



HHS Public Access

Author manuscript

Int J Prison Health. Author manuscript; available in PMC 2022 December 16.

Published in final edited form as:

Int J Prison Health. 2023 September 05; 19(3): 350–362. doi:10.1108/IJPH-02-2022-0009.

Nutrition availability for those incarcerated in jail: Implications for mental health

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Abstract

Purpose: Using a seven-day cycle menu and commissary items at a rural county jail, we described provisions of micronutrients known to be associated with mental health disorders and if they meet dietary guidelines.

Design: The nutritional content of a seven-day cycle menu and four available commissary food packs were evaluated using NutritionCalc® Plus software (McGraw-Hill Education version 5.0.19) and compared to Dietary Reference Intakes (DRI).

Findings: Menu mean values of Vitamin B6, Vitamin B12, Vitamin C, and zinc met DRI recommendations. However, Vitamin D (for men and women), magnesium (for men only), and omega-3s (for men only) did not meet the DRI recommendations.

Originality: As deficits of Vitamin D, magnesium, and omega-3s are known to exacerbate bipolar disorder, anxiety, and depression, small changes to food would increase the offerings and potential intake of nutrients that may improve mental health.

Keywords

jail; mental health; nutrition; psychological services; commissary

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Introduction

In the United States (US), 740,700 individuals are incarcerated in local and county jails with approximately 10.7 million individual admissions annually (Maruschak and Minton; 2020, Zeng, 2020). Jails are correctional facilities for individuals awaiting trial, sentencing, or transfer to prison, and those in violation of probation or parole (Dumont et al., 2012; Office of Disease Prevention and Health Promotion, 2021). Most individuals who are sent to jail only stay a few days; however, the length of stay varies by facility and individual circumstances. For example, in a Southwestern jail facility, the median length of stay was two days (Camplain et al., 2019). Yet, individuals may be incarcerated much longer while awaiting trial (range of 0-3,000 days; Camplain et al., 2019).

Individuals who are incarcerated have higher rates of mental and behavioral health issues, substance use disorders, and poor physical health compared to non-institutionalized populations and this is in large part due to the criminalization of mental illness and behavioral health issues in the US (Dumont et al., 2012). An estimated 44% of individuals held in jails have a history of a mental health illness with rates often more than double that of the general population (National Alliance on Mental Illness, 2019). In a Southwestern jail, 34% of individuals incarcerated reported a depressive disorder compared to 8% of the general adult population (National Institute of Mental Health, n.d.-d; Trotter II et al., 2018). Similarly, there is a higher prevalence of the following compared to the general populations: anxiety disorder (37% vs. 19%), bipolar disorder (20% vs. 3%), and attention-deficit hyperactivity disorder (ADHD; 23% vs. 4%; National Institute of Mental Health, n.d.-a, National Institute of Mental Health, n.d.-b, National Institute of Mental Health, n.d.-c; Trotter II et al., 2018). Epidemiological evidence suggests there is a relationship among diet, nutrition, mental health, well-being, and mood. Patterns of healthy eating that meet dietary recommendations are positively associated with the prevention and management of various mental health illnesses (Adan et al., 2019; Kris-Etherton et al., 2021). Despite the positive evidence of meeting dietary recommendations, individuals who are incarcerated are often served foods that are high in fat, salt, sugar, and carbohydrates and little-to-no fresh fruits or vegetables. Essentially, menus in correctional facilities are diets that do not support dietary guideline recommendations and that the general population are advised to avoid (McGuire, 2011).

The Eighth Amendment prohibits jail staff from denying food to individuals who are incarcerated and from serving nutritionally inadequate food and must ensure that individuals' health while incarcerated does not suffer as a result of inadequate food service. To attempt to meet standards, jails will often employ a qualified food service professional (e.g., registered dietitian) to develop or approve menus that are handled internally (preparing meals on site), or contract with food service providers or purchase meals from a local restaurant or hospital (McCotter, 2015). However, there are barriers to serving nutritionally adequate foods in jails. Although standards encourage a dietitian or qualified food service professional to create or approve what is served during meals in jails, it is not a constitutional requirement and there is no federal or state entity that reviews or approves local jail menus. Additionally, menu preparation is not always in the control of jail staff or administration. Menu preparation disruptions include restrictions in

food availability, such as shortages in fruits and vegetables, substitutions from suppliers, supply chain issues, and budget constraints which may cause changes in what is served to individuals incarcerated compared to what is approved on a menu. Finally, administrative priorities in the jail may not align with health eating.

The impact of nutrition and micronutrients on mental health

Research on the connection between nutrition and mental health is growing. Food groups as well as micro and macronutrients are associated with overall mental health and well-being, mood, and how people live with anxiety, depression, ADHD, and bipolar disorder. Fresh fruits and vegetables, zinc, omega-3 fatty acids, and fish are associated with well-being (Adan et al., 2019; Firth et al., 2020). A micronutrient formula consisting of vitamins (i.e., B, D, and C), minerals, fatty acids, amino acids, herbs, and botanicals can improve an unstable mood (Adan et al., 2019; Dome et al., 2019; Gately and Kaplan, 2009; Kaplan et al., 2017; Rucklidge et al., 2010; Parker et al., 2017). Additionally, incorporating omega-3 fatty acids and magnesium into the diet can improve impulse dysfunction and decrease aggressive behaviors (Bozzatello et al., 2020; Patrick and Ames, 2015; Rucklidge et al., 2011).

Specific to ADHD, individuals who consume diets rich in fresh fruits and vegetables, zinc, omega-3 fatty acids, and fish are at a reduced risk of experiencing ADHD symptoms (Adan et al., 2019; Firth et al., 2020). Similarly, eliminating food additives and supplementation of free fatty acids is associated with a small, yet reliable, reduction of ADHD symptoms (Adan et al., 2019). Alternatively, diets with higher consumption of meats, sugar, and saturated fats increase symptoms of ADHD, such as hyperactivity (Adan et al., 2019; Del-Ponte et al., 2019; Firth et al., 2020; Kris-Etherton et al., 2021; F Masana et al., 2019)

Nutrition can additionally aid in the management of bipolar disorder symptomology. Balancing the omega-6 fatty acids to omega-3 fatty acids (i.e., 4:1) and limiting caffeine, alcohol, sugar, salt, and fat (i.e., saturated fat and trans fatty acids) intake is associated with less bipolar disorder symptoms (Vann and Young, 2021). Incorporating a micronutrient formula (i.e., dietary supplement of 36 essential vitamins, minerals, and nutrients) may also reduce symptoms of bipolar and co-occurring disorders, such as anxiety, ADHD, obsessive compulsive disorder (OCD), and schizophrenia (Gately and Kaplan, 2009).

Many aspects of a diet are associated with depression. Diets consisting of meats, sugar, and saturated fats increase symptoms of depression (Adan et al., 2019; Del-Ponte et al., 2019; Firth et al., 2020; Kris-Etherton et al., 2021; F Masana et al., 2019). Cross-sectional and longitudinal studies suggest that individuals with vitamin D deficiency are at a greater risk of experiencing symptoms of depression and that in the absence of opportunities to acquire vitamin D through outside sunshine exposure, vitamin D supplementation can be beneficial in addressing symptoms of depression (Parker et al., 2017). Incorporating omega-3 fatty acids and magnesium into the diet as well as fresh fruits, vegetables, zinc, and fish is associated with a reduction in depression symptoms (Adan et al., 2019; Bozzatello et al., 2020; Firth et al., 2020; Patrick and Ames, 2015; Rucklidge et al., 2011).

Finally, epidemiological studies suggest that anxiety symptoms may be reduced with high-quality diets that contain micronutrients (i.e., B Vitamins, Vitamin C, magnesium, and zinc), fruits and vegetables, whole grains, lean protein sources, nuts, legumes, low added sugars, and a micronutrient formula consisting of vitamins, minerals, fatty acids, amino acids, herbs, and botanicals (Adan et al., 2019; Dome et al., 2019; Gately and Kaplan, 2009; Kaplan et al., 2017; Kris-Etherton et al., 2021; Rucklidge et al., 2010; Parker et al., 2017). Diets with higher consumption of meats, sugar, and saturated fats are associated with a higher prevalence of anxiety symptoms (Adan et al., 2019; Del-Ponte et al., 2019; Firth et al., 2020; Kris-Etherton et al., 2021; F Masana et al., 2019).

Based on research in the general population, the nutritional quality of jail diets may positively or negatively impact the mental health of individuals incarcerated (Cook et al., 2015; Smoyer, 2019). In correctional facilities, menus are created to feed the general population and are approved by a registered dietitian and/or food service director, which offers little autonomy over food choices (Cook et al., 2015). Nutritionally-balanced diets can be skewed by commissary items, such as soda, chips, and cookies (Cook et al., 2015; Smoyer, 2019). Although most food options available through commissary are processed, not nutritionally dense, and are not typically considered a healthy choice, provision of a variety of commissary foodstuffs is essential to instill autonomy and identity (Condon et al., 2008; Smoyer, 2019).

Psychological services in jails

Psychologists in jails tend not to have the time or even an established protocol to inquire about nutrition or modify it if they learn someone has nutritional needs (Comartin et al., 2021). In general, the correctional system struggles to meet the increasing and complicated needs of individuals incarcerated in jail with mental health disorders even with guidelines for identification, referral, and psychological services in jail (Comartin et al., 2021). With one-third of individuals incarcerated in jail having a depressive disorder and about a quarter with bipolar disorder and a constitutional requirement for jails to provide mental health care to those with mental health needs, services for individuals with mental illnesses are necessary (Jacobs and Giordano, 2018).

In a qualitative study of jail staff and clinical providers, concerns about mental health in a jail setting ranged from staff and clinicians reporting a lack of training around recognizing and treating mental health disorders; a high demand for psychotropic medication paired with noncompliance and the struggle of a jail setting for mental health treatment as jails are not therapeutic environments (Segal et al., 2018). Thus, there are barriers to mental health treatment in jail settings and limited resources to care for individuals who are incarcerated with a mental illness. Paired with the criminalization of mental health in the US, the aforementioned barriers to mental health services highlight the institution- and structural-related issues in accessing services in jails. For example, even in institutions that are implementing “best practices” for identifying mental illness immediately after booking, providing services and referrals for discharge, only about two-thirds are referred for jail-based mental health services and less than half actually received mental health service and only 13% received community care after leaving the jail (Comartin et al., 2021). These

poor outcomes related to accessing mental health care in institutions implementing what are considered best practices, highlight the need to review best practices in treating individuals incarcerated with mental health issues.

With evidence of associations between poor diet and the exacerbation of mental health disorders and the struggle to provide mental health care, a nutritionally-balanced diet may be a mechanism for improving mental health symptoms (i.e., depressive/manic mood, troubling thoughts, negative interactions with others) and a potential point of intervention for individuals incarcerated in jail struggling with mental health disorders.

Purpose of the present study

As jails increasingly house individuals with mental health symptoms, the role nutrition has on mental health among individuals incarcerated needs to be examined to determine if jail menus and commissary provide adequate nutrients for individuals experiencing mental health symptoms. Therefore, we sought to determine if previously established micronutrients (i.e., Vitamin B6, Vitamin B12, Vitamin C, Vitamin D, magnesium, zinc, and omega-3s) related to mental health disorders (i.e., depression, anxiety, ADHD, and bipolar) meet Dietary Reference Intakes (DRIs) from a seven-day cycle menu and commissary items in a rural jail.

Methods

Study setting

A seven-day cycle menu (referred to throughout this manuscript as “menu”) and available commissary items were obtained from a Southwest rural county jail. The menu consisted of breakfast, lunch, and dinner available to all individuals incarcerated at the jail. Additionally, individuals incarcerated or their families, may purchase up to \$80.00 in items of shelf-stable food packs from the commissary, weekly. Review by the Northern Arizona University Institutional Review Board was not required for the current study because human subjects were not involved as per US Department of Health and Human Services guidelines.

Food items from the menu and commissary packs were entered into NutritionCalc[®] Plus (McGraw-Hill Education version 5.0.19). Individual daily profiles were created for the menu provisions, with meals entered as breakfast, lunch, and dinner. Each food item was entered as if an individual ate the menu provisions in their entirety using the amount provided on the menu. If NutritionCalc[®] Plus did not have a food or recipe in the database, food items close in nutritional value to the menu item were chosen, with “USDA” used whenever possible. As indicated by the menu, fruits were inputted as “fresh” (e.g., fresh apple, fresh banana) and beans and vegetables were inputted as “canned” (e.g., niblet corn, pinto beans, green peas). Menu items that were clearly indicated as fresh vegetables were entered appropriately (e.g., tossed green salad, carrot and celery sticks). Each commissary pack was considered an independent addition to the weekly menu and entered into NutritionCalc[®] Plus as a new profile. Based on contents, the four commissary packs were categorized as “Dinner Pack,” “Snack Pack,” “Breakfast Pack,” and “Sweets Pack.” The Dinner Pack (\$35.00) included 23 entrée-type items, such as ramen noodles and tuna fish. The Snack Pack (\$26.00) included

23 single-serving savory snack items, such as peanuts and pork rinds. The Breakfast Pack (\$21.50) included 52 breakfast-type items, such as freeze-dried coffee, honey buns, and sugar packets. The Sweets Pack (\$10.00) included 8 single-serving sugary snacks, such as cookies and candy.

Data evaluation

Nutritional intake guidelines are based on Dietary Reference Intakes (DRI), a set of nutritional reference values for all nutrients set by the Food and Nutrition Board of the Institute of Medicine (IOM). The DRI provides quantitative reference values of nutrient needs to plan and assess the diet of healthy people (McGuire, 2011). The DRI includes Recommended Dietary Allowances (RDAs) that provide the average daily dietary intake sufficient to meet the nutrient requirements of 97-98% of healthy people. The DRI is typically evaluated over a three-day period due to the fact that DRIs are valued over time and not necessarily a daily recommendation. RDAs are based on Estimated Average Requirements (EARs), the amounts of nutrients for meeting the requirements of 50% of healthy people in a specific age- and sex-group. The DRIs also include Adequate Intake (AI), used for nutrients instead of RDAs when scientific evidence is insufficient to calculate the EARs. The AI is based on nutrient intake levels of healthy people and exceeds the requirement for the nutrient. The DRIs were originally created in 1941 at the request of the National Defense Advisory Commission to provide a foundation for food relief efforts in the US and abroad during the war. Since those initial DRIs, the Food and Nutrition Board at the IOM has reviewed additional data to determine if there should be separate DRIs for Black and Hispanic Americans. All the data indicate that there is insufficient evidence to support the creation of separate DRIs based on ethnicity/race (Stallings et al., 2019).

Analyses of Vitamin B6, Vitamin B12, Vitamin C, Vitamin D, magnesium, zinc, and omega-3s of the menu and four commissary food packs were calculated using data acquired from NutritionCalc® Plus. Mean values for Vitamin B6, Vitamin B12, Vitamin C, Vitamin D, magnesium, zinc, and omega-3s in the menu and for the combination of the menu plus each individual food pack were calculated by summing each micronutrient and dividing by seven.

Dietary reference intakes.—For the analysis, we chose to analyze DRI data by determining mean values for the micronutrients based upon the seven-day cycle menu and commissary foods. The following are Recommended Dietary Allowances: Vitamin B6 is 1.3 mg, Vitamin B12 is 2.4 mcg, Vitamin C is 90 mg for men and 75 mg for women, Vitamin D is 15 mcg, magnesium is 420 mg for men and 320 mg for women, and zinc is 11 mg for men and 8 mg for women (Office of Dietary Supplements, 2021a; Office of Dietary Supplements, 2021b; Office of Dietary Supplements, 2021c; Office of Dietary Supplements, 2021d; Office of Dietary Supplements, 2021e; office of Dietary Supplements, 2021f). Omega-3 fatty acids have an AI of 1.6 g for men and 1.1 g for women. The DRIs for those aged 31-50 years were used as the greatest percentage of individuals incarcerated are 36-40 years old (Federal Bureau of Prisons, 2022).

Results

Daily Vitamin B6 ranged from 0.92-3.19 mg for the menu, and 0-3.10 mg for the commissary food packs (Table 1). Five of the seven days of the menu met recommendations for Vitamin B6. Mean percentage DRI for Vitamin B6 for the menu exceeded recommendations for men and women by 40%, and when consumed with the commissary food packs, exceeded recommendations for men and women by 40-75% (Table 2).

Vitamin B12 ranged from 1.99-3.89 mcg for the menu, and 0-0.68 mcg for the commissary food packs. Five of the seven days of the menu met recommendations for Vitamin B12. Mean percentage DRI for Vitamin B12 for the menu exceeded recommendations for men and women by 41%, and when consumed with the commissary food packs, exceeded recommendations for men and women by 41-45%. Daily Vitamin C ranged from 41.57-188.04 mg for the menu, and 1.45-34.20 mg for the commissary food packs. Three of the seven days of the menu did not meet recommendations for men for Vitamin C and did not meet recommendations for women on one day. Mean percentage DRI for Vitamin C for the menu exceeded recommendations for men and women by 21% and 44%, respectively, and when consumed with the commissary food packs, exceeded recommendations for men and women by 20-51%. Available daily Vitamin D ranged from 3.18-6.18 mcg for the menu and 0-0.43 mcg for the commissary food packs. All seven days of the menu did not meet recommendations for Vitamin D. Mean percentage DRI for Vitamin D for the menu did not meet recommendations for men and women by 68%, and when consumed with the commissary food packs, did not meet recommendations for men and women by 68-69%. Available daily magnesium ranged from 260.79-456.70 mg for the menu, and 0-262.0 mg for the commissary food packs. Three of the seven days of the menu met recommendations for magnesium for men, whereas five of the seven days met recommendations for magnesium for women. Mean percentage DRI for magnesium for the menu did not meet recommendations for men by 12% and exceeded recommendations for women by 16%, and when consumed with the commissary food packs, did not meet recommendations for men by 9-12% and met recommendations for women by 16-26%. Available zinc ranged from 7.62-18.52 mg for the menu, and 0-7.93 mg for the commissary food packs. Three of the seven days of the menu met recommendations for zinc for men, whereas six of the seven days met recommendations for zinc for women. Mean percentage DRI for zinc for the menu exceeded recommendations for men and women by 6% and 46%, respectively. When consumed with the commissary food packs, mean percentage DRI for zinc exceeded recommendations for men and women by 6-60%. Available omega-3 fatty acids ranged from 0.78-1.95 g for the menu, and 0-3.41 g for the commissary food packs. Two of the seven days of the menu met recommendations for omega-3s for men, whereas six of the seven days met recommendations for omega-3s for women. Mean percentage DRI (AI) for omega-3s for the menu did not meet recommendations for men by 11% and exceeded recommendations for women by 30%. When consumed with the commissary food packs, recommendations for men for omega-3s were not met by three of the four food packs. When consumed with the commissary food packs, omega-3s exceeded recommendations for women by 30-75%.

Discussion

We aimed to assess if provisions of micronutrients previously associated with mental health issues from a jail menu and commissary items in a Southwestern jail met dietary recommendations. We determined that the mean values of most nutrients from the menu, by itself and when combined with the commissary food packs, met nutritional guidelines for Vitamin B6, Vitamin B12, Vitamin C, and zinc. However, there were a few exceptions: Vitamin D (for men and women), magnesium (for men only), and omega-3s (for men only). Individuals incarcerated in this Southwestern county jail have access to diets that may not sufficiently promote positive mental health outcomes due to nutritional deficiencies; specifically Vitamin D, magnesium, and omega-3 micronutrients associated with mental health disorders, including bipolar, anxiety, and depression, did not meet dietary recommendations. However, research is limited in identifying the amounts of these micronutrients required for optimum mental health; we determined if these micronutrients met the average dietary guidelines for healthy adults.

Because of the criminalization of mental health, jails have become a point of mental health intervention for many and the largest providers of mental health and psychiatric services (Torrey et al., 2010). Although they are the largest provider of mental health care, correctional facilities may provide inadequate, or even harmful, mental health care services because of cost, lack of adequate screening, stigmatization of mental health, and the overall perspective that correctional facilities are punitive, not rehabilitative (Hutchison, 2017; Wilper et al., 2009). Diet modifications or supplementation can be one component of mental health intervention and may have a broad, holistic health impact on individuals while incarcerated. A nationwide survey found 157,634 individuals incarcerated in jails had at least one diagnosed mental health disorder with 38.5% taking medications prior to their arrest and 45% taking psychotropic medications after admission (Wilper et al., 2009). Incorporating nutrition with psychiatric treatment, and concomitantly, other social and structural services to improve mental health for individuals with a mental health illness, should be a standard and may improve outcomes for individuals incarcerated by improving overall health, well-being, and behaviors (Kris-Etherton et al., 2021; Smoyer and Minke, 2015; Wangmo et al., 2018). Intervention components may include, but are not limited to, establishing guidelines for dietitians or other experts as well as overseeing bodies to create and review menus in jails. Additionally, having experts such as a food service director or registered dietitian partner to collaborate with mental and physical health providers, behavioral health specialists, and other wellness professionals as an interdisciplinary team to make recommendations for health promotion for individuals incarcerated who may present with psychological symptoms. Another service that should be considered is a holistic health approach to mental health care in jails, although outside the scope of this study, includes time outdoors, particularly exposure to sunshine, as an important component of mental health. Exposure to sunshine and exercise can improve depression and anxiety symptoms and interventions to increase time outdoors may be of particular importance to individuals incarcerated as most individuals incarcerated do not attend recreation time, a time dedicated to physical activity, outside, when available (Camplain et al., 2022b; Camplain et al., 2022a; Penckofer et al., 2010).

Various considerations need to be accounted for when examining food within jails. Currently, menus are designed as a “one size fits all” service. While this approach meets the nutritional guidelines of the general population, it does not account for body size, age, gender, activity level, or personal health conditions (Collins and Thompson, 2012; Cook et al., 2015; Edwards et al., 2007; Eves and Gesch, 2003; Smoyer, 2019). For the purpose of our study, we assumed that individuals incarcerated consumed the menu provisions and commissary food packs in their entirety and were incarcerated for at least one day. As with previous research, our findings suggest the need for an individualized nutrient-balanced diet that can address mental health symptoms.

It is important to highlight the distinction between prisons and jails regarding menu planning. Jail settings are not studied as frequently as prisons and while federal prisons follow a national menu, local jails may incorporate different menus (Cook et al., 2015; Smoyer, 2019). Despite the nutritional guidelines outlined for correctional facilities, the menus and food choices vary among each institution (Condon et al., 2008). Literature confirms the limited studies examining the relationship between diets and nutrients in jail facilities. To date, there are two studies that examined the relationship of nutritional offerings and diet among individuals incarcerated (Collins and Thompson, 2012; Cook et al., 2015).

Jail facilities operate under their own State Department of Corrections, whereas prisons operate under the authority of the Department of Justice’s (DOJ) Bureau of Prisons (BOP). Similar to menu planning, mental health services vary among each correctional facility. In federal prisons, there are numerous programs that promote healthy lifestyle and healthy eating patterns (i.e., catering, sports programs, substance use treatment, and involvement with outside organizations; World Health Organization, 2021). Federal prisons have the opportunity to offer programs with lasting effects, such as cooking classes, self-cook kitchens, vocational training, gardens or farms, food-related to visits, food service catering operated by outside organizations, canteens, and informal food preparation (Smoyer and Minke, 2015). Our results suggest that an increase in micronutrients may be a step that serves to mitigate mental health symptoms. Increasing micronutrients may be achieved by improving jail menus or adding nutrition and diet programming, such as what is offered in federal prisons.

Predetermined menus and commissary do not empower an individual who is incarcerated to make choices that positively impact their physical and mental health. Research suggests that the loss of food consumption choice is just one way an individual loses their sense of self and agency as they are transformed into an individual incarcerated (Smoyer, 2019). Individuals are not able to adjust their food consumption to account for illness (i.e., common cold), cultural preferences, or nutrient depletion during the cooking process (Collins and Thompson, 2012; Cook et al., 2015; Smoyer, 2019). However, autonomy can be supported when individuals independently decide to make the choice to purchase vitamins which may positively improve their health and well-being. We can assume that those individuals who purchase vitamin supplementation value the purchase of vitamins and have an understanding of how they influence health, but this may not be the case for all those incarcerated.

Limitations

This study is not without limitations. We conducted analyses on a seven-day cycle menu provided by the jail rather than actual consumption of food. If supply issues arise or other factors that influence availability of the food provided, we were not able to determine changes in food provided. We additionally were not able to assess actual consumption of menu and commissary items among individuals incarcerated. Thus, we were not able to determine associations between consumption and mental health. However, it is an important contribution to the literature in that the menus are designed with full consumption in mind and what decisions about purchasing and serving are based on. Future work on actual preparation and purchasing behaviors would support our findings. There is sparse data on the impact nutrition and diet has on the mental health of individuals incarcerated, preventing a direct comparison of nutritional recommendations for mental health with the current menu and commissary items. It is important to note that a multivitamin is available for purchase from the commissary, but not all individuals incarcerated understand the impact micronutrients can have on mental health symptoms and may not have access to commissary and those who do may prefer to spend money on other items. Furthermore, vitamin supplementation may not be effective in reducing every deficiency (e.g., fiber), but they can address major micronutrient deficiencies based upon the established DRIs/AIs. Epidemiologic studies and clinical trials are necessary to determine causal inference between diet and mental health outcomes. Our study is limited to the comparison of available food for consumption to dietary standards. It should be considered that while representing 98% of the needs of a healthy population, the DRIs used for the current study may not be adequate for the incarcerated population studied as dietary needs vary within individuals. However, our work is a crucial first step in understanding the needs at the intersection of nutrition and mental health among individuals incarcerated in jail. The majority of literature on incarceration comes from prisons, not local or county jails, limiting generalizability of study results. We did not determine if vitamin and mineral supplements were provided to individuals incarcerated. However, we are confident that supplementation does not routinely occur within jail settings. Incorporating a micronutrient-rich diet may not be feasible for all jails due to the lack of resources, such as personnel and funding, needed to provide this service. Access to health care, programs, mental health services, and menus differ depending on type of facility, reason for incarceration, and length of stay. Furthermore, the size of a jail will determine the availability of services. Lastly, we examined data from a rural Southwestern county jail. While our findings were considerable and we can assume that we can extrapolate our findings across various ethnicities, cultures, and populations (i.e., age groups), future research should examine the immense ethno-cultural differences in dietary preferences and the menus of more facilities.

Conclusion

We determined that micronutrients associated with poor mental health, including Vitamin D, magnesium, and omega-3s, do not meet dietary recommendations at a rural county jail. To date, there is more information on prison settings than jails pertaining to the impact of diet on mental health symptoms (Smoyer, 2019). Current literature endorses the need for refining menus served in jails and examining the advantages and disadvantages of

commissary foods for incarcerated individuals to support overall healthy eating patterns (Collins and Thompson, 2012; Cook et al., 2015; Schoenthaler et al., 2021; Smoyer, 2019). Research indicates that nutrition directly impacts mental health symptoms of individuals incarcerated, but is inconclusive on the micronutrient (i.e., combinations of minerals and vitamins) consumption levels needed to effectively address symptoms of mental health disorders (Adan et al., 2019; Firth et al., 2020; Gately and Kaplan, 2009; Rucklidge et al., 2010; Kris-Etherton et al., 2021). Further rigorous studies are needed to explore the associations, both direct and indirect, micronutrients play in ameliorating mental health disorders for individuals incarcerated in jails.

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Nutrient Provisions of a Seven-Day Cycle Menu and Commissary Food Packs at a Rural County Jail in the Southwestern United States

Table 1

Macronutrient	Seven-Day Cycle Menu Provisions							Commissary Food Packs			
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Dinner Pack	Snack Pack	Breakfast Pack	Sweets Pack
Vitamin B6 (mg)	1.82	1.19	2.09	1.66	3.19	1.90	0.92	0.48	0.13	3.10	0.00
Vitamin B12 (mcg)	3.09	3.89	5.02	3.40	2.07	4.19	1.99	0.68	0.34	0.10	0.00
Vitamin C (mg)	116.97	109.24	41.57	80.46	188.04	132.68	88.14	4.93	34.20	1.45	2.28
Vitamin D (mcg)	5.92	6.18	5.74	3.18	4.84	3.18	4.85	0.43	0.22	0.00	0.00
Magnesium (mg)	260.79	373.99	440.23	277.99	452.41	456.70	332.70	220.00	79.10	262.00	0.00
Zinc (mg)	7.62	11.30	18.52	10.24	10.43	14.33	9.16	7.00	2.79	7.93	0.00
Omega-3 fatty acids (g)	1.50	1.95	1.30	0.78	1.49	1.69	1.33	3.41	0.52	0.22	0.00

Table 2

Mean Nutrient Provisions and Dietary Reference Intake of a Seven-Day Cycle Menu and Commissary Food Packs at a Rural County Jail in the Southwestern United States

Nutrient	Seven-Day Cycle Menu			Menu + 1 Dinner Pack			Menu + 1 Snack Pack			Menu + 1 Breakfast Pack			Menu + 1 Sweets Pack		
	Mean Provisions	% DRI		Mean Provisions	% DRI		Mean Provisions	% DRI		Mean Provisions	% DRI		Mean Provisions	% DRI	
		M	F		M	F		M	F		M	F		M	F
Vitamin B6* (mg)	1.82	140%	140%	1.89	145%	145%	1.84	142%	142%	2.27	175%	175%	1.82	140%	140%
Vitamin B12* (mcg)	3.38	141%	141%	3.48	145%	145%	3.43	143%	143%	3.39	141%	141%	3.38	141%	141%
Vitamin C* (mg)	108.16	121%	144%	108.86	121%	145%	113.04	126%	151%	108.36	120%	144%	108.48	121%	144%
Vitamin D* (mcg)	4.84	32%	32%	4.90	33%	33%	4.87	32%	32%	4.84	32%	32%	4.84	32%	32%
Magnesium† (mg)	370.69	88%	116%	402.12	96%	126%	381.99	91%	119%	408.12	97%	128%	370.69	88%	116%
Zinc* (mg)	11.66	106%	146%	12.66	115%	158%	12.06	110%	151%	12.79	116%	160%	11.66	106%	146%
omega-3st (g)	1.43	89%	130%	1.92	120%	175%	1.51	94%	137%	1.47	92%	134%	1.43	89%	130%