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ISBN

9798186163466

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Publication Date

2026-07-29

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Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA,
IRVINE

The California Healthy Kids Survey May
Identify Potential Food Insecurity in Military-Connected Adolescents

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF SCIENCE

in Environmental Health Sciences

by

Karine Monique Hollis-Perry

Thesis Committee:
Professor Marizen Ramirez, Chair
Professor Andrea De Vizcaya-Ruiz
Professor Jun Wu

2026

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ACKNOWLEDGMENTS

I would like to express my appreciation to my committee Professor Marizen Ramirez, Professor Andrea De Vizcaya-Ruiz, and Professor Jun Wu, without whose guidance this thesis would not have been possible. In addition, I would like to thank my fellow residents Rasha Saaed M.D., Ashley Thomas M.D., Marielle Borom D.O., and Michael Angerbauer M.D., for their camaraderie.

More importantly, I would like to thank everyone whose collaboration and teamwork support research on health and social issues facing middle and secondary school students: the State of California Department of Education, WestEd, and the schools, families, and students who participated in the surveys.

Reports of current events in Iran are of particular interest to the San Diego-based families of the sailors and Marines attached to the ships of the USS Abraham Lincoln carrier strike group, and known survivors of casualties include children ([Associated Press 2026](#); [Korte 2026](#); [Dyer 2026](#)). Of the more than 1.1 million service members on active duty in 2023, approximately 14% were assigned to ships or installations based in California ([Department of Defense 2023](#)).

ABSTRACT OF THE THESIS

The California Healthy Kids Survey May
Identify Potential Food Insecurity in Military-Connected Adolescents
by

Karine Monique Hollis-Perry
Master of Science in Environmental Health Sciences
University of California, Irvine, 2026
Professor Marizen Ramirez, Chair

Rates of food insecurity in the military, which are higher than those in comparable communities, remain an ongoing issue. Adolescents with military parents may also struggle to cope with frequent moves and parental deployments. Using a state-wide database that included children of military personnel, we measured the association between skipping breakfast on the day of the survey and mental health screening data scores. Over 43% of students in our sample reported skipping breakfast. These students reported higher mean, median, and 90th percentile stress level scores ($\mu = 10.9$, $M_{50} = 10$, $M_{90} = 19$) than the students who did not skip breakfast ($\mu = 9.4$, $M_{50} = 8$, $M_{90} = 16$). Groups with increased levels of high distress (>90th percentile) included students who skipped breakfast (17.3%), females (14.4%), gender minorities (36.3%), American Indian/Alaska Native (16.0%), and Hispanic/LatinX students (13.1%). Logistic regression showed that skipping breakfast increased a student's odds of developing stress by 2.1 (OR 2.1). These findings demonstrate an association between skipping breakfast and mental stress in an adolescent population at increased risk for both.

INTRODUCTION

According to Department of Defense (DoD) 2023 demographic data, over 880,000 active-duty children included approximately 84,900 living in California, 21.7% of whom were 12-18 years of age ([Department of Defense 2023](#)). Because average military compensation is higher than that of equivalent civilian positions, service members and their families are less likely to live below the federal poverty level ([Crouch et al. 2025](#)) ([Asch and Totten 2024](#)). Despite an apparent wage advantage, over a quarter of military members reported being food insecure ([Rabbitt et al. 2024](#)). Enlisted service members earning lower salaries than officers are at higher risk for income volatility, which has been associated with food insecurity ([B J Asch and Totten 2024](#)).

Food Insecurity in the Military

The 25.3% prevalence of food insecurity reported by military respondents in a Department of Agriculture survey exceeded the 10.1% reported by civilian counterparts ([Rabbitt, Beymer, and United States. Department of Agriculture. Economic Research Service 2024](#)). Rates of very low food security in military and civilian respondents in this survey were 10.5% and 3.6% respectively ([Rabbitt et al. 2024](#)). A Military Family Advisory Network (MFAN) survey based on the USDA Six-Item Short Form Food Security Scale reported that 21.5% of families endorsing 2-4 of 6 indicators were considered to have “low” food security, while 9.5% of the families who endorsed 5 or 6 indicators were considered to have “very low” food security ([L’Esperance et al. 2024](#)).

Despite efforts to provide and promote resources for support, junior service members who have recently arrived at a new duty station remain at higher risk for food insecurity

[\(Krattiger, Bliese, and Adler 2024\)](#). Prior DoD-wide initiatives to address root causes of food insecurity among military personnel and their families have been superseded by “nutritional readiness” programs to reduce obesity rates among active-duty service members [\(Office of the Under Secretary for Personnel & Readiness 2022; Under Secretary of Defense for Personnel & Readiness 2023\)](#) [\(American Security Project and Obesity Care Advocacy Network 2026\)](#)[\(House Armed Services Committee 2024\)](#). A recent scoping review provides a concise overview of factors affecting food insecurity in the military including demographics, barriers to finding and accessing aid, and impacts on family wellbeing and military readiness [\(Jennings and Patton 2025\)](#).

Military personnel, however, do not generally participate in food support programs. Until September 2025, the Supplemental Nutrition Assistance Program (SNAP), a collaboration between state and federal agencies, had provided over 70% of government food assistance [\(Jones 2025\)](#). Because SNAP eligibility varies across states, economically vulnerable service members may exceed income eligibility criteria because housing and family support allowances are considered income [\(Golfín et al. 2019\)](#). Lack of awareness of resources, fear of stigma, and administrative barriers contribute to food insecurity [\(Lutz and Welsh 2022\)](#). This is consistent with studies of active-duty families reporting both low participation rates in the Supplemental Nutrition Program for Women, Infants, and Children (WIC) and, paradoxically, higher food insecurity rates than those who did not participate in the program [\(Zven et al. 2024; Chokshi et al. 2024\)](#). The association between food insecurity and changes in social and health factors during economic downturns has been described [\(Bauer, Ruffini, and Schanzenbach 2024\)](#) [\(Tan and Shahril 2023\)](#)[\(H. W. Hoynes and Schanzenbach 2018; H. Hoynes, Schanzenbach, and Almond 2016\)](#).

Food Insecurity and Associated Health Risks

The U.S. Department of Agriculture defines food security and food insecurity in terms of access and quality of food and describes how these traits impact food intake ([Rabbitt et al. 2025](#)). As outlined during a 2024 interagency workshop, food insecurity and activation of stress pathways are associated with inflammation, altered metabolic functions, and obesity ([Odoms-Young et al. 2024](#)). Food insecurity has been associated with adverse health outcomes, as consequences of anxiety, depression, asthma and obesity are appearing earlier in the lifespan ([Althoff et al. 2016](#); [Davis et al. 2007](#)) ([Burke et al. 2016](#)). Interaction between obesity- and food insecurity-related risk factors may contribute to overeating or consumption of nutrition-poor foods, weight gain, stress, and further insecurity and distress ([Althoff et al. 2016](#)). Studies from multiple countries identified an association between food insecurity and higher odds of substance use, violent activity, and suicidal behavior ([Xu et al. 2025](#); [Singleton 2024](#); [Tetteh et al. 2024](#)) ([Brinkman et al. 2021](#)).

Among military-connected (MC) students, another particularly vulnerable group, food insecurity can aggravate stress. MC-students are expected to demonstrate resilience and conduct themselves as *de facto* representatives of the military to the community ([Buck 2017](#)) ([Fairbank et al. 2018](#)). Children struggling to cope with the stresses of frequent relocations and parental deployments may become less resilient over time ([Gjelsvik et al. 2019](#); [Crouch et al. 2024](#)) ([Burke and Miller 2018](#)) ([Millegan, McLay, and Engel 2014](#)). In their 2023 survey, the National Military Family Association (NMFA) reported that 51% of adolescents 13-19 years of age endorsed some level of food insecurity in the previous 30 days, a percentage increase over the 46% reported in 2022 ([Bloom and NMFA 2023](#)).

CHAPTER TWO: Breakfast Is About More Than Food

Skipping Breakfast: A Food Insecurity Signal

Skipping breakfast is a subtle, but important, symptom of potential psychosocial, physical, and economic problems. Adolescents report multiple reasons for maladaptive meal behaviors, e.g., skipping meals or binge eating or poor diet quality ([Marshall et al. 2021](#)). Skipping breakfast is one example of disordered eating behaviors linked with food insecurity ([Dubois et al. 2023](#); [Lee and Kim 2019](#); [Hooper et al. 2020](#)). In prior studies, psychosocial distress and food insecurity have been associated with increased susceptibility to adverse effects of stress which may persist over time ([Frank and Sato 2023](#); [Whitsett et al. 2019](#)).

Food insecurity has also been identified as an independent risk factor for overweight/obesity ([Hooper et al. 2020](#); [Robson et al. 2017](#)). A longitudinal study of adolescents found that skipping breakfast was associated with an increased risk of being food insecure after completing secondary education ([Larson et al. 2020](#)). Skipping breakfast is associated with psychological disorders, particularly depression and anxiety ([Zahedi et al. 2022](#); [Gratão et al. 2022](#); [Gürbüz et al. 2024](#))([Lee et al. 2017](#)). Missing breakfast has been associated with increased risks for being bullied, poor academic performance, and less sense of connection to the school community ([Du et al. 2025](#); [Martin et al. 2024](#); [Sliwa et al. 2024](#))([Leidy et al. 2025](#)) ([Wang et al. 2025](#)). A 2021 study found that middle school students who reported rare or no physical activity or did not eat breakfast every day were more likely to report food insecurity, and those reporting food insecurity were more likely to endorse feelings of hopelessness and suicidal ideation ([Brinkman et al. 2021](#)).

MC-students are an at-risk population for disordered eating due to multiple factors and may be more sensitive to stressors originating at home, school, or in the community ([Spinner et](#)

[al. 2024; Pearlman et al. 2019](#)). Between 2016 and 2021 the crude annual incidence rate of new-onset eating disorder diagnoses in children of active-duty military service members aged 10-17 years was 1.75 cases/10,000 person-years, a 64.5% increase over the prior period ([Thompson et al. 2023](#)). Studies of food insecurity in military communities typically emphasize socioeconomic or political outcomes on adults or younger children by framing the discussion in terms of hidden economic costs of military service to families ([Wax and Stankorb 2016; O’Neal et al. 2023](#)).

Research Question and Hypothesis

Skipping breakfast was previously shown to be associated with an increased risk of both food insecurity and evidence of emotional distress. We hypothesized that skipping breakfast was associated with higher levels of social or emotional distress. MC-students are at risk for exposure to multiple triggers of social or emotional distress, e.g., social isolation or bullying at school ([Chandra et al. 2010](#)) ([Rossiter et al. 2020](#)) ([Atuel et al. 2014](#)) ([Edwardson and Gorely 2010](#)). We will study MC-students who completed the 2023-2024 California Healthy Kids Survey to determine whether those who reported skipping breakfast had higher social-emotional distress scores than those who did not.

CHAPTER THREE: Methods, Analysis, and Results

Methods

The California Healthy Kids Survey (CHKS)

The California Healthy Kids Survey (CHKS) is the largest state-wide surveillance survey that measures student well-being, health risks, and resiliency ([California Department of Education 2025](#)). Schools receiving Tobacco Use Prevention Education funding are required to administer the cross-sectional survey at least biannually ([CA Department of Education 2025](#)).

Although parental consent is required, students' assents are also obtained prior to enrollment ([CA Department of Education 2025](#)). Participation is voluntary. Students are assured of anonymity and confidentiality during the informed assent process, and the self-administered survey is offered in electronic format when possible ([O'Hara et al. 2023](#); [Davis et al. 2007](#)). The survey is conducted in approximately 85% of California secondary schools, with reported response rates ranging from 56-77% and 87%, depending on grade level ([Amadori et al. 2025](#)) ([Edwards 2025](#)).

School districts with MC-students have administered specific questionnaires to identify and monitor their concerns about substance use, school violence, and social isolation ([Gilreath et al. 2014](#)) ([Gilreath 2016](#); [Atuel et al. 2014](#))([Pedro and Esqueda 2020](#); [Estrada et al. 2017](#)). The survey has included a breakfast-related question since 2003 ([WestEd 2011](#); [Austin et al. 2016](#)). Questions regarding dissatisfaction with weight and disordered eating are included in a supplementary physical health and nutrition module ([WestEd 2026](#)).

The CHKS includes a Social-Emotional Distress Scale-Brief (SEDS-B) survey that draws on prior tools (e.g., the Multidimensional Life Satisfaction Scale, Behavioral and Emotional Screening System, and the Social Emotional Health System—Secondary) as precedent ([Dowdy et al. 2018](#)). The SEDS-B queries students' mental health over the prior 30-day period and includes questions regarding overall emotional health and life satisfaction and has been validated for use in middle and high school students, in gender-diverse samples, and in Spanish ([Dowdy et al. 2023](#); [Furlong et al. 2023](#))([Chan et al. 2026](#); [Rodríguez-Jiménez et al. 2023](#)).

Eligibility Criteria

We focused on MC-students who were identified by an affirmative answer to the question “Is your father, mother, or guardian currently in the military?” Students providing

negative answers or whose responses were “Don’t know” or Missing were excluded from the study. Data from the remaining students was reviewed to identify how many completed the SEDS-B survey and answered the survey’s breakfast question. Data from MC-students with complete SEDS-B case scores was included in the analysis.

Main Outcome: Social-Emotional Distress

The 2023-2024 CHKS Social Emotional Distress Scale-Secondary Brief (SEDS-B) survey asks students to consider, “Over the past 30 days, how true do you feel these statements are about you?”: 1) I had a hard time relaxing; 2) I felt sad and down; 3) I was easily irritated; 4) It was hard for me to cope, and I thought I would panic; and 5) It was hard for me to get excited about anything ([WestEd.org 2024](https://www.wested.org)). Response options include Not at all true; A little true; Pretty much true; Very much true; and Missing. Complete cases had no Missing responses. Each non-Missing response was scored between 1-4 points and aggregated to generate a complete case score. Complete case scores ranged from 5 to 20 points. Descriptive statistics include frequency and percentage of demographic characteristics and social and emotional distress scores. Incomplete MC-student SEDS-B responses were excluded from further analysis.

Independent Variable: Food Insecurity

We did not have a question directly assessing food security. Instead, we focused on the question, “Did you eat breakfast today?” This question, included in the core survey module, had a high response rate ($16,664/16,721 = 99.66\%$) among MC-students who completed the SEDS-B survey. Responses were treated as binary values: “1=No” and any affirmative answer as “0=Yes”. Students scored as “No” reported they did not eat breakfast on the day of the survey. SEDS-B score ranges were determined by the percentage of complete cases in each category. Low score ranges varied by group and included values up to, but not including the group’s

median (e.g., 5-8). Medium score ranges also varied by group, with values up to but not including the 90th percentile (e.g., 9-16). High score ranges (“High Stress”) spanned from the 90th percentile to the maximum (17-20).

Skipping breakfast is a variable used when reporting health behaviors in groups with other risk factors for future chronic medical conditions. Personal reasons commonly cited for skipping breakfast include time pressures, lack of motivation, and efforts to control weight ([Hovdenak et al. 2024](#)). A systematic review assessing associations between skipping breakfast and cardio-metabolic measures in children and/or adolescents illustrates the methodological limitations of characterizing the impact of skipping breakfast on child and adolescent health ([Monzani et al. 2019](#)).

Analysis

Using a complete case analysis, we used data from MC-students whose surveys had non-missing SEDS-B responses. Sample demographic characteristics included gender, grade, and race and ethnicity. Students describing their gender as Nonbinary or Something else were combined into a single group (Other). The 2023-2024 CHKS Scoring Key included standardized STATA code to properly format race and ethnicity data for analysis and table construction ([WestEd.org 2024](#)). Grade levels were used rather than age, since they are strongly correlated. These were grouped into lower (6-8) and upper (9-10, 11-12) secondary school spans, consistent with middle and high school respectively.

We performed a chi-square analysis to describe the crude association between skipping breakfast and reported social-emotional distress. We used the dagitty package (v3.1) to visualize causal pathways and identify covariates to control for confounding ([Textor et al. 2016](#)). (Figure 1) Linear regression measured the strength and direction of association between skipping

breakfast and social-emotional distress analyzed as a continuous measure, adjusting for specific gender, grade groups, and racial and ethnic status. Logistic regression determined the odds ratios and the strength, direction, of the association between skipping breakfast (yes vs. no) and high SEDS-B scores (yes vs. no), controlled for confounding by sociodemographic factors. Data review and statistical analysis were completed in Stata MP (v. 18 StataCorp LLC, College Station TX).

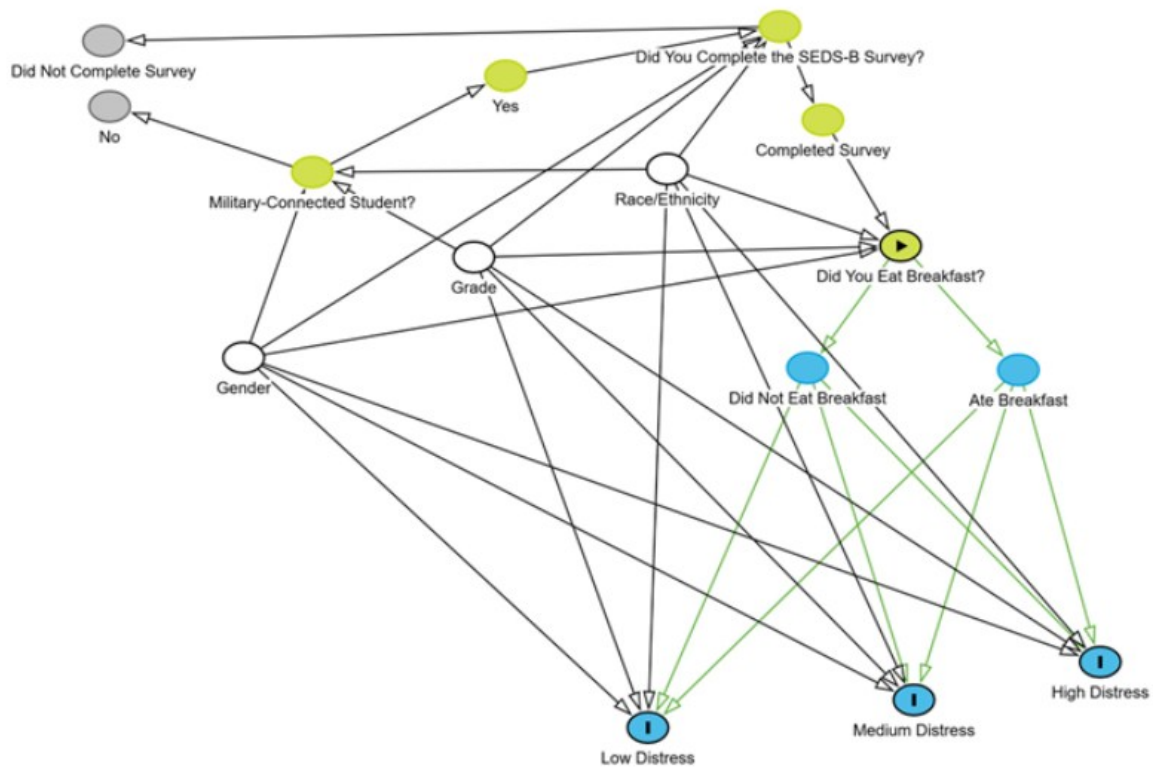


Figure 1: Directed Acyclic Graphic

Results

Sample Demographics

The 2023-2024 CHKS Secondary Survey population included 629,408 students in grades 6-12 across 52 California counties, including the 20,059 self-declared MC-students (3.2%). Student distribution varied widely across the state. Five counties (Madera, Mono, Santa Cruz, Sierra, and Sonoma) had five or fewer complete cases. Los Angeles, Riverside, and San Diego counties each had more than 1,000 complete cases. This study focused primarily on the 16,721/20,059 MC-students with completed SEDS-B scales (83.4%). Gender composition was 53.2% male, 41.0% female, and 5.8% other (i.e., non-binary or not defined). Students in middle (grades 6-8) and high school (grades 9/10 and 11/12) composed 41.1%, 33.2, and 25.7% of the sample respectively. Representation of racial and ethnic groups ranged from 1.2% (Native Hawaiian/Pacific Islander) to 42.5% (Hispanic/LatinX). Students reporting multiracial or identities not listed (“Something else”) were 11.7% and 4.8% of the sample respectively.

Skipping Breakfast

Approximately 44% of all MC-students in the sample reported skipping breakfast on the day of the survey. Among MC-students, a greater proportion of other (58.3%) and female (48.2%) students skipped breakfast compared with males (39.3%). Among racial or ethnic minority groups, between 41.9% of American Indian/Native Alaskan) and 53.7% of Native Hawaiian/Pacific Islander students skipped breakfast compared with 36.9% white students. About 41.8% MC-students in grades 6-8, 43.8% in grades 9-10, and 47.7% in grades 11-12 skipped breakfast on the day of the survey. (Table 1)

Table 1: Demographic Summary

	Ate Breakfast		
	No (%)	Yes (%)	Total (%) ¹
MC-Students			20,059
Complete cases			16,721 (83.4)
Did you eat breakfast today?	7,331 (43.8)	9,333 (55.8)	16,664 (99.7)
Gender			
Male	3,470 (39.3)	5,355 (60.7)	8,825 (53.2)
Female	3,272 (48.2)	3,524 (51.9)	6,796 (41.0)
Other	560 (58.3)	400 (41.7)	960 (5.8)
Grades			
6-8	2,858 (41.8)	3,982 (58.2)	6,840 (41.1)
9-10	2,413 (43.8)	3,102 (56.3)	5,515 (33.2)
11-12	2,041 (47.7)	2,239 (52.3)	4,280 (25.7)
Race/ethnicity			
American Indian/Alaska Native	85 (41.9)	118 (58.1)	203 (1.2)
Asian	709 (37.7)	1,172 (62.3)	1,881 (11.3)
African American	595 (47.5)	659 (52.6)	1,254 (7.6)
Hispanic or Latinx	3,430 (48.7)	3,621 (51.4)	7,051 (42.5)
Native Hawaiian/Pacific Islander	108 (53.7)	93 (46.3)	201 (1.2)
White	1,208 (36.9)	2,066 (63.1)	3,274 (19.7)
Multiracial	816 (41.9)	1,130 (58.1)	1,946 (11.7)
Something else	356 (45.1)	433 (54.9)	789 (4.8)

¹Total (%)

Gender: Pearson $\chi^2(2) = 205.85$; Pr = 0.00

Grades: Pearson $\chi^2(2) = 37.38$; Pr = 0.00

Race/Ethnicity: Pearson $\chi^2(7) = 177.08$; Pr = 0.00

Stress Levels

Overall, the mean and median SEDS-B scores for students who skipped breakfast and those who did not were: ($\mu = 10.9$, $M_{50} = 10$) and ($\mu = 9.4$, $M_{50} = 8$) respectively. Students who skipped breakfast also represented larger segments of those with scores above the median (54.7%) and 90th percentile (17.3%) than these classmates. Of students who reported skipping breakfast, 26.8% were in the low stress group (SEDS-B range 5-6), and 55.9 % were in the medium stress range (7-16). A larger proportion of students who ate breakfast reported SEDS-B values in the low range (42.3%). Increased proportions of high distress (>90th percentile) were

seen in the following groups: students who skipped breakfast (17.3%), females (14.4%), gender minorities (36.3%), American Indian/Alaska Native (16.0%), and Hispanic/LatinX students (13.1%). High-distress ranges were consistent between demographic groups (17-20) despite intergroup variation (16-19). (Table 2)

Males reported lower mean and median SEDS-B scores ($\mu = 9.0$, $M_{50} = 8$) than females ($\mu = 10.9$, $M_{50} = 10$) and others ($\mu = 13.4$, $M_{50} = 14$). Mean SEDS-B scores in grades 6-8 and 9-10 were equivalent ($\mu = 10.0$) but slightly lower than those for grades 11-12 ($\mu = 10.1$). Mean SEDS-B values for racial and ethnic groups ranged from Something else ($\mu = 9.6$) to Multiracial ($\mu = 10.7$). Median and 90th percentile values for all three grade groups were the same ($M_{50} = 9$, and $M_{90} = 17$). Most racial and ethnic groups had similar median SEDS-B values (mode = 9, range 8-10). Box plots based on median and interquartile ranges show the distribution of scores within gender groups. (Figure 2)

Table 2: Social-Emotional Distress-Brief Scores

	SED-B Scores ³								
	Mean	Median	90 th Percentile	Low		Medium		High	
	(SD)	(% Above) ¹	(% Above) ²	Range	%	Range	%	Range	%
Did you eat breakfast today?									
No	10.9 (5.0)	10 (54.7)	19 (17.3)	5-6	26.8	7-16	55.9	17-20	17.3
Yes	9.4 (4.3)	8 (41.6)	16 (8.3)	5-7	42.3	8-16	49.4	17-20	8.3
Gender									
Male	9.0 (4.3)	8 (37.0)	16 (8.0)	5-8	55.9	9-16	36.1	17-20	8.0
Female	10.9 (4.5)	10 (57.5)	18 (14.4)	5-7	28.2	8-16	57.4	17-20	14.4
Other	13.4 (5.6)	14 (71.3)	20 (36.3)	5	17.3	6-16	46.4	17-20	36.3
Grade									
6-8	10.0 (4.6)	9 (46.6)	17 (12.0)	5-7	38.1	8-16	49.9	17-20	12.0
9-10	10.0 (4.6)	9 (47.0)	17 (12.2)	5-7	38.7	8-16	49.1	17-20	12.1
11-12	10.1 (4.7)	9 (48.8)	17 (12.7)	5-7	37.5	8-16	49.8	17-20	12.7
Race/Ethnicity									
American Indian/ Alaska Native	10.4 (5.1)	9 (48.1)	19 (16.0)	5-7	39.3	8-16	44.7	17-20	16.0
Asian	10.0 (4.2)	9 (48.8)	16 (9.3)	5-7	43.0	9-16	47.7	17-20	9.3
African American	9.8 (4.8)	9 (45.1)	18 (12.5)	5-8	41.7	8-16	45.9	17-20	12.5
Hispanic or Latinx	10.0 (4.7)	9 (46.4)	18 (13.1)	5-7	39.6	8-16	46.4	17-20	13.1
Native Hawaiian/ Pacific Islander	10.1 (4.9)	9 (48.3)	18 (13.8)	5-7	39.4	8-16	46.8	17-20	13.8
White	10.0 (4.5)	9 (47.3)	17 (11.3)	5-8	45.5	9-16	43.2	17-20	11.3
Multiracial	10.7 (4.6)	10 (53.0)	18 (13.7)	5-7	31.7	8-16	54.6	17-20	13.7
Something else	9.6 (4.7)	8 (42.0)	17 (12.1)	5-7	44.6	8-16	12.1	17-20	12.1

¹% Above 50th Percentile

Complete Cases: Pearson $\chi^2(1) = 284.1$; Pr = 0.00

Gender: Pearson $\chi^2(2) = 880.7$; Pr = 0.00

Grades: Pearson $\chi^2(2) = 5.4$; Pr = 0.07

Race/Ethnicity: Pearson $\chi^2(7) = 40.4$; Pr = 0.00

²% Above 90th Percentile

Pearson $\chi^2(1) = 309.4$; Pr = 0.00

Pearson $\chi^2(2) = 694.4$; Pr = 0.00

Pearson $\chi^2(2) = 1.3$; Pr = 0.53

Pearson $\chi^2(7) = 29.6$; Pr = 0.00

³SED-B Scores

Breakfast: Pearson $\chi^2(15) = 490.0$; Pr = 0.00

Gender: Pearson $\chi^2(30) = 1.8 \times 10^3$; Pr = 0.00

Grades: Pearson $\chi^2(30) = 87.5$; Pr = 0.00

Race/Ethnicity: Pearson $\chi^2(105) = 289.0$; Pr = 0.00

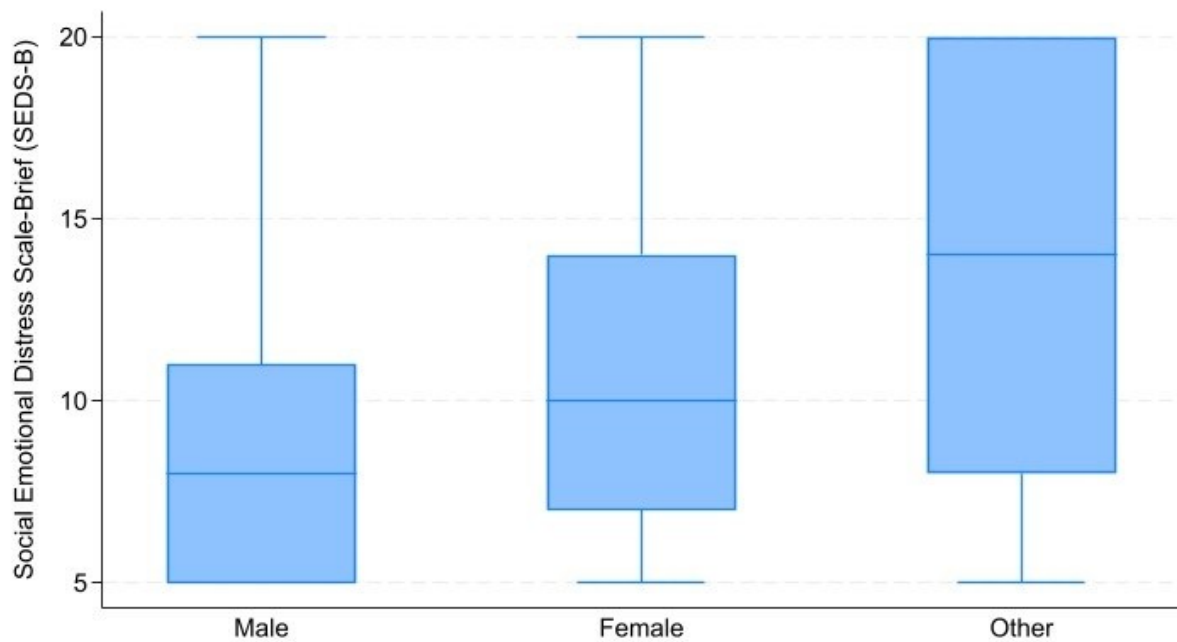


Figure 2: Social-Emotional Distress Across Gender Groups

Relationship between skipping breakfast and stress

A larger proportion of students who did not eat breakfast had SEDS-B scores greater than the median (54.7%; $M_{50}=10$) compared to those who did (41.6%; $M_{50}=8$). There was a significant difference in the mean SEDS-B scores between MC-students who ate breakfast ($M = 9.4$; $SD = 4.3$) and those who did not ($M = 10.9$; $SD = 5.0$); (95% CI 1.3-1.6; $p<0.001$). Linear regression of a fully adjusted model showed that skipping breakfast was associated with higher social-emotional distress scores ($\beta = 1.2$; 95% CI 1.1 to 1.4, $p<0.001$). Those who did not eat breakfast had distress scores about 1.2 points higher than those who did. Larger associations between skipping breakfast and higher SEDS-B scores were also seen with females ($\beta = 1.8$; 95% CI 1.7 to 2.0, $p<0.001$) and other gender groups ($\beta = 4.1$; 95% CI 3.8 to 4.4, $p<0.001$). Similar associations did not occur with grade or racial/ethnic groups. Logistic regression showed

that not eating breakfast was associated with an increased risk of high distress (scores at or above the 90th percentile) (OR = 2.1; 95% CI 1.9 to 2.3, $p < 0.001$). (Table 3) Sensitivity analysis based on student clustering variations across schools showed no impact on logistic or linear regression outcomes, consistent with model stability.

Table 3: T-test with Linear and Logistic Regression

Two-Sample T-Test with Equal Variances: SEDS-B Score vs. Eating Breakfast								
	Mean		Standard Deviation		95% Confidence Interval			
Skipped Breakfast	10.9		5.0		10.8		11.0	
Ate Breakfast	9.4		4.3		9.3		9.5	
difference	1.5				1.3		1.6	
t							20.7	
	Linear Regression				Logistic Regression			
	Coefficient	P> t	95% Confidence Interval		Odds Ratio	P > z	95% Confidence Interval	
Skipping Breakfast	1.2	0.0	1.1	1.4	2.1	0.0	1.9	2.3
Gender Groups								
Male								
Female	1.8	0.0	1.7	2.0	1.8	0.0	1.6	2.0
Other	4.1	0.0	3.8	4.4	5.8	0.0	4.9	6.8
Grades								
6-8								
9-10	-0.1	0.3	-0.2	0.1	1.0	0.9	0.9	1.1
11-12	-0.1	0.5	-0.2	0.1	1.0	0.8	0.9	1.1
Race/Ethnicity								
American Indian/ Alaska Native								
Asian	-0.3	0.4	-0.9	0.4	0.6	0.0	0.4	0.9
African American	-0.6	0.1	-1.3	0.0	0.7	0.2	0.5	1.1
Hispanic or Latinx	-0.4	0.2	-1.0	0.2	0.8	0.3	0.5	1.2
Native Hawaiian/ Pacific Islander	-0.6	0.1	-1.5	0.2	0.7	0.3	0.4	1.3
White	-0.2	0.6	-0.8	0.4	0.8	0.2	0.5	1.2
Multiracial	0.2	0.4	-0.4	0.9	0.9	0.5	0.6	1.3
Something Else	-0.8	0.0	-1.5	-0.2	0.7	0.1	0.5	1.1
Intercept	7.6	0.0	7.0	8.3	0.0	0.0	0.0	0.1

CHAPTER FOUR: Summary and Conclusions

Findings Support Hypothesis

Analysis of a sample of MC-students participating in the 2023-2024 California Healthy Kids Survey (CHKS) found that 44% of these students reported not eating breakfast on the day of the survey. Students who skipped breakfast had higher mean and median stress level scores ($\mu = 10.9$; $M_{50} = 10$) than the group overall ($\mu = 10.0$; $M_{50} = 9$). This finding is also consistent with prior reports of associations between food insecurity and signs of emotional distress ([Rahman and Siu 2025](#); [Brinkman et al. 2021](#)). Greater percentages of female (14.4%) and other (36.3%) students reported scores above the 90th percentile than males (8.0%), indicating higher percentages of increased distress in these groups. For each grade group, percentage values above the median (46.6%-48.8%) and 90th percentile (12.0%-12.7%) were similar. After adjusting for sociodemographic variables, a logistic regression model showed skipping breakfast was associated with an increased risk of high distress (OR 2.1).

This association between skipping breakfast and high distress reflects the possible effects of overlapping factors contributing to food insecurity in military communities. Lack of knowledge about nutrition support programs, administrative barriers to obtaining assistance, and fears of social stigma contribute to food insecurity ([Zven et al. 2024](#); [Chokshi et al. 2024](#); [Rabbitt 2024](#); [Asch et al. 2023](#)).

Implications for Prevention

The need for nutritional support extends through all phases of childhood and secondary school. Nutritional support can mitigate current problems but cannot completely relieve losses incurred during earlier periods of nutritional shortage ([Chen et al. 2025](#)). Developmental changes in adolescence reflect profound age-related neurocognitive changes which can present as

antisocial or risky behavior ([Heflin et al. 2019](#)). Adolescents who skip breakfast are at risk for developing not only distress but also maladaptive responses that may jeopardize their ability to form successful family and peer relationships and negotiate a transition to adulthood ([Capitán-Moyano et al. 2026](#)). Extrinsic and intrinsic family, peer, and community factors also influence dietary choices and how adolescents respond to food insecurity and may help shape prevention strategies ([Mmari 2023](#); [Popkin et al. 2016](#); [Waxman et al. 2015](#)). Despite cogent arguments for rolling back food aid programs to reduce waste or costs, restricting access to nutritional support may adversely affect future employment readiness as students may not be physically fit enough to participate in the workforce due to obesity or other disqualifying health conditions ([Koehlmoos et al. 2020](#); [Lutz and Welsh 2022](#)).

Strengths and Limitations

The California Healthy Kids Survey is a validated database used by school districts to proactively identify and monitor trends or issues that may require mitigation strategies (e.g., substance use, bullying). Its geographic and demographic diversity support both detailed evaluations and broad assessments of groups not easily sampled otherwise. CHKS has also been used to find at-risk student sub-groups who may otherwise be overlooked ([De Pedro and Shim-Pelayo 2018](#); [Pedro and Esqueda 2020](#)). The current study shows that secondary students in California public schools respond to survey questions at high rates and can provide high-quality data about food insecurity that may not otherwise be available.

This study has limitations. The cross-sectional design precludes analysis for causality. Despite the access to a diverse student population, potential selection bias may result in missing groups of interest due to absence or non-participation. Because the 2023-2024 CHKS Survey did not directly survey students about food insecurity, we used the breakfast question as an imperfect

proxy. Students citing non-economic reasons for skipping meals to avoid potential stigma may also introduce a potential reporting bias ([Gassman-Pines et al. 2021](#)). Skipping breakfast is typically studied in conjunction with other factors that influence adolescent behaviors (e.g., family socioeconomic levels and school climate) ([Hovdenak et al. 2024; Du et al. 2025](#)).

A higher proportion of students from low-income families reported skipping breakfast than those students who were not, and these students also reported higher anxiety and depression scores ([Lee et al. 2021](#)). As previously noted, military families are more likely to be food insecure than their civilian counterparts ([Rabbitt et al. 2024](#)). According to a Military Family Advisory Network survey, 54% of teen respondents reported low or very low food security in the past month ([Bloom and NMFA 2024](#)). The results are not necessarily generalizable to a broader population.

Future Directions

Research on military families, particularly adolescents, is evolving. Military family organizations (e.g. MFAN, Blue Star Families) that included teens in outreach efforts provide useful cross-sectional data to leaders who would otherwise not have access to it. National surveys (e.g., the Youth Risk Behavior Survey) provide data regarding food insecurity among adolescents overall do not routinely ask survey participants about military affiliations ([CDC 2024](#)). CHKS surveys can provide insight into the psychosocial wellbeing of a potentially overlooked student group ([Department of Defense 2023](#)). Future studies may compare SEDS-B scores of military and civilian students who skip breakfast to determine increased risks identified in this study affect the civilian community. The effects of food insecurity on academic performance, long-term health, and behavioral outcomes among demographically and

geographically diverse populations with different challenges and resources can be analyzed to shape and evaluate school policy ([Orihuela et al. 2023; Shankar et al. 2017](#)).

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