

A scoping review of nutrition education interventions applied in prison settings

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Declarations

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Conflict of Interest

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Conceptualisation of the study was done by BAE. NB, JE, BAE carried out research for this study. Data Analysis, tabulation, and writing of the manuscript was carried out by FA, NB, AA, AS, ED. Initial reviews of the manuscript were carried out by FA, NB, ED. Final review of article was carried out by BAE FA, ED.

Abstract

Purpose of review: Over 11 million individuals are incarcerated globally, facing health challenges such as obesity, diabetes, and cardiovascular disease, possibly exacerbated by prison diets. The objective of this scoping review is to explore the various available types of nutrition education interventions that currently exist in the literature applied in prison settings.

Recent findings: Utilizing the PRISMA Extension for Scoping Reviews, 19 databases were searched for studies on nutrition interventions in prisons from 2000 to May 2023, guided by the 'PICO' structure. Inclusion criteria encompassed articles in five languages from peer-reviewed journals focusing solely on nutrition education interventions. Rayyan QCRI software was utilized for screening and data extraction. 15 international studies were analyzed, covering various countries, and targeting different populations in prisons. Interventions varied from nutrition education to comprehensive health programs. The outcomes were inconsistent, with some showing health improvements and others encountering challenges. Few utilized established theoretical frameworks, indicating a research gap.

Summary: The range of interventions highlights the potential complexity of nutrition education interventions within prisons. Implementing recognized theoretical frameworks may enhance effectiveness. The diverse outcomes highlight the challenges in creating impactful programs, emphasizing foundational issues. Recommendations focus on rigorous research designs and understanding prison-specific complexities.

Nutrition education interventions in incarcerated settings present varied results, emphasizing the need for well-structured, theoretically grounded, and carefully evaluated programs. Future strategies should recognize the multifaceted nature of correctional facilities, aiming for holistic approaches to improve health in prisons.

Keywords

Nutrition; education; Prison; incarceration

Introduction

Globally, there are more than 11 million people incarcerated in prison systems [1,2]. For example, in the United States, approximately 740,700 individuals account for those incarcerated in local and county jails with approximately 10.7 million new individual admissions annually [3,4]. Incarceration is regarded as a social determinant of health that can affect the health and well-being of those currently incarcerated as well as those with a history of incarceration, their families, and communities [5,6]. Additionally, several chronic diseases such as cardiovascular disease and diabetes is considered to be the leading causes of morbidity and mortality among incarcerated people [7-12].

The incarcerated population are some of the most disadvantaged at-risk and underserved groups in society inflicted with several socially-determinant public health issues and chronic conditions. An inmate's control over the two most important risk factors contributing to obesity and hence cardiovascular risk is varied. These include a healthy diet and regular physical activity [13]. One of the major public health issues that contributes to these chronic diseases is the lack of healthy nutrient-dense food available to incarcerated people [14]. Overall, prisons tend to serve less nutrient-dense fruits, vegetables, and whole grains and more calorically-dense high fat, high sugar, and high sodium foods that contribute to the development of obesity, diabetes, and cardiovascular disease [3,10,15]. In the last decade, evidence-based health interventions involving nutrition, physical activity, and health education among the incarcerated have studied the feasibility and potential efficacy of these interventions to improve health outcomes [11,16-22].

A scoping review examining food in correctional facilities found that, overall, most inmates had low rates of satisfaction with the food provided and there were significant connections made

throughout the facilities relating to cooking partnerships and sharing of foods [23]. Conversely, the same review found that those within facilities with self-cook programs had higher satisfaction with the food they consumed [23].

The purpose of this scoping review is to examine the nutrition education interventions that have been applied within prison systems around the world and investigate the effects these interventions have on health-related outcomes of incarcerated individuals and individuals working within the prison setting. An examination of these interventions will assist in determining effectiveness of various nutrition education interventions in prisons. This information can then be used to expand and develop nutrition education interventions in prison systems throughout the world with the intent to reduce chronic health conditions and improve overall health outcomes of incarcerated individuals. The objective of this scoping review is to explore the various available types of nutrition education interventions that currently exist in the literature applied in prison systems.

Methods

Literature search

A scoping review of the literature was conducted using 19 databases, employing the PRISMA Extension for Scoping Reviews [24], that were selected due to their medical and biomedical scope and rigor and a combination of search terms and phrases (Table 1). The comprehensive electronic search was undertaken to identify all available intervention-based studies relating nutrition education applied in prison settings worldwide and the inclusion/exclusion criteria was based around a ‘Population, Intervention, Outcome’ (PICO) structure (Table 2). Additionally, reference lists from retrieved studies were hand searched to identify any additional relevant

publications. All retrieved articles were screened against the eligibility criteria for relevance to the topic and the objective of this review. Given the nature of this review, no ethical oversight or approval was found to be necessary and therefore not acquired.

Eligibility Criteria

The search was limited to studies published in the Italian, Spanish, English, Arabic, and French languages in peer-reviewed journals. The search was conducted in the early summer of 2023 and the results communicate literature published between 2000 and May 2023. Only intervention-focused articles that involved the application of a nutrition-based intervention or education or program as either the primary intervention or as a component of a multi-behavioral intervention were included. Protocol studies were also included. Publications in other languages, brief communications, grey literature, qualitative studies, and interventions reported outside of traditional peer-reviewed articles were excluded (Table 2).

Study Selection and Data Extraction

BAE and JE independently conducted the literature search and selected studies for inclusion in the scoping review. Differences were discussed to reach consensus; NB resolved discrepancies if needed. Extraction and tabulation of data was done by AS and AS and independently checked by BAE and ED. The search strategy was adapted according to the indexing systems of each respective database. Rayyan QCRI software [25] was used to assist in the screening process and study selection. Titles and abstracts were screened for relevancy, and potentially relevant journal abstracts were reviewed by 3 of the authors (FA, NB, and BAE). Potential studies for inclusion in this review were evaluated independently by each author for relevance, merit, and

inclusion/exclusion criteria (Table 2). All selected articles were then discussed with the primary author before final decision for inclusion (Figure 1). Once the list of selected studies was finalized, BAE, AS, and AS extracted and FA and NB cross-checked the following for each study: author, date, target population, country, type of study, sample size, type, details of intervention, measured parameters, main results, and main recommendations. Differences in opinion in data extracted were discussed to reach consensus and tabulated (Table 3). Given that methodological quality assessment is not a prerequisite for scoping reviews, we did not appraise the included studies [26].

Results

The review included 15 studies from various countries. The United States (US) had the highest representation with seven studies [16,19,27-31] followed by Spain with four studies [32-35]. Canada, Turkey, Haiti, and France were each represented by a single study [36-39]. The studies reviewed predominantly focused on incarcerated populations. Gil-Delgado et al. [32] and Mauro-Martín et al. [33] examined both male and female inmates in Spain. Örs [39] and Mainous et al. [38] focused on male prisoners in Turkey and Haiti, respectively. Elwood Martin et al. [36] directed their study towards women prisoners in Canada. Clouse et al. [27] and McKinney, Cotronea [28] targeted male prisoners in the US, with the latter focusing on a federal correctional institution. Ferraro et al. [34] uniquely targeted employees at a high-security correctional institution. Sebelia, Greene [29] and Nair et al. [16] both explored adult prisoners in the US, with Nair et al. [16] specifically looking at incarcerated women. Firth et al. [30] study focused on female inmates with diabetes in the US. Martínez-Delgado, Ramírez-López [35] studied prisoners with chronic conditions in Soria, Spain. Albertini et al. [37] took a unique approach by

focusing on diabetic patients in a prison. Curd et al. [31] targeted adult males in a substance abuse program in Kentucky, US, and Johnson et al. [19] explored a female federal prison campus in the US. The methodologies employed spanned from prospective longitudinal studies, experimental designs, pre- and post-intervention assessments, to quasi-experimental and descriptive studies. Sample sizes across these studies were diverse, ranging from as few as 15 in McKinney, Cotronea [28] to as many as 1060 in Mainous et al. [38]. Of the 15 studies, only three [27,28,36] employed specific theoretical frameworks. Both Elwood Martin et al. [36] and Clouse et al. [27] utilized the PRECEDE/PROCEED planning model, while McKinney, Cotronea [28] integrated the self-determination theory.

Interventions across the 15 studies were diverse, encompassing a range of approaches from nutritional education, physical activity encouragement, health risk assessments, to comprehensive health programs. Gil-Delgado et al. [32] introduced a nutritionist-recommended diet and encouraged physical activity. Örs [39] compared the effects of education and brochures on nutritional knowledge. Mainous et al. [38] provided a culturally competent educational intervention for prison cooks, focusing on addressing nutritional deficits. Clouse et al. [27] analyzed data from the Wellness Works program participants who underwent pre- and post-health risk assessments. Elwood Martin et al. [36] implemented a 6-week pilot program that combined nutritional guidance with a personal exercise component. McKinney, Cotronea [28] developed an educational course on nutrition based on self-determination theory. Mauro-Martín et al. [33] conducted a nutrition education intervention. Ferraro et al. [34] initiated a 20-week weight-loss challenge for correctional institution employees. Sebelia, Greene [29] dispatched stage-tailored newsletters to promote fruit and vegetable consumption. Nair et al. [16] introduced an indoor group cycling program combined with a health education program. Firth et al. [30]

assessed the effectiveness of the Healthy Food Access Project on female inmates with diabetes. Martínez-Delgado, Ramírez-López [35] conducted a health education workshop focusing on chronic conditions like diabetes and hypertension. Albertini et al. [37] introduced a therapeutic education program tailored for diabetic patients in prison. Curd et al. [31] implemented the Wellness Works program designed for recovering substance abusers, emphasizing their health during recovery. Lastly, Johnson et al. [19] introduced a multi-component intervention, including pedometer use and health education classes, for female inmates.

The outcomes of the 15 studies under review varied considerably in terms of their effectiveness and primary focus. Gil-Delgado et al. [32] documented notable improvements in anthropometric variables and cardiovascular risk parameters, suggesting a robust intervention efficacy. Similarly, Ferraro et al. [34] evidenced significant reductions in weight, BMI, and waist circumference among correctional institution employees, underscoring the potential of targeted interventions in such settings. Elwood Martin et al. [36] reported a statistically significant decrement in waist-to-hip ratios and other health metrics, reinforcing the efficacy of their 6-week pilot program. Sebelia, Greene [29] achieved positive results with an uptick in fruit and vegetable consumption among participants. Firth et al. [30] reported a reduction in hemoglobin A1c levels among exposed inmates, indicating improved glycemic control. McKinney, Cotroneo [28] showcased a mastery of nutritional content, with post-test scores markedly surpassing pre-test scores. Curd et al. [31] reported improvement in nutrition practices, general health outcomes and social ties among the program participants compared to the control group. Albeit the changes are not as pronounced as in other studies.

In contrast, the study by Johnson et al. [19] presented mixed results. While in their study they documented a significant decrease in BMI, resilience scores remained static. Örs [39]

emphasised the efficacy of combined education and brochures in enhancing nutritional knowledge. Mauro-Martín et al. [33] highlighted higher nutrition knowledge among prisoners vis-à-vis a control group.

Conversely, Mainous et al. [38] characterized their intervention as unsuccessful, with persistent, and in some cases exacerbated, nutritional deficiencies. Martínez-Delgado, Ramírez-López [35] pinpointed cardiovascular risk among a subset of their participants, but the broader implications of their intervention remain ambiguous. Albertini et al. [37] deemed their therapeutic program feasible, but with marginal changes in HbA1C levels. Clouse et al. [27] identified improvements in discrete health risk factors, such as smoking and depression, but other health indicators remained static. In summation, the reviewed studies underscore the multifaceted nature of nutrition education within incarcerated settings, with some interventions demonstrating pronounced effectiveness, while others encountered challenges.

Several studies targeting incarcerated populations have provided recommendations based on their findings. Gil-Delgado et al. [32], Elwood Martin et al. [36], and Firth et al. [30] emphasized the importance of extended follow-up periods and larger sample sizes to enhance the robustness and generalizability of results. Additionally, Martínez-Delgado, Ramírez-López [35] conducting post-intervention behavioral assessments. McKinney, Cotronea [28] and Sebelia, Greene [29] highlighted the need for aligning interventions with specific theoretical constructs and gauging commitment to dietary changes. Ferraro et al. [34] and Mauro-Martín et al. [33] supported the integration of regular physical activities and nutrition education in correctional settings. Mainous et al. [38] emphasized the significance of addressing food inadequacies. Clouse et al. [27] and Johnson et al. [19] pointed out the necessity for rigorous data collection methods, control groups, and caution against potential biases from self-reporting. Örs [39] suggested that inmate

participants may benefit from nutrition education but suggested further investigations be performed in a larger study population.

Discussion

The current review sought to examine the nutrition education interventions within prison systems around the world and investigate the effects of these interventions. From the results, it is evident that interventions varied considerably in their approach, theoretical foundation, and outcomes. The implementation of specific theoretical frameworks, as seen in three studies, suggests a potential benefit for intervention development. The PRECEDE/PROCEED model, utilized in two studies, offers a systematic approach to health program planning and evaluation, focusing on behavioral and environmental determinants and reinforcing health practices. Similarly, the integration of the self-determination theory utilized by McKinney, Cotronea [28] anchors the intervention on innate psychological needs, promoting sustained behavior change. This could indicate that the employment of established theoretical frameworks might aid in the robustness and efficacy of interventions. A recommendation, drawn from studies such as McKinney, Cotronea [28] and Sebelia, Greene [29], was the alignment of interventions with specific theoretical constructs. This highlights the importance of grounding health programs within established behavioral theories thereby improving their efficacy. The use of theoretical based interventions has been widely recognized as critical for ensuring consistent, positive outcomes in nutrition interventions [40,41].

Diversity in interventions ranged from simple nutritional education to more comprehensive health programs. The results reflect the efficacy of specific methods over others. For instance, combining nutritional guidance with physical activity, as done by Elwood Martin et al. [36],

appeared to have significant positive effects. In contrast, more focused interventions like those targeting food inadequacies or specific health conditions did not always yield desired results, as observed with Mainous et al. [38] and Albertini et al. [37]. These findings align with other reviews where comprehensive multicomponent nutrition interventions have shown high effectiveness in other contexts and different populations [42,43].

Several of the reviewed studies achieved measurable success in health metrics such as reduced BMI, waist circumference, and improved nutritional practices. It is notable that some of these successful interventions were relatively short-term, such as the 6-week pilot by Elwood Martin et al. [36]. On the other hand, some interventions yielded mixed or minimal results. The variance in outcomes highlights the challenges inherent in creating effective nutrition education for incarcerated settings, given the variety of factors that can influence health behaviors.

Specifically, the challenges faced in correctional facilities, like those identified by Mainous et al. [38], highlight the importance of addressing foundational issues, such as food inadequacies, before or in tandem with other health initiatives. Other reviews had also highlighted the unique challenges and barriers in correctional facilities [44,45]. Such insights provide a roadmap for more holistic and effective strategies. Recommendations derived from the studies highlight several common themes for future research and implementation. The emphasis on extended follow-up periods, larger sample sizes, and post-intervention behavioral assessments underlines the necessity for rigorous research designs. Such recommendations ensure that observed results can be attributed to the intervention and can be replicated or scaled up.

Conclusion

In conclusion, while certain nutrition interventions within prison settings show potential, the diverse results emphasize the need for carefully planned, theoretically grounded, and rigorously evaluated programs. To elevate the health status of incarcerated populations, future interventions should take into account the complex interplay of environmental, behavioral, and individual factors inherent in such settings.

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Figure 1. PRISMA Flow diagram

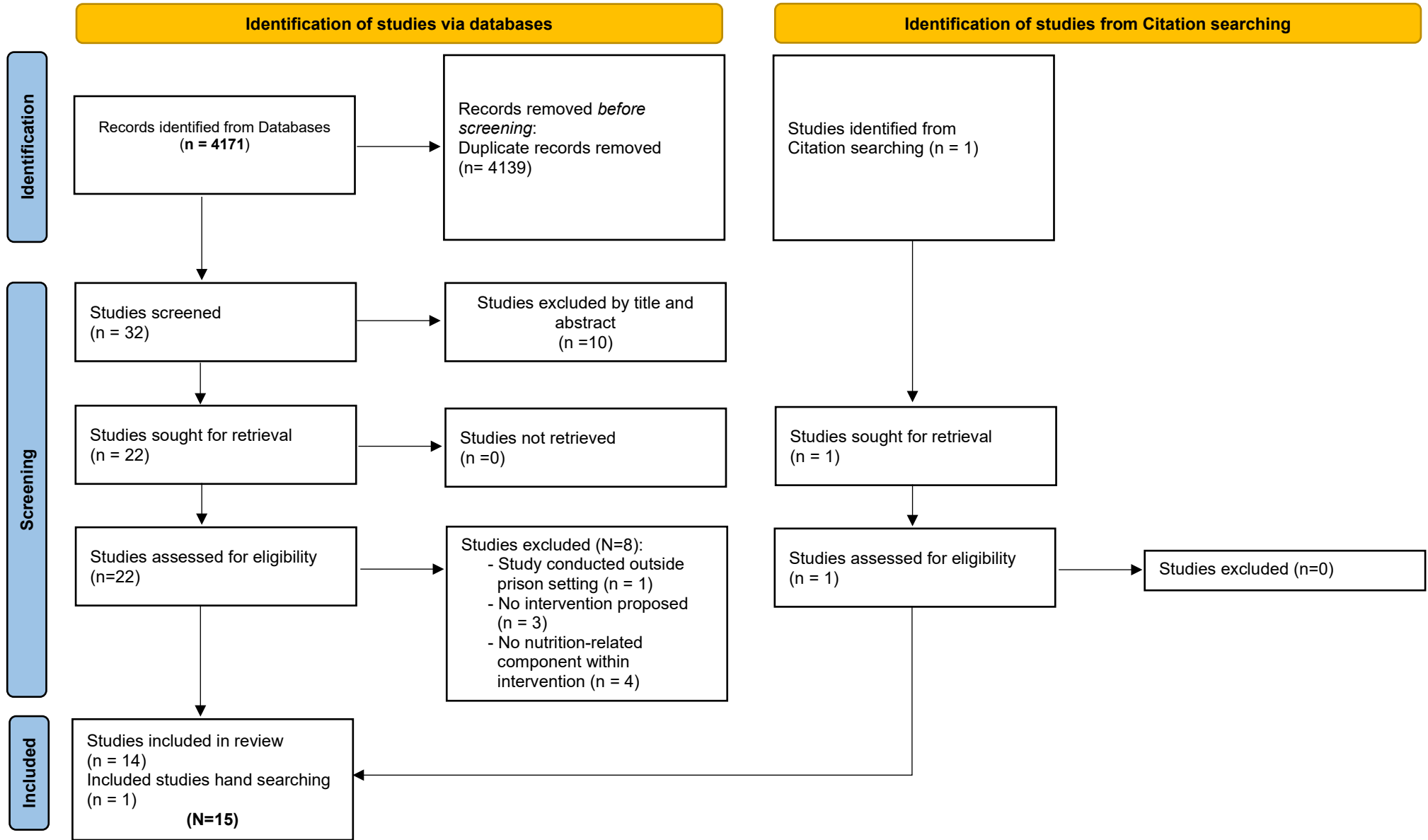


Figure 1. PRISMA Flow diagram

Table 1. Electronic Databases Used with Relevant Search Period and Terms

Databases	Search Period	Search Terms, Keywords, and phrases
PubMed; Scopus; ScienceDirect; EBSCOHost; ArticleFirst; SpringerLink; ProQuest; Taylor & Francis; Wiley Online; Biomed Central; BioOne; CINAHL; BIOSIS; SAGE Reference Online; Web of Science; PsycINFO; EMBASE; BIOSIS; ASSIA	2000 to May 2023	nutrition [All Fields]; OR diet [All Fields]; AND intervention [All Fields]; OR [All Fields]; education [All Fields]; OR program [All Fields]; AND prison [All Fields]; OR correctional facility [All Fields]; OR incarceration [All Fields]; OR penitentiary [All Fields]

Table 2. PICOS Criteria for inclusion and exclusion of studies

Parameter	Inclusion Criteria	Exclusion Criteria
Date Range	Between 2000 and May 31 st 2023	N/A
Population	Any population group under study applied within the prison system setting	N/A
Morbidities	With or without morbidities	N/A
Intervention type	All Nutrition-delivered interventions applied within the prison setting that examine: <ul style="list-style-type: none">- Adherence to the nutrition intervention- Impact of the intervention on nutrition behaviors- Impact of the intervention on nutrition-related health outcomes	Non-nutrition-focused interventions or intervention lacking a nutrition-related component as part of a multi-behavioral intervention Interventions applied outside the prison setting
Outcomes	Blood pressure Weight Blood lipid profile Food intake Diet quality Sodium intake Overall quality of healthy eating Commitment to maintaining Behavior change Nutrition knowledge	Non-numeric/categorical assessment
Language	Italian, Spanish, English, Arabic, and French	All other languages
Category	Peer-reviewed articles	Non-peer-reviewed articles
Study Types	Intervention-based studies Intervention Protocols	Commentaries Narratives Communications Conference papers Non-intervention based studies White papers Grey Literature Similar article types

Table 3. Summary of literature search ($N = 15$)

Authors (Year)/ Country	Target Population	Type of Study	Sample Size	Intervention	Theoretical Framework /Model used	Measured Parameters	Main Results	Main Recommendations
Gil-Delgado et al. (2011)/ Spain	Men and women inmates of Prison of Huelva	Prospective longitudinal non-randomized cohort study	139	Nutritionist recommended special diet was provided to the inmates and physical activity was encouraged	NS	Anthropometric variables like-weight, height, BMI, abdominal perimeter, determination of fat mass ratio and blood pressure Biochemical factors in blood test- blood sugar concentration, total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, glycated hemoglobin). Cardiovascular risk calculated using the following: age, gender, a family and personal history of	Changes observed were-Weight loss of 1.4 kg; a BMI decrease of 0.5 kg/cm ² ; a fat mass percentage decrease of 0.7%, a reduction of the abdominal circumference of 2.5 cm and an average reduction of diastolic blood pressure of 1.2 mm Hg; Between the initial and the final assessment there was a decrease of the number of patients at high risk from baseline, while the number of patients at low risk slightly increased and the number of patients at average risk was unchanged.	A Longer follow-up period (>1 year) is recommended.

premature ischemic heart disease in first degree relatives (under 55 in males and under 65 in females), tobacco smoking throughout the past year

Framingham functions to estimate of suffering a cardiovascular event in the next 10 years.

Örs (2018)/Turkey	Adult male prisoners in Amasya, Turkey	Experimental	504	<p>This study compared the following four groups of prisoners: education, brochure, education+ brochure and control group</p> <p>Nutritional education was provided orally as two course hours per week for two weeks for education and education+ brochure</p>	NS	<p>Nutritional knowledge</p>	<p>Highest score (23.04) in the posttest was for the “brochure + education” group, which was followed by the “education” (21.34) and “brochure” (8.44) groups.</p> <p>There were no significant differences between the pretest and posttest scores ($p>0.05$) in the brochure group.</p>	<p>Inmate participants could benefit from nutrition education and suggests that further investigations should be performed in a larger study population</p>
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				groups but not for the other groups.				
Mainous et al. (2022)/ Haiti	Incarcerated men in the National Penitentiary in Port Au Prince and the prison in Mirebalais	Experimental	1060	A culturally competent educational intervention was delivered to the prison cooks where after assessing ingredients used by prison cooks in prepared meals, a training was administered subsequently to improve knowledge of nutrition. Discussion on foods addressing the nutritional deficits of vitamin B1 deficiency and affiliated beriberi disease, vitamin C deficiency and affiliated scurvy was carried out Recipes with reasonable food substitutes were advised	NS	BMI Dietary assessment using the Automated Self-Administered 24-h (ASA24)	Intervention was unsuccessful The mean caloric intake per day in both the baseline and the follow up consistent with a starvation-level diet i.e., <600. Caloric intake decreased to a mean of 454 per day (p < 0.001) The proportion of incarcerated men who had insufficient vitamin C and vitamin B1 to prevent disease increased in the follow-up period	The identification of the factors preventing Haiti's prisons from obtaining enough food and the ability for cooks to plan nutritious meals will have the greatest effect on the health and wellbeing of those persons within Haitian prisons.
Clouse et al., (2012)/ USA	Incarcerated male prisoners at LaGrange, Kentucky	Pre- and post-HRA assessments	177	This study analyzes data from Wellness Works program participants who completed a pre- or post- health risk assessment (HRA).	PRECEDE/PROCEED planning model and community-based participatory research concept	Demographics Exercise status, nutrition, stress, depression, smoking status, Length of incarceration social ties, race,	Smoking (1.3; CI [0.4, 2.16]; p<005) and depression (1.4; CI [0.6, 2.18]; p<0005) were the only health risk factors that were significant after the intervention. Respondents experienced, on average, 2 fewer days of poor physical health and the average number of days (in the past 30	Incorporating rigorous data collection methods and repeating this study after including a control population will

						access to health care Health indicators were categorized as healthy, moderate health risk, or high health risk.	days) of experiencing poor physical health was found to improve significantly by 2 days.	provide better insight on the reliability of the HRA. It is also recommended to measure nutrition and anthropometric measurements for future studies
Elwood Martin et al. (2013)/ Canada	Women prisoners in a medium security correctional center in Canada	Pre- and post-intervention assessments quasi-experimental study	16	The 6-week pilot program included a nutritional component and a personal exercise component. For the nutritional component, participants were given the Canada Food Guide and a personalized food chart to self-monitor their eating behavior progress for six weeks and a PowerPoint nutrition presentation weekly. For the exercise component, proper use and maintenance of the fitness equipment was demonstrated to the women in a gym to	Participatory action research and the Precede-Proceed framework	Weight, BMI, waist-to-hip ratio, and chest measurements, Physical Activity Readiness Questionnaire (PAR-Q)	The decrease in the mean W-H ratio and mean chest measurement was statistically significance (p=0.06 paired t-test, p=0.002 paired t-test). Mean changes observed were- Weight (170.93 to 168.13), BMI (27 to 26.27), waist-to-hip ratio (0.82 to 0.80), and chest measurements (37.97 to 36.98) decreased, and energy, sleep, and stress levels improved by the end of the program.	A larger sample size is recommended to improve the generalizability of results.

				encourage independent workout.				
McKinney& Contronea (2011)/ USA	Male prisoners in Federal correctional institution, McKean	Pre/post test	15	<p>The purpose of the present study was to incorporate the two components of self-determination theory towards educational courses (i.e., competence and autonomy) into the development of a new correctional educational course on nutrition. Additionally, pre and post-test measures were created evaluate mastery of the material.</p> <p>The interactive activities created for the course were choosing the healthiest grocery items based on reading food label examples, and building a 7-day menu of meals in order to be more organized during grocery shopping</p>	Self-determination theory		<p>First course offering- Average post-test score was 97%. There was a significant increase in scores from pre to posttest (t=15.95)</p> <p>Second course offering- Average score in the course was 92%, which was lower than the first class. Pre to posttest scores increased at the end of this course (post-test, t = 12.17)</p> <p>Third course offering- a significant increase in the scores from pre-test to post-test, t = 17.04, p < .001</p>	A major limitation of the study was that the study instruments did not include items directly measuring constructs from the SDT. Specificity in course content and measurement items is recommended.
Mauro-Martín et al. (2017) Spain	Male and female Prisoners	Pre-/post intervention	Prisoners group: n=53	Nutrition education intervention	NS	Nutrition knowledge	Better nutrition knowledge was obtained for prisoners group compared to control group (p>.05)	It is important promote nutrition education in prison through effective

			Contr ol grou p: n=45				No significant differences were found before and after the nutritional workshop (p>.05)	communication via workshops and other activities. A multi-sectorial collaboration is highly recommended.
Ferraro et al.(2013)/ USA	Men and women employees at a high-security correctional institution	Pre-/ posttest quasi-experim ental design	24	This intervention consisted of a 12-week weight-loss program with an 8-week weight-maintenance period (20-week program) called “Lose the Weight; Win Your Health” weight-loss challenge All educational materials for healthy weight-loss were posted biweekly on the bulletin board in the officers’ mess	NS	BMI Weight Waist circumference	Significant reductions in weight (13.36 lbs reduction), BMI, and waist circumference (among men) were observed before and after the intervention At the completion of the program, 37.5% (n=9) participants were overweight (25 to 29.9 kg/m2), 45.8% (n=11) had class I obesity (30 to 34.9 kg/m2), and 16.7% (n = 4) had class II obesity (35 to 39.9 kg/m2) The average waist circumference declined from 43.79 ± 1.07 inches at baseline to 41.14 °± 1.04 inches at week 20.	Future interventions could incorporate ways of incorporating regular physical activity into correctional officers’ daily routine, such as adopting a form of job rotation that would eliminate long uninterrupted sedentary work. Additionally, factors affecting health outcomes related to employee schedules should be targeted.

Sebelia et al. (2007)/ USA	Adult female and male prisoners enrolled at the Rhode Island (RI) Department of Corrections	Non-experimental study. Pre- and post-intervention assessments	81	The intervention consists of 4 stages of change tailored newsletters mailed to participants on a weekly basis to promote the consumption of fruits and vegetables (FV).	NS.	Nutrition FV intake Self-efficacy to consume FV	An increase of mean cups of fruits and vegetables day usually eaten from 3.1 +/-2.1 to 4.3 +/- 2.3, t=5.4, p<0.001 was noted. The frequency of consumption of FV/day was measured by the NCIFV screener from 4.9 +/-3.3 to 6.4 +/-4.5, t=5.5, p<0.001. There was an increase in self-efficacy to eat 5 cups of FV/day from 6.1 +/-3.4 to 7.3 +/- 2.9, t=4.8, P<0.001. There was a positive movement towards action and maintenance for 5 cups of V/day from pre to post-intervention ($X^2 = 44$, P<0.001) with most of the stage movement in the first 2 weeks.	This study measures the commitment to behavioral change and self-efficacy in consuming recommended cups of FV.
Nair et al. (2016)/ USA	Incarcerated women (18-59 years of age)	Quasi-experimental, two-group design	120	Indoor group cycling (IC) and health education programs (HEP) focus on integrating critical cardiovascular health information that promotes fitness, healthy eating and weight maintenance, smoking cessation and relapse through health education, providing social support, and guiding on making healthy lifestyle choices. Trained instructors	NS.	Primary outcomes of CV-related health measures include; CV-health related measures and test or device: (1) aerobic fitness - the Canadian home fitness step test, (2) muscle flexibility - the Sit and Reach test, (3) BMI (BMI)	Study on-going pending results and recommendations	Study on-going pending results and recommendations

				conducted 60 min IC classes three times a week at the prison facility. The principal investigators delivered 2-hour HEP workshops that include didactic lectures, discussions, role-playing, and readings.		- self-reported height and weight (kg/m ²), and (4) percent body fat - the Omron™ hand-held device.		
Firth et al. (2015)/ USA	Female inmates with diabetes at Coffee Creek Correctional Facility	Quasi-experimental study	63	The goal is to determine the effectiveness of the Healthy Food Access Project (HFAP) on female inmates with diabetes and reduced calorie menu on glycemic control, other biometric measures, and calories purchased from commissary foods.	NS.	Baseline demographics Biometric measures (height, weight, HbA1c, and cholesterol) Calorie menu and commissary purchases	Exposed inmates were able to reduce their hemoglobin A1c levels by 0.04% points/month compared with 0.01% points/month among unexposed inmates. The BMI changes noted were attributed to the amount of time the participants served at the prison. An average of 1094 calories was purchased from the commissary per day.	A longer observation period and larger sample size are required to find significant group differences and establish a strong and positive impact of the intervention on female prisoners.
Martinez-Delgado et al. (2016)/ Spain	Prisoners from Soria with chronic conditions (i.e. diabetes, hypertension)	Descriptive study	33	The Health Education workshop consists of three one and a half hour long group sessions focused on the etiology, diagnosis, and treatment of diabetes, hyperlipidemia, and hypertension as well as basic principles on eating a Mediterranean diet and physical	NS.	Demographic details, Cardiovascular risk assessment – measured by Gray and Bray’s scale based on age and waist-to-hip ratio. Quantitative variables: weight (kg), height (cm),	Cardiovascular risk was calculated using the REGICOR table for 18 (54%) participants over the age of 35 years old. Among these 4.12% of participants were at moderate risk of developing cardiovascular disease in the next ten years. About 11 participants (33.3%) were categorized as overweight BMI (25.0 – 29.9) while 4 participants (12.1%) were obese BMI (>30).	It is recommended to interview participants after 6 months of intervention exposure. The authors determined only participants’ intentions to modify their behaviors but

				exercise in different conditions.		BMI (kg/m ²), systolic blood pressure (mmHg), diastolic blood pressure (mmHg), total cholesterol (mg/dl), HDL cholesterol (mg/dL), waist and hip circumference (cm) Other variables: substance use (i.e., alcohol, drugs) and smoking status.		must also follow up to see if the changes have been implemented. It is recommended to have a larger sample size for future studies.
Albertini et al. (2015)/ France	Diabetic patients in prison	Monocentric prospective observational study	21 for the diagnostic session 10 for the evaluation session	Therapeutic education program tailored to prison for diabetic patients (ETADIAP)	None	Feasibility Number of beneficiaries HbA1C Development of educational tools specific to the target population	The therapeutic education program is feasible No significant change in HbA1C was obtained Specific tools were developed	Further improvement in the program are need to ensure a better impact on health status due to the challenging circumstances on the Diabetic patients in prison

Curd et al. (2013)/ USA	Adult males enrolled at a 200-bed minimum security residential behavioral substance abuse program (SAP) operated by a Kentucky state prison system.	Pre- and post-inmate-Health Risk Assessment [I-HRA]	19	Wellness Works was designed for recovering substance abusers to make them accountable for their health during their recovery process. The first two workshops consist of four weekly 90-minute sessions within a classroom setting focused on food groups, nutrition labeling, and fat/calorie/carbohydrate content. While the third workshop was conducted in five sessions focused on self-management of common chronic diseases. Nutrition themes were identified based on the community vegetable garden project and a resident-produced wellness newsletter with nutritious recipes.	Community-based participatory research	Race Incarceration length Nutrition status General health status Social ties.	A greater proportion of study participants (23.5%) reported improved nutrition practices compared to controls (3.2%). The participants (52.6%) were four times more likely to report improved general health outcomes in comparison to controls (13.9%). While a smaller proportion of the participants (10.5%) reported improved social ties in contrast to the controls (30.6%).	Lower sample size and differences in responses to improved diet choices at the beginning and end of the SAP may contribute to the statistical significance seen with the larger proportion of the participants. Increasing the sample size along with receiving an adequate number of participant responses is advised.
Johnson et al. (2018)/ USA	Female federal prison campus located in the Northeast with a 200	Quasi-experimental pilot study	29	This intervention has four components: (1) 7-day data storing Yamax (YX) CW-701 Digiwalker pedometer use to motivate walking, (2) Use of MyPlate tool divided into four	Model of resilience	BMI/weight status Resilience scores	The Wilcoxon signed rank test indicated a statistically significant decrease in BMI from baseline to 6 weeks ($Z = -2.205$, $p = .027$) and baseline to 12 weeks ($Z = 2.031$, $p = .042$). The median resilience score was 148.5 (IQR=22) at baseline,	The lack of statistical significance noted in resilience scores can be attributed to the majority of participants

prisoners capacity.	sections by food type (fruits, vegetables, grains, and proteins) with recommended portion size to motivate portion control, (3) three 60-90 minute health education classes held on weeks 1, 4, 8 of intervention including print materials (MyPlate poster, measuring cups and serving tray visual aids), physical activity recommendations and instructions to set up weekly step goals, and (4) intervention monitoring and support from a nurse practitioner to increase weekly step count by 2000 steps/day until they reach 10,000 or more steps/day.	149.0 (IQR= 27) at 6 weeks, and 150.5 (IQR = 27) at 12 weeks. There was no significant difference in resilience scores between the three points.	having moderately high levels of resilience at baseline. It is also important to consider if the resilience levels were influenced by holiday seasons or increased visitation hours. This study also lacks a control group which undermines the internal validity of the study. Due to self-reporting for the MyPlate data, there is a possibility of social desirability bias. It is advised to re-evaluate this intervention using a control group.
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Abbreviations

BMI = Body Mass Index

NS = Not specified

Selected references of outstanding importance

Woods-Brown C, Hunt K, Sweeting H. Food and the prison environment: a meta-ethnography of global first-hand experiences of food, meals and eating in custody. *Health Justice*. 2023 May 4;11(1):23. doi: 10.1186/s40352-023-00222-z.

This meta-ethnographic synthesis integrated personal food experiences in prison settings across ten countries. The potential of food to support prisoner health and wellbeing appears limited when the dietary content is insufficient. Prison policies incorporating familial and cultural identity through cooking opportunities have the potential to improve prison health outcomes.

Holliday MK, Richardson KM. Nutrition in Midwestern State Department of Corrections Prisons: A Comparison of Nutritional Offerings With Commonly Utilized Nutritional Standards. *J Correct Health Care*. 2021 Sep;27(3):154-160. doi: 10.1089/jchc.19.08.0067.

This study compared average menu offerings in U.S Midwestern state departments of corrections (DoCs) with nutritional standards including the DRIs and the 2015–2020 Dietary Guidelines for Americans. Menus in Midwestern DoCs revealed excessive caloric offerings coupled with low fruit & vegetables offerings. A lack of or ill-defined regulations may lead to inappropriate or inconsistent nutrition care within corrections.