthesized current literature regarding social determinants and outcomes of mental health. In this systematic review, researchers concluded that research had emphasized the association between multiple social determinants and interventions used to address the growing causes of mental health challenges. Findings also indicated a methodological challenge and inconsistency that caused a lack of understanding of infinitive

social determinants that should be addressed regarding mental health challenges. Based on this article, it can be deduced that more research must be done on social determinants of health to better provide intervention strategies and improve health outcomes.

COVID-19

COVID-19, a respiratory disease, is caused by SARS-CoV-2, discovered in 2019 (CDC, 2021c). The Coronavirus has caused a pandemic that impacted the lives of many. On March 11, 2020, the World Health Organization (WHO) officially declared the COVID-19 a pandemic. Since November 5, 2021, WHO has reported 248,467,363 confirmed cases of COVID-19 globally (WHO, n.d.). Pre-existing conditions bring increased risk to individuals for those who contract the disease. The CDC stated vital topic areas of SDOH that contributed to minority groups being disproportionately affected by COVID-19 (CDC, 2020a). Singu et al. (2020) proposed that helping vulnerable populations and focusing on how SDOH affects disadvantaged populations can help with better management of health crises. The researchers' studied these SDOHs and sought to summarize the impact of SDOHs during the COVID-19 pandemic. Findings showed that populations with significant SDOH, such as neighborhood and socioeconomic status factors, are disproportionately affected by COVID-19. Researchers suggested that providing additional aid to these populations will be essential to curb disease impact and suggested SDOH has been overlooked during the pandemic.

Galea stated SDOH contributed negatively to health, and the U.S failing to invest in social conditions led to devastating health challenges, as seen with the COVID-19 pandemic (Rollston and Galea, 2020). Researchers argued that a large part of the U.S.'s challenges during the COVID-19 pandemic had been inattention to key SDOH. The authors stated that the U.S has a significant discrepancy between spending on healthcare and adverse health outcomes. They accounted for this mismatch to a lack of investment in factors that shape health. A major SDOH mentioned by researchers is low socioeconomic status. Low socioeconomic status negatively affects access to health care, influences neighborhoods lived in, and access to healthy foods, quality education, and types of jobs. Such analysis recognized the importance of addressing SDOH and its influence on health.

Sleep Health

Sleep health, while important, is not a widely defined term used. The article (Buysse, 2014) proposed the definition of sleep health as intricate patterns of sleep-wakefulness, which are tailored to an individual's demands, as well as social and environmental needs, in which physical and mental well-being is promoted. Some characteristics of good sleep health depend upon adequate durations of sleep, timing, efficient sleep, and continuous alertness during hours of wakefulness. For adults 18 to 60 years of age, the recommended hours of sleep are 7 or more per night (CDC, 2021d)**.** The current prevalence of sleep showed that a third of U.S adults don’t get the recommended hours of sleep.

Sleep is essential to improve overall health. Sleep can assist in recharging one's mind and body and help prevent illnesses. Lack of sleep has been linked to many chronic diseases and conditions, such as heart disease, obesity, and type 2 diabetes (CDC, 2020b).

Belmon et al. (2020) used concept mapping to investigate the perspective of children and parents on determinants of inadequate sleep among children. The study focused on children with a sample size of 45 and their parents, a sample size of 33. The sample size of children and parents were from low socioeconomic neighborhoods because their children were at a higher risk of living in an environment that disturbed sleep. All participants identified possible reasons for inadequate sleep and sorted out ideas by importance and whether they related. After analysis, researchers found that children and parents listed psychological (fear, stress), social environment (sleep schedule and household customs), physical environment (noise, light), and physiological factors (physical well-being) as determinants. Such results showed a correlation between social determinants and inadequate sleep.

Hunter and Hayden (2018) analytical essay, analyzed and synthesized 18 articles that discussed environmental factors that promoted sleep loss. The article sought to evaluate physical and social environmental determinants that contributed to adverse sleep outcomes. Findings showed that factors such as noise pollution (i.e., roadways and airplanes) and air pollution from particulate matter and the ozone impeded residents' ability to fall asleep, stay asleep and

wake up feeling well-rested. Additional evidence showed that a neighborhood's safety, environment, and other social characteristics impacted residents' sleep. The article provided an analysis that revealed a relationship between a neighborhood's physical and social environment and sleep. Neighborhood and built environment are key SDOH, thus identifying SDOH influence on sleep.

Young Adults

While there is no definitive definition for the term young adult, much of current literature and publications interpret young adults as being between late teenage years to early twenties, defined by the CDC as 18-24 years of age (CDC, 2021e). Young adults face many challenges as they are in a transition period from adolescence to adulthood. In the book (Bonnie et al., 2015, Chapter 2) provided a summary of the current literature regarding the critical period of young adults and highlighted trends in social, economic, and healthy young adults face in the U.S. The socio-economic challenges mentioned reflected a need for an increased focus on higher education to restructure the U.S economy. The rising cost of education and the restructuring of the family structure and prioritization due to increased focus on higher education has challenged young adults.

Furthermore, unintentional injury and homicide were higher among young adults than any other age group and substance use peaked in young adults, and mental health remained a concern. Authors emphasized that transition into adulthood is a critical period in health and the higher trends in this period set a

course of poor health in adulthood. Moreover, poor decision-making and increased risk by young adults exposed them to health risks and outcomes.

Substance Use (Alcohol, Tobacco, and Other Drugs)

According to the *Addiction Center* (*Young Adults*, 2021), young adults are more likely to use substances and start experimenting and abusing drugs and alcohol. Young adults had some of the highest alcohol and substance abuse rates, reflected in a survey by the Substance Abuse and Mental Health Services Administration (SAMHSA). Results showed that in 2018, 35% of young adults (18 to 25 years old) binge drink. In addition, e-cigarettes are highly addictive and unsafe; there has been an increased usage amongst youth and young adults. There was a 10% increase in young adult usage of e-cigarettes from 2014 to 2016 (*Young Adults*, 2021).

Seaman et al. (2020) evaluated the several factors of increased availability of tobacco products, rising vaping trends, and changed marijuana policies in relation to its prevalence among U.S young adults using tobacco products/devices for marijuana consumption. The authors used data from the Population Assessment of Tobacco and Health Study (2015-2016) to assess young adults' marijuana and electronic nicotine delivery, hookah, or cigar use for marijuana use. The population consisted of young adults 18-24 years old, with an unweighted sample of 8,453. The authors found through weighted analysis that about 52.1% of young adults had ever used marijuana. From this sample, 80.1% had used tobacco products/devices for marijuana use. The use of tobacco

products for marijuana predestined a substance abuse problem. Such results identified that tobacco products/devices for the use of marijuana are high among young adults, and it is associated with substance abuse issues.

STIs (Sexually Transmitted Infections)

College-age students account for much of the age group of young adults 18-24 years old. STDs are prevalent among young people. In 2018, people between the ages of 15-24 years old made up about half of the sexually transmitted infections in the U.S. (CDC, 2021e)**.** Haider et al. (2020) aimed to study the cross-sectional factors linked to the STIs among young adults in the U.S., which they identified as being 18-25 years old. The authors used the National Survey on Drug Use and Health data from 2015-2018, encompassing 55,690 young adults. Results reflected that 3.4% of respondents reported within the past year having an STI. In addition, 38.4% reported using illicit drugs, and 3.7% reported having a history of delinquency in the past year. There was also a higher probability of contracting an STI in the prior year among young adults 22-25 years old, male, non-Hispanic African American, as well as many other demographic characteristics. Such results identified young adults as a vulnerable population with a high incidence of illicit drug use and its strong connection to STI rates.

Sleep Health

Alkhatatbeh et al. (2021), a cross-sectional study, examined the relationships between sleep quality, anxiety, depression, musculoskeletal pain

(MSP), and calcium intake in young adults. Study participants included 1,422 healthy 18–29-year-old male and female young adults. Participants were recruited from the Jordan University of Science and Technology in Irbid, Jordan from February 2019-2020. After assessment and self-reporting, the authors found 62.22% of participants were found to have poor sleep quality. Participants who had poorer sleep quality had lower levels of calcium intake, higher anxiety, and depression levels, and severe MSP and multisite pain. Results link factors such as anxiety, depression, low calcium consumption, and multisite pain predictors of poor sleep quality among young adults.

Summary

Cumulative, the literature review above showed that social determinants of health influence health outcomes. Identifying and addressing social determinants of health were important to reduce negative health outcomes that arise from social determinants. Young adults were a vulnerable population and exposed to several risks and adverse health outcomes. Many young adults do not get sufficient hours of sleep recommended by the CDC, so the social determinants of health regarding young adults and sleep health must be explored.

Purpose Statement

The purpose of the study is to identify possible social determinants of sleep health among college students.

Research Questions

- What is the prevalence of hours of sleep reported on an average school night among the study population?
- What percent of the study population reported feeling tired, fatigued, or sleepy during the daytime?
- What percent of the study population reported feeling their sleep quality has gotten worse since before the pandemic?
- Is there an association between participants' report of average hours of sleep and reporting that their sleep hours have gotten worse since before the pandemic?
- What is the association between hours of sleep and often feeling tired, fatigued, or sleepy during the daytime?
- Is there an association between hours of sleep and you have noticed or someone telling you that you snore while sleeping?
- Is there an association between hours of sleep and feeling sleep quality has gotten worse since before the pandemic?

CHAPTER TWO

METHODS

Study Design

The present study employed a cross-sectional study design approach to evaluate the purpose of the study, which is to identify possible social determinants of sleep health among college students at a public university in Southern California. This university had a student population of 19,404. Of these students 12,167 (63%) were female and 7,237 (37%) were males. 66% of the students that attended were of Hispanic identity. The majority of the students were juniors (29%) and seniors (28%).

Data Collection

Data was collected from a public university in Southern California's college students through a virtual survey. Those who met eligibility criteria were included in the recruitment process/eligible to participate. Exclusion consisted of individuals 18 and under and those not currently enrolled at a public university in Southern California. Inclusion consisted of 18 and older and individuals whose instructors agreed to give out the survey. All participants received an informed consent form and those who agreed to participate were further given a survey to complete via virtually and participants were given 5 points extra credit. All data were kept anonymous.

Measures

The primary dependent variables of interest were quality of sleep hours due to pandemic, number of sleep hours due to pandemic, feeling daytime tiredness, fatigue, sleepiness, and snoring. The primary independent variable of interest was reported average hours of sleep during the average school night.

Quality of sleep hours due to the pandemic were measured by: *"I feel the number of hours I sleep has gotten less since before the pandemic."*

Number of sleep hours due to the pandemic were measured by: *"I feel the number of hours I sleep has gotten less since before the pandemic."*

Feeling daytime tiredness, fatigue, and sleepiness, and snoring were measured by: *"Do you often feel tired, fatigued, or sleepy during daytime?"*

Snoring was measured by: *"Have you noticed or has anyone told you that you snore while sleeping?"*

Reported average hours of sleep during the usuals school week were measured by: *"On an average school night, how many hours do you sleep? Please select only one option."*

Data Analysis

Research question 1: What is the prevalence of hours of sleep reported on an average school night among the study population?

To determine the percentage of the study population who reported feeling their sleep quality has gotten worse since, before the pandemic, descriptive statistics were conducted utilizing SPSS version 28.

Research question 2: What percent of the study population reported feeling tired, fatigued, or sleepy during the daytime?

To determine the percentage of the study population who reported feeling tired, fatigued, or sleepy during the daytime, descriptive statistics were performed with the use of SPSS version 28.

Research question 3: What percent of the study population reported feeling their sleep quality has gotten worse since before the pandemic?

To determine the percentage of the study population who reported feeling their sleep quality has gotten worse since, before the pandemic, descriptive statistics were conducted utilizing SPSS version 28.

Research question 4: Is there an association between participants' report of average hours of sleep and reporting that their sleep hours have gotten worse since before the pandemic?

To answer research question 4, crosstabs and chi-square were performed using SPSS version 28, with p less than .05 denoting significance.

Research question 5: What is the association between hours of sleep and often feeling tired, fatigued, or sleepy during the daytime?

To answer the research question 5, crosstabs and chi-square were performed using SPSS version 28, with p less than .05 denoting significance.

Research question 6: Is there an association between hours of sleep and you have noticed or someone telling you that you snore while sleeping?

To answer question 6, crosstabs and chi-square were performed using SPSS version 28, with p less than .05 denoting significance.

Research question 7: Is there an association between hours of sleep and feeling sleep quality has gotten worse since before the pandemic.

To answer question 7, crosstabs and chi-square were performed using SPSS version 28, with p less than .05 denoting significance.

Ethics

This study followed the Belmont report, following guidelines and principles for research involving human subjects. The three basic ethical principles are as follows: (1) respect for persons (2) beneficence and (3) justice (Protections (OHRP), 2018). To ensure respect for persons, informed consent forms were given to participants. In addition, participation was voluntary, and could leave the study without being negatively impacted. Efforts were made to reduce harm and increase benefits for participants, thus guaranteeing beneficence. All questions were kept to a minimum needed to keep the engagement of students. The survey was anonymous to protect students, so they were not identifiable when answering sensitive questions. Upon analysis, a random sample was selected to prevent unique cross-tabulations that may indirectly identify a participant in rare cases. Additionally, incentives were provided to increase benefit. Lastly, all students are enrolled at a public university in Southern California and those aged

18 years or older were allowed to participate. As a result, no one group was burdened with study while another benefited, thus ensuring the ethical principle of justice. The study was approved by the Institutional Review Board (-IRB-FY2022-146).

CHAPTER THREE

RESULTS

As shown in Table 1, a majority of the participants (62.8%) reported getting less than 7 hours of sleep on an average school night.

Table 1. Prevalence of hours of sleep reported on an average school night among the study population.

Hours of sleep	Percentage
9 or more hours	1.1%
7-8 hours	36.2%
Less than 7	62.8%

As shown in Table 2, a majority of the participants (78.7%) reported often feeling tired, fatigued, or sleepy during the daytime.

Table 2. Percent of the study population reported feeling tired, fatigued, or sleepy during the daytime.

	Percentage
Yes	78.7%
No	21.3%

As shown in Table 3, 45.7% of the study population reported feeling their sleep quality has gotten worse since before the pandemic.

Table 3. Percent of the study population reported feeling their sleep quality has gotten worse since before the pandemic

	Percentage
Yes	45.7%
No	54.3%

As shown in Table 4, there was a significant association between participants' report of average hours of sleep and reporting that their sleep quality has gotten worse since before the pandemic ($p < .05$). For example, among participants who got less than 7 hours of sleep, 50.8% reported their sleep hours had gotten less due to the pandemic, compared to 17.1% reporting such among those who had 7 or more hours.

Table 4. Association between participants' report of average hours of sleep and reporting that their sleep hours have gotten worse since before the pandemic.

	Number of sleep hours has gotten worse since before the pandemic	
Hours of sleep	No	Yes
7 or more hours	82.9%	17.1%
Less than 7 hours	49.2%	50.8%

As shown in Table 5, there was a significant association between participants' report of average hours of sleep and reporting often feeling tired, fatigued, or sleepy during the daytime ($p<.05$). For example, among participants

who got less than 7 hours of sleep, 89.8% reported they often feel tired, fatigued, or sleepy during the daytime, compared to 60.0% reporting such among those who had 7 or more hours.

Table 5. Association between hours of sleep and often feeling tired, fatigued, or sleepy during the daytime.

	Feeling daytime tiredness/fatigue/sleepiness	
Hours of sleep	No	Yes
7 or more hours	40.0%	60.0%
Less than 7 hours	10.2%	89.8%

As shown in Table 6, there was significant association between participants' report of average hours of sleep and reporting you noticed or if anyone has told you that you snore while sleeping ($p<.05$). For example, among participants who got less than 7 hours of sleep 52.5% reported they have noticed or if anyone has told you that you snore while sleeping. This is compared to 31.4% reporting such among those who had 7 or more hours.

Table 6. Association between hours of sleep and you have noticed or someone telling you that you snore while sleeping.

	You or someone has noticed you snore while sleeping	
Hours of sleep	No	Yes
7 or more hours	68.6%	31.4%
Less than 7 hours	47.5%	52.5%

As shown in the table, there was a significant association between participants' report of average hours of sleep and reported that sleep quality has worsened since before the pandemic ($p<.05$). For example, among participants who got less than 7 hours of sleep, 61.0% reported feeling sleep quality has gotten worse since before the pandemic, compared to 20.0% reporting such among those who had 7 or more hours.

Table 7. Association between hours of sleep and feeling sleep quality has gotten worse since before the pandemic.

	Sleep quality has gotten worse since before the pandemic	
Hours of sleep	No	Yes
7 or more hours	80.0%	20.0%
Less than 7 hours	39.0%	61.0%

CHAPTER FOUR

DISCUSSION

The purpose of the study is to assess sleep health among college students. A cross-sectional analysis was used for the study. Key findings show: (1) a majority of the participants report less than 7 hours of sleep, (2) nearly half report their sleep quality had worsened as a result of the pandemic, (3) there was a significant association between sleeping less than 7 hours of sleep at night and prevalence of feeling daytime fatigue/tiredness/sleepiness, and finally (4) those who report less than 7 hours of sleep per night had a significantly higher prevalence of reporting that their sleep quality had worsened during the pandemic.

In this study, many participants report less than 7 hours of sleep. The CDC recommends getting 7 or more hours of sleep. Sleeping less than 7 hours increases the risk for health problems. Lack of sleep is linked to many chronic diseases and conditions such as type 2 diabetes, heart disease, obesity, and depression (CDC, 2021). Poor sleep health can affect overall health and well-being, but poor academic performance can also be a consequence among students (CDC, 2019). Programs and interventions to improve sleep health literacy can help mitigate the adverse outcomes from the lack of recommended sleep hours.

Close to half of the participants report sleep quality worsened due to the pandemic. It is not enough to meet the recommended hours of sleep; sleep quality plays a vital role in ensuring an individual is functional throughout the day. Mental distress not only affects mental but physical well-being. Stressors, like the pandemic, can disrupt sleep and contribute to sleep disorders like insomnia (*CDC,* 2019a). Sleep disorders negatively affect sleep quality and increase the risk of health problems. Interventions and programs that help students deal with stressors and identify what is causing the worsening in sleep quality can reduce mental and physical burdens. In addition, education on the different types of sleep disorders and their treatment could benefit individuals who may not know they have a sleep disorder or how to manage it.

There is a relationship between sleeping less than 7 hours and feeling daytime fatigue/tiredness/sleepiness, reflective of low daytime wakefulness. Such low daytime wakefulness is due to a lack of sufficient sleep can lead to accidents and injury. Given that for many campuses, including the campus surveyed in this study, a majority (90%) of students are commuters, sleep health is critical. With many students commuting to and from campus, this can lead to a dangerous environment for students and those around them. Furthermore, daytime fatigue/tiredness/sleepiness can result in academic problems. Other effects, such as cognitive impairment, could lead to a decrease in performance and lack of alertness (CDC, 2020b). Implementing sleep pods and commuter-friendly designated sleep areas for students are just some of the ways to alleviate the

negative consequences of daytime sleepiness among students. Many schools have recognized the danger of sleep deprivation among students and have begun implementing nap stations. In an article (Liu, 2021), the author described how schools such as USC have adopted nap stations or sleeping pods to accommodate students, specifically those commuting to fight the constant challenge of sleep deprivation students face.

Hours of sleep per night and quality of sleep during the pandemic are related. The pandemic has been challenging and burdensome for students and many individuals worldwide. The correlation between hours of sleep per night and quality during the pandemic reveals that the effects of the pandemic are still relevant. According to the CDC, the stress, fear, anxiety, and worry that has come from the COVID-19 pandemic can affect sleep and cause an array of other health issues, such as increased usage of alcohol and other substances and worsening of chronic health problems (*Coping with Stress*, 2022). Creating a community for students online allows students to feel connected without feeling isolated. Making it easier for students to connect with other students with like-mindedness or similarities to help relieve some of the burden and feelings associated with the pandemic. Moreover, schools can send students informational links on how to cope with stress, fatigue, etc., via email. Videos can include home activities on how to improve overall well-being, topics can include, meditations, exercise, breathing techniques, healthy eating habits, and how to improve sleep quality.

Limitations

The study design presents some limitations. Firstly, the study cannot imply any causation. While the study reveals associations between many variables, a cause-and-effect relationship cannot be deduced. Another limitation of the study is recall bias, this could have influenced responses, as participants may not recall previous experiences or events.

Strengths

The study design presents some strengths. The study establishes associations for future studies. The results from this study can be useful for finding possible associations and contribute to success in the future. Secondly, the study has reduced the risk of self-selection bias, as participants were given incentives and wide eligibility criteria (Hsieh & Kocielnik, 2016), (*Incentives Can Reduce Bias in Online Employer Reviews. - PsycNET*, n.d.). Additionally, due to the anonymity of the survey, the risk for social desirability bias is reduced (Joinson,1999).

Conclusion

The purpose of this study was to address sleep health among college students during the COVID-19 pandemic. A cross-sectional study design was utilized. Major findings highlighted that almost 63% of students reported getting less than 7 hours of sleep and roughly 46% of students reported their sleep quality had worsened due to the pandemic and a significant association between

sleeping less than 7 hours of sleep at night and a prevalence of feeling daytime fatigue/tiredness/sleepiness. Lastly, a major finding highlighted that those who reported less than 7 hours of sleep per night had a higher prevalence of also reporting that their sleep quality had declined during the pandemic. To address poor sleep health burdens, recommended action includes programs and interventions to improve health literacy, education on sleep health and sleeping disorders, an investment in sleep pods for commuting students and other students on campus, and an effort by schools to engage students via at home through informational videos and activities to help improve overall health and well-being.

APPENDIX A

IRB APPROVAL

February 22, 2022

CSUSB INSTITUTIONAL REVIEW BOARD
Protocol Change/Modification
IRB-FY2022-146
Status: Approved

Prof. Monideepa Becerra
CNS - Health Science
California State University, San Bernardino
5500 University Parkway
San Bernardino, California 92407

Dear Prof. Becerra:

The protocol change/modification to your application to use human subjects, titled "Student health needs assessment-Third round" has been reviewed and approved by the Chair of the Institutional Review Board (IRB). A change in your informed consent requires resubmission of your protocol as amended. Please ensure your CITI Human Subjects Training is kept up-to-date and current throughout the study. A lapse in your approval may result in your not being able to use the data collected during the lapse in your approval.

This approval notice does not replace any departmental or additional campus approvals which may be required including access to CSUSB campus facilities and affiliate campuses. Investigators should consider the changing COVID-19 circumstances based on current CDC, California Department of Public Health, and campus guidance and submit appropriate protocol modifications to the IRB as needed. CSUSB campus and affiliate health screenings should be completed for all campus human research related activities. Human research activities conducted at off-campus sites should follow CDC, California Department of Public Health, and local guidance. See CSUSB's COVID-19 Prevention Plan for more information regarding campus requirements.

You are required to notify the IRB of the following by submitting the appropriate form (modification, unanticipated/adverse event, renewal, study closure) through the online Cayuse IRB Submission System.

1. If you need to make any changes/modifications to your protocol submit a modification form as the IRB must review all changes before implementing them in your study to ensure the degree of risk has not changed.
2. If any unanticipated adverse events are experienced by subjects during your research study or project.
3. If your study has not been completed submit a renewal to the IRB.
4. If you are no longer conducting the study or project submit a study closure.

You are required to keep copies of the informed consent forms and data for at least three years.

If you have any questions regarding the IRB decision, please contact Michael Gillespie, Research Compliance Officer. Mr. Gillespie can be reached by phone at (909) 537-7588, by fax at (909) 537-7028, or by email at mgillesp@csusb.edu. Please include your application approval number IRB-FY2022-146 in all correspondence.

Best of luck with your research.

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