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**A POTENTIAL RECIPE FOR PEACE:
EXPLORING NUTRITIONAL INTERVENTIONS
FOR THE REDUCTION OF VIOLENCE AND
CONFLICTUAL BEHAVIORS IN JUVENILE
PRISONS**

Faculty of Social Science
Master's Thesis
January 2023

ABSTRACT

Julie Burke: A Potential Recipe for Peace: Exploring Nutritional Interventions for the Reduction of Violence and Conflictual Behaviors in Juvenile Prisons

Master's Thesis

Tampere University

Master's Degree Programme in Peace, Mediation, and Conflict Research

January 2023

This paper uses an exploratory research design as it looks to examine the intervention of nutritional supplements within juvenile detention facilities. A total of five studies in four countries, including The Netherlands, The United Kingdom, Singapore, and The United States were used to synthesize existing data for the effect of nutritional supplementation on inmate behavior. A specified focus on detained youths between ages 13 to 25 provided an exclusive look at a group still in the developmental stage. It has been shown that the dietary impact of behavior displays causal effects for the value of quality nutrition in mitigating conflictual behaviors.

The following research questions will be addressed: (1) What is the relationship between peace and health? (2) Do diets have the capacity to lower individual rates of violent and conflictual behaviors?

Existing research has highlighted a need for further examination into reduced rates of prison violence, aggression, and antisocial behaviors resulting from dietary supplementation. While further research is still needed to establish definitive linkages, the isolation of this one variable is promising. While dietary approaches to behavior changes are no new phenomenon, the application to the field of peace and conflict research is important to uncover varying pathways for peace.

Keywords: Malnutrition, Conflictual Behavior, Structural Violence, Juvenile Delinquency, Nutritional Justice, Prisons, Nutritional Supplementation

The originality of this thesis has been checked using the Turnitin OriginalityCheck service.

Acknowledgments

This topic was my original thesis idea that eventually morphed into something completely different, yet ultimately returned to write. In truth, it is indeed outside the typical research realm of TAPRI (Tampere Peace Research Institute) and epitomizes trans-disciplinarity through its incorporations of criminology, nutritional psychiatry, sociology, epidemiology, and behavioral psychology. While I only skim the surface of these fascinating disciplines, this work so accurately demonstrates my varied interests and curiosity within this Peace-Health nexus.

Many sincere thanks...

To Anniita Kynsilehto, my kind thesis advisor; for your patience and guidance.

To Ilaria Tucci, my wonderful TAPRI professor (and playwright!), who boldly showcased a spectrum for conducting peace research. I'm grateful for her encouragement to pursue my own research interests.

To my dear friends for their love, assistance, and cheer throughout this process.

To my family, for your relentless support in all avenues of my life.

To Finland, for two years of wonder and self-discovery.

Glossary of Terms

| TERM | DEFINITION |
|---|--|
| Carceral | Relating to a jail or prison |
| Delinquency | Relating to behavior, especially of a young person |
| Evolutionary Neuroandrogenic Theory (ENA) | Conceptual framework theory to explain violent or criminal behavior |
| Food and Agriculture Organization of the United Nations (FAO) | An agency of the United Nations (UN) that leads international efforts to defeat hunger |
| Maladaptive | Poor or inadequate adaptation to an environment or situation |
| Malnutrition | Refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients |
| Negative Peace | The absence of violence or fear of violence |
| Nutritional Justice | Conceptual framework from Hanieh et al., 2020, to seek nutrition justice and nutritional sufficiency for all, eradicating malnutrition in all forms. |
| Positive Peace | Attitudes, institutions, and structures that create and sustain peaceful societies |
| Recommended Dietary Allowance (RDA) | System of nutrition recommendations by the National Academy of Medicine to meet sufficient nutrient intake levels |
| Randomized Controlled Trial (RCT) | A scientific experiment where participants are randomly assigned to receive an intervention |
| Structural Violence | A social structure where disadvantaged groups are harmed by institutions or laws, preventing them from meeting basic needs |
| Organisation for Economic Co-operation and Development (OECD) | An international organisation working to advance economic and social well-being of its 38 member countries |
| World Health Organization (WHO) | An agency of the United Nations responsible for international public health |
| United Nations Children's Fund (UNICEF) | An agency of the United Nations that provides developmental and humanitarian assistance to children and families in need |

Table of Contents

| | |
|--|----|
| 1. Introduction | |
| 1.1. Background..... | 6 |
| 1.2. Why Prisons: A Carceral Approach..... | 8 |
| 1.3. Bridging Peace and Health Research..... | 9 |
| 1.4. Research Overview..... | 10 |
| 2. Literature Review | |
| 2.1. Food, Nutrition, and Health..... | 11 |
| 2.2. Food Insecurity and Health Disparities..... | 13 |
| 2.3. Juvenile Incarceration and Health..... | 16 |
| 2.4. Nutrition and Behavior..... | 19 |
| 2.5. Child and Adolescent Nutrition..... | 20 |
| 2.6. The Role of Dietary Supplementation..... | 22 |
| 2.6.1. Nutrition Linkages..... | 23 |
| 2.6.1.1. <i>Aggression and Violence</i> | |
| 2.6.1.2. <i>Anti-Social Behaviors</i> | |
| 2.6.1.3. <i>Impulsivity</i> | |
| 2.7. Understanding/Reframing Crime and Conflict..... | 25 |
| 3. Theoretical Framework | |
| 3.1. Structural Violence..... | 29 |
| 3.1.1. Nutritional Justice..... | 30 |
| 3.2. Positive Peace-Health Connection..... | 31 |
| 3.3. Bridging Theories..... | 33 |
| 4. Data & Methodology | |
| 4.1. Overview..... | 35 |
| 4.2. Data Selection..... | 36 |
| 4.3. Synthesis of Research Findings..... | 38 |
| 4.4. Data Findings & Insights..... | 41 |
| 4.5. Ethics & Limitations..... | 43 |
| 5. Conclusion | |
| 5.1. Overview..... | 44 |
| 5.2. Call for Collaboration..... | 45 |
| 5.3. Research Hesitancy..... | 46 |
| 5.4. Food for thought..... | 47 |
| 5.5. Looking Ahead & Future Research..... | 48 |

1. Introduction

Background

Much of the literature on food within peace and conflict research centers around global food insecurity, hunger, war, and climate change. While food and nutrition research has been conducted in many areas of extreme instability, the prevalence of malnutrition has often been linked to situations of conflict. However, ideas around malnutrition relative to *conflictual behaviors* have seldom been applied to this field. Research related to the behavioral impacts of malnutrition has been multifaceted. Studies have explored how violent and conflictual behaviors can be reduced when levels of adequate nutrition are achieved (Gesch et al., 2002; Raine et al., 2020; Schoenthaler et al., 1997; Schoenthaler et al., 2021; Zaalberg et al., 2010). The research objective is to examine nutritional interventions for their role in reducing conflictual behaviors in juvenile delinquent centers. This work, above all, aims to explore alternative and diverse pathways to peace through adequate nourishment.

There is no one diet that leads to peace, as malnutrition (in most forms) is not necessarily indicative of violent behaviors. Still, other social science disciplines have explored this nutrition/diet connection within the carceral system worldwide. Dr. Stephen Schoenthaler, an American Criminal Justice professor, first postulated a diet-behavior study in a California prison in 1983. Similarly, Dr. Bernard Gesch, a British Physiologist, did much to advance the theory of good nutrition on behavioral outcomes (Gesch et al., 2002; Gesch 2013). Formulated from the work of Schoenthaler and Gesch, this thesis will explore the below general theory.

*Poor nutrition increases the proclivity for conflictual behavior.
Adequate nutrition reduces the likelihood of conflictual behavior.*

This theory serves as a basis for the outlined research questions: (1) What is the relationship between peace and health? (2) How is inadequate access to healthy food and nutrition a form of violence?

The term *conflictual behavior* is employed to be as all-encompassing as possible. The additional terms, *maladaptive behavior* and *externalizing behavior* are employed to avoid the overuse of the word “conflict.” These terms will be used interchangeably throughout this work. Furthermore, the terminology around prisons, delinquency, carceral systems, and detention centers should all be viewed with cohesion. The above theory will be applied to studies looking at juvenile offenders. This specified focus on youth and adolescence highlights an age of rapid growth and transition to adulthood, at a time when the body’s nutritional needs are increasingly high. A key reason this subset was chosen for closer examination was due, in part, to the age group of research participants and their fluctuating developmental needs. Later explored studies examine the impact of nutritional supplementation during this time in young adulthood. No other research yet has attempted to synthesize findings specific to juvenile populations. This lends significance to a research gap in this understudied population group.

According to Liu, “childhood aggression, teenage delinquency, and adult violent acts are being increasingly viewed as a public health issue” (2011). The increased need for cross-sectoral research within the fields of peace and health is bound for further exploration. A meta-analysis from The Jackson Laboratory found that 50% of delinquency and violent behavior is attributed to environmental conditions, such as, social relationships, stress levels, sleep, and diet, all of which impact brain output (Garcia-Arocena, 2015). The role of

diet in cognitive functioning as it relates to the brain's role in externalizing behaviors will be discussed later.

As further explored below, this work examines an approach to behavior change through simple dietary modification, i.e., increased nutrition through supplementation. This work to explore the growth of research into nutritional supplement interventions and their effect on adverse behavioral outcomes. By isolating one variable (nutrient adequacy) and altering no other mental or environmental factors, promising results have been illuminated (Gesch et al., 2002; Raine et al., 2020; Schoenthaler et al., 1997; Schoenthaler et al., 2021; Zaalberg et al., 2010). The aim is to look not at *why* people behave poorly but at *how* we can address, prevent, and reduce maladaptive behaviors from a nutritional perspective.

Why Prisons: A Carceral Approach

Prisons provide not only heavily controlled environments for research but an opportunity to address *how* to reduce conflictual behaviors at a social level. It has long been asserted that prisons serve as a societal microcosm (Kinner and Young 2018). Such reasoning claims prisons are a direct reflection of society at large and serve to highlight societal failure in masse. This guiding belief shapes the importance of studying such a substandard system. The clear social breakdown that is prisons posit the notion that societal structures, policies, and institutions are more at fault than individual actors. A *what went wrong* approach is employed to address such a system with curiosity over judgment. This guiding perspective asks that if prisons showcase societal failure, what, if any, opportunities are present?

In many ways, prisons are illogical for the majority of the population. Taken from the North American context, prisons do little about inmate rehabilitation and adherence to restorative justice principles and practices. According to Kifer et al.'s *The Goal of Corrections*, prisons serve various aims of retribution, deterrence, incapacitation, and theoretical rehabilitation (2003). While the reasoning behind the expansion of global correctional systems is outside the scope of this paper, it indicates that we, as a society, have much more work to do to address such a blatant social breakdown. It is here, within prison systems, that inequity, violence, aggression, and inhumanity live. While a step down in ferocity from war or terrorism, carceral systems present an opportunity to address conflict differently. While individuals have an undisputed role in their own self-determination, structural factors are just as much, if not more, to blame. This distinction serves as the foundation to apply a structural violence theoretical framework to be explored later.

Bridging Peace and Health Research

The interdisciplinarity of peace and conflict research has paved the way for exploration into the many subfields of peace and health research. Kessel, et al. introduce such a combination of disciplines for which collaboration and technique-sharing take place as the baseline definition for interdisciplinary research (2008). This orientation of social science enables a network for which a plethora of research avenues exist and span differing scientific fields. It is through this branch of study that such a diversity of disciplines could be further explored and integrated. Confortini and Vaitinen's work in this nexus has highlighted the crucial need to centralize health in research on peace and violence (2019). While the core research of this work looks at qualitative data from nutritional intervention studies, analysis and theory are applied from a qualitative lens. While this is by no means an exhaustive

synthesis of the available evidence, it provides the opportunity to consider perspectives from other subsets of social science. This will integrate such discoveries in a new way as applied to peace and conflict research.

Research Overview

Chapter II provides a literature review on the interconnection of health-nutrition-behavior literature as it applies to adolescents and young adults. The role of supplementation will be purported, along with explored linkages to maladaptive behavioral outcomes. A new look at reframing crime will also be proposed. Chapter III introduces a structural violence theoretical frame, along with the application of conceptual nutritional justice theory. The establishment of a health-peace connection will utilize the Positive Peace theory to draw on integral connective elements. The aim is to contribute to the nutrition-behavior literature, while at the same time, strengthening the nexus of peace-health research. Chapter IV discusses synthesized data studies and analysis. A total of five studies established criteria and thus have been assessed in this research. Lastly, Chapter V provides key takeaways and further postulation on research findings and ways to advance such discoveries. This work, above all, aims to explore alternative and diverse pathways to peace through adequate nourishment.

2. Literature Review

Food, Nutrition, and Health

The Constitution of the World Health Organization (WHO) defines health as a “state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (1946). It asserts that health is a fundamental right that is to be protected, nurtured, and fully attained. Today, health is multidimensional and can primarily be categorized as physical, social, or psychological. The health of our bodies and minds is largely derived from the consumption of food for daily necessary sustenance. Food is consciously selected and ingested, while the absorption of nutrients within food is unconsciously carried out by our bodies. Food can either provide high-level macro and micronutrients or little to none, thus directly impacting one’s well-being. Our bodies require six major nutrients: protein, carbohydrates, fats, vitamins, minerals, and water. All of these nutrients are essential to bodily functions. As the human body cannot produce or synthesize these nutrients itself, they must come from our diets. While food-based dietary guidelines vary by country, the WHO (2020) has set forth general principles of a healthy diet that include limiting the intake of sugars, salt, and fat, balancing energy intake and expenditure, and eating a diet rich in vegetables, fruits, legumes, nuts, and whole grains. Food acts as fuel to provide energy and contribute to the variety of biochemical processes that allow basic functioning. Put simply, nutrients are the foundation for one’s overall health status.

Food plays a powerful role in health and well-being serving our innate human need for nourishment. Food is an essential component of maintaining proper physical, mental, and social health. A healthy diet and adequate nutrient intake aid in the growth and development

of the body, support dynamic functioning, ward off disease and bodily decline, and maintains metabolic health. When proper nourishment is suboptimal, either through lack of access, availability, sufficiency, or adequacy, the body does not operate at its highest capacity (Owino et al., 2019). Malnutrition has long-term medical implications that can affect developmental, economic, and social outcomes at the individual, familial, or community level (WHO, 2021). The linkages between nutrition and health leave little to be disputed-- healthy diets lead to happier, healthier, and more productive livelihoods.

The unmet need for sustenance looks different between the developed and developing worlds. While all forms of malnutrition are prevalent in every country, extreme forms of undernutrition including wasting, stunting, and being underweight will not be discussed in this work. Rather, micronutrient-related malnutrition, overnutrition and obesity, and diet-related noncommunicable diseases are all forms of malnutrition that will be explored further. The dual burden of malnutrition is when obesity and malnutrition occur side by side in the same person, family, or community, disproportionately affecting people of low socioeconomic status (Shifler Bowers, Kara et al., 2018; Doak et al., 2005). It is crucial to acknowledge from the start that food and health systems are stratified and inequitable. Ranging from the neighborhood to the global level, inequality permeates these systems and impacts groups with the least social, economic, or political power (Hossain, 2017). While this unbalanced reality is more prevalent in areas with high global hunger and malnutrition rates, highly developed nations still experience marginalized food and health inequities.

In 2020, The Food and Agriculture Organization of the United Nations (FAO) released a brief titled *The State of Food Security and Nutrition in the World*. A key finding of this brief reported that “healthy diets cost sixty percent more than diets that only meet requirements for

essential nutrients and almost 5 times as much as diets that meet only the dietary energy needs” (FAO, 2020, p.65). This acknowledges that diets globally are impacted by a lack of affordability and critically affect health, nutrition, and food security outcomes. For those most economically disadvantaged, meeting nutrition targets becomes a challenge. Allowing socioeconomic status to determine the quality of nutritional needs is one example of epistemic violence. As explored next, food needs are framed to better understand diet access and availability.

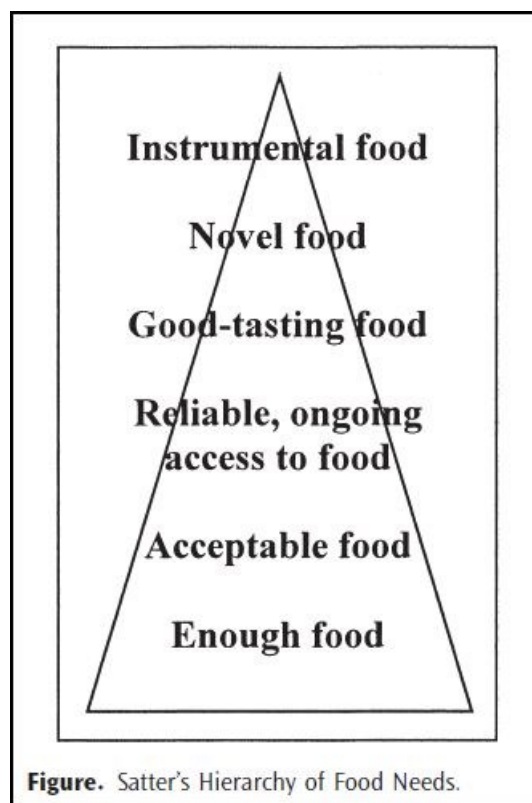
Food Insecurity and Health Disparities

Food insecurity spans varying levels of individual and societal populations and is a critical threat to public and global health. The FAO defines food security as when “people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2006, p.1). The core dimensions of food security are food availability, access, utilization, and stability, and are not mutually exclusive to the developing world. In fact, food insecurity in high-income and developed countries remains a persistent issue. It is estimated that household-level food insecurity in rich, developed countries ranges from 8 to 20%, making it a serious health concern (Pollard and Booth, 2019). While these rates pale in global comparisons, this work will look primarily within the European and North American context, with one study from Southeast Asia. While food insecurity as a conceptual framework is not at the center of this work, it is crucial to frame food security in terms of food needs.

Maslow’s Hierarchy of Needs is a widely known and accepted psychology theory on human motivation. It distinguishes broad categories of basic needs that must be met through a

sequential order of importance. In order, these needs include Physiological, Safety, Love/Belonging, Esteem, and Self-Actualization (Maslow, 1943). Food Security falls within a baseline physiological need; along with water, shelter, sleep, and air; all things central to basic human necessities. To highlight the current state of food needs, Ellyn Satter adapted Maslow's model in the 2007 *Journal of Nutrition Education and Behavior*. Figure A demonstrates a bottom-up ladder approach to the way many consumers approach food.

Figure A

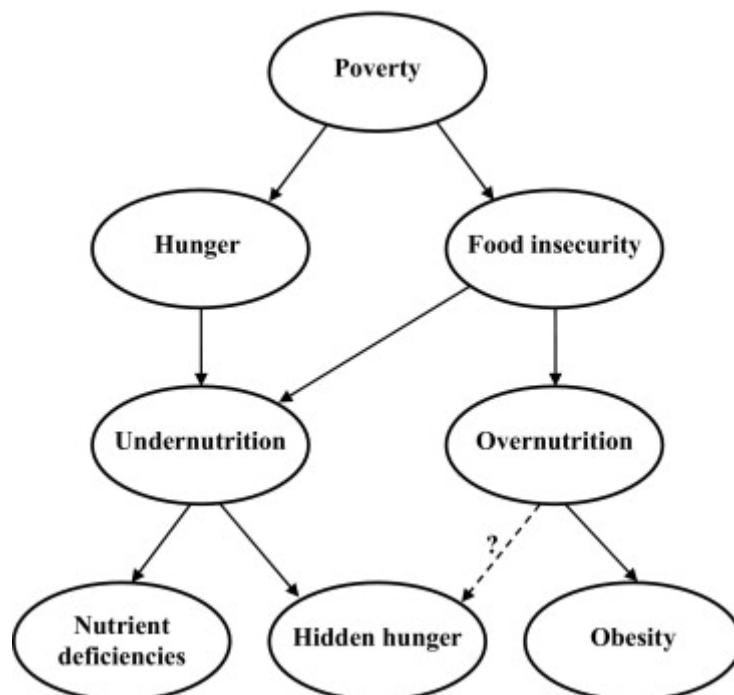


Source: Satter, Ellyn. "Hierarchy of food needs." *Journal of nutrition education and behavior* vol. 39,5 Suppl (2007): S187-8. doi:10.1016/j.jneb.2007.01.003

According to Satter's Hierarchy of Food Needs, getting *Enough Food* is central to warding off hunger. These foods tend to be more calorically and energy-dense, oftentimes providing less nutritional value. At this baseline need, adequate nutrition is not usually prioritized. *Acceptable Food* extends beyond food to satisfy hunger and seek food that is socially or

culturally “acceptable.” Satter refers to acceptability as subjective as it relates to specific types of food or “core” foods, nutritional quality, and food assistance as part of what is deemed personally acceptable (Satter, 2007). *Reliable, ongoing access to Food* means a sense of food security is established as food is both available and accessible on an ongoing basis to fulfill both present and future needs. *Good-tasting Food* prioritizes taste and food you enjoy most, while *Novel Food* is the exploration of seeking new tastes without fear of waste from a disliked food item. Lastly, *Instrumental Food* applies a chosen rationale to either seek or avoid foods for the desired result, whether for cognition, physical appearance, or other outcomes. In this top-tier, closely resembling Maslow’s Self-Actualization need, consideration for what is healthy and nutritional, while avoiding particular foods, is at the very basis of most global dietary guidelines and recommendations (Satter, 2007).

Figure B



Source: “Hidden Hunger” from Sherry A. Tanumihardjo, Cheryl Anderson, Martha Kaufer-Horwitz, Lars Bode, Nancy J. Emenaker, Andrea M. Haqq, Jessie A. Satia, Heidi J. Silver, Diane D. Stadler, Poverty, Obesity, and Malnutrition: An International Perspective Recognizing the Paradox, *Journal of the American Dietetic Association*, Volume 107, Issue 11, 2007, Pages 1966-1972, ISSN 0002-8223, <https://doi.org/10.1016/j.jada.2007.08.007>.

It is vital to frame an understanding of the current state of food and nutrition needs. People experiencing food insecurity often do not have the luxury of choice when seeking out food to satisfy hunger. If people do not have enough food, in addition to the food that is acceptable enough, nutritional needs are not of primary focus. Figure B highlights a sequential-like relationship between all involved factors that result in hidden hunger. Lowe (2021) explains how an “energy-dense, but nutrient-poor diet” can lead to the concurrence of micronutrient deficiencies. This is quite similar to the double burden of malnutrition where low-nutrient diets are becoming more widespread globally. This dietary shift away from whole foods and towards highly processed and “fast” foods has aided in insufficient nutrition, especially in middle and high-income countries. Food deemed “unhealthy” is oftentimes more readily available and a lack of nutritional focus can be superseded by other basic needs. There is a luxury element to considering nutrition in one’s diet and it is vital to realize what food considerations are for food-insecure individuals. Wang et al. have revealed that food insecurity has been reported by a staggering 91% of newly released inmates in the United States (2013). As this work looks at nutritional interventions within correctional facilities, it is important to set the stage for what diet and food choices look like within underserved and vulnerable populations.

Juvenile Incarceration and Health

A juvenile is a developmentally immature individual bound by socio-legal requirements and status (Hess et al., 2012). The Organization for Economic Co-operation and Development (OECD), with 38 member countries, including The United States, The Netherlands, and the United Kingdom, has looked at the legal age thresholds within these criminal justice systems. Anyone under the age of 18 years is considered a minor by law and is usually

ineligible for criminal prosecution (OECD, 2016). The term delinquency extends beyond criminality which includes school truancy, running away from home, and disobeying lawful commands (Shoemaker, 2009). The U.S. and Europe have separate juvenile justice systems that reside over youth delinquency and aim to uphold fundamental rights and fair outcomes. Thematic area four within The Convention of the Rights of the Child supports upholding the rights and needs of children, including through the support of fair and just legal systems (United Nations, 1989). It is noteworthy; however, the United States is one of only two UN member countries that have not signed the treaty since ratification in 2002.

The United Nations Children's Fund (UNICEF) reported 261,200 children detained globally in 2021 (UNICEF, 2021). The United States has the highest incarceration rates in the world for both adults and juveniles, while rates within Europe vary drastically by country with the United Kingdom and Poland at the top (European Prison Observatory, 2019). Literature on juvenile detention remains most prevalent in Western nations, while increased research is needed for a more global perspective on youth confinement. According to the Children's Defense Fund's 2021 annual *State of America's Children* report, a total of 696,620 children were arrested in the U.S. in 2019 with less than 10 percent of arrests due to violent crimes (Children's Defense Fund, 2021). Further data from the Census of Juveniles in Residential Placement indicated 36,479 youth under 20 years of age were detained, committed, or otherwise placed in detention facilities (Sickmund et al., 2022). While youths who commit a crime may risk entry into the criminal justice system, the U.S. has a staggeringly high rate of youth incarceration compared to its global counterparts. In 2019, the number of youths in juvenile detention throughout Europe was 4,873 detainees (European Prison Observatory, 2019). Given adolescents makes up a notable portion of incarcerated individuals, it is within

reason to explore the health implications of detention on such a developmentally vulnerable group.

Individuals in prison have a consequential impact on community health and health equity, highlighting that prison health is a component of public health (Kinner and Young 2018; Dumont et al., 2012). While few studies have looked exclusively at the health status of incarcerated youth, predictors from adult incarcerated populations can apply. Youth incarceration is associated with worsened physical and mental health outcomes in adulthood (Barnert et al., 2017). Growing evidence on the linkages between incarceration and health outcomes has scarcely focused on juvenile populations. Given approximately 80% of youth offenders are likely to be reincarcerated as adults, it is important to understand the health implications that follow incarcerated juveniles into adulthood (Barnert et al., 2017; Mendel, 2011).

Disadvantaged groups tend to have greater propinquity to the criminal justice system than not. Socioeconomically disadvantaged groups are estimated to experience a 25% difference in health disparities and tend to have a higher prevalence of unhealthy habits (Porter, 2014). What is known is that 46% of newly detained youth have immediate medical needs, (Barnert et al., 2017; Hein, Karen, et al., 1980) and around 70% have at least one psychiatric disorder (Barnert et al., 2017; Teplin, Linda et al., 2002). The unmet health needs of youth prior to entry highlight the inconsistent distribution of access and care in communities interfaced with incarceration. Moreover, imprisonment not only introduces new health risks, but inmates also have more unfavorable outcomes related to addiction and mental illness than the general population (Dumont et al., 2012). These new, or exacerbated, health risks can even manifest post-release or years after release. However, more longitudinal data is

needed to link the relationship between the deleterious health implications of youth incarceration and adverse adult health outcomes (Barnert et al., 2017).

Nutrition and Behavior

The existing body of research on the relationship between nutrition and one's subsequent behavior has been well documented. Simply put, the food we eat directly affects how we feel, develop, and behave, consequently impacting our mental and emotional state (Singh, 2014). The absence of a healthy diet and ensuing nutrient deficiencies have been linked to a host of unfavorable health outcomes. Fishbein and Pease (1994) note that these conditions include "learning disabilities (e.g., cognitive impairment, hyperactivity, attention deficit disorder, and others), poor impulse control (impulsivity), conduct disorder, alcoholism and/or drug abuse." Such behavioral outcomes stem from neurobiological imbalances where brain functioning is suboptimal. Worobey et al. explore the brain-behavior connection and the impact of brain health and functioning on behavioral outcomes (2015). When adjustments in behavior occur, the body's central nervous system (CNS) is impacted, a change seen in both mature and developing brains in humans and animals (Worobey et al., 2015, page 22). While the brain-behavior nexus is accepted by neurobiological research, the jump from healthy food to a healthy brain to healthy executive functioning is still modifiable.

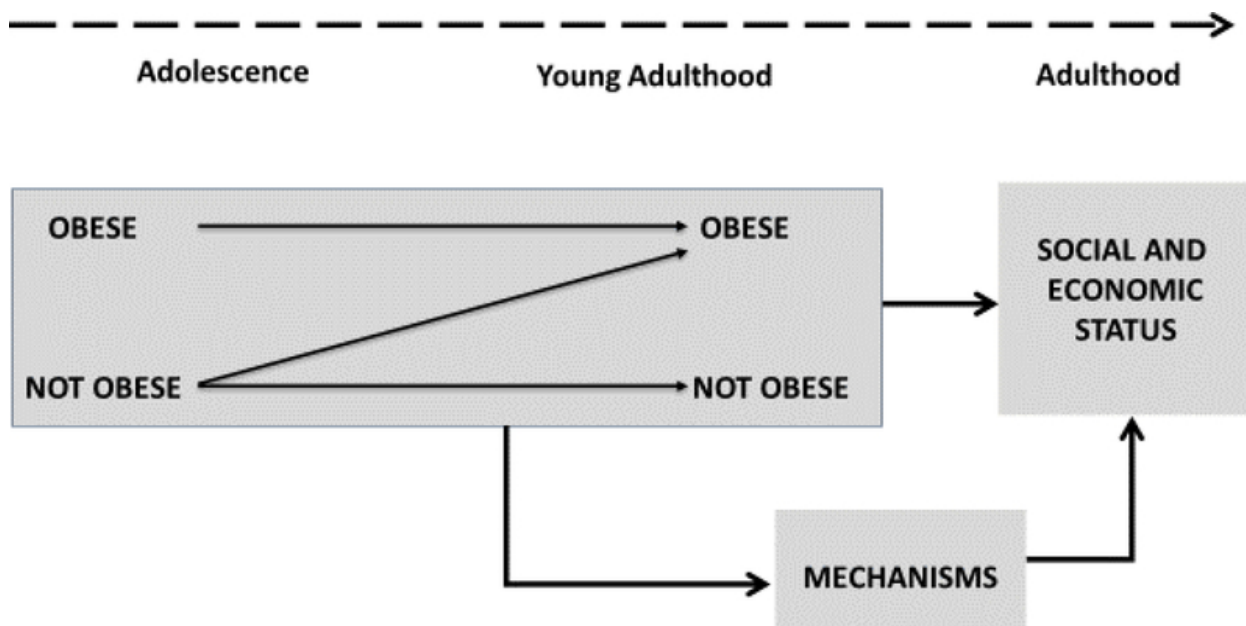
The nascent field of nutritional psychiatry takes a food-as-medicine approach to use food and nutrient supplements as complementary forms of treatment for mental health conditions (Adan, Roger A H et al., 2019). This field highlights the deep connection between food and how we feel, looking at nutrition for increased emotional health. Nutritional psychiatry seeks

to introduce and expand on much-needed research into the food-brain connection. Meanwhile, research highlighting the linkages between nutrition and maladaptive behaviors in children will be explored below.

Child and Adolescent Nutrition

There is a growing body of literature that recognizes how diet plays a role in the cognitive development of children (Benton & ILSI Europe, 2008). Of particular concern is how the association of diet and behavior in adolescence may impact risk factors for adverse behavior in adulthood. Liu, Jianghong et al. (2004) demonstrated that “malnutrition predisposes to neurocognitive deficits, which in turn predispose to persistent externalizing behavior problems throughout childhood and adolescence.” This indicates that reducing malnutrition can be an important factor in mitigating aggressive and antisocial behavior later on in a child’s life. It is hypothesized by Fishbein and Pease that dietary modifications may have the greatest effect on children as brain function is still in a developmental stage (1994). Bellisle (2004) furthered this notion finding that young people who already exhibited a poor nutritional status were the most impacted by nutritional modifications. These effects extended to both cognition and behavior. This illustrates how dietary changes contribute to either the degradation or enhancement of brain health in young people. Therefore, nutritional interventions offer an opportunity to protect brain integrity rather than impeding its optimal function. Figure C below highlights a crucial response needed to ensure adequate nutrition in adolescence and beyond.

Figure C



Source: "Role of Health in Social Stratification Processes" from Harris and McDade; Harris, Kathleen Mullan, and Thomas W McDade. "The Biosocial Approach to Human Development, Behavior, and Health Across the Life Course." *The Russell Sage Foundation journal of the social sciences: RSF* vol. 4,4 (2018): 2-26. doi:10.7758/RSF.2018.4.4.01

Figure C illustrates the effects of malnutrition (obesity) on key status outcomes from adolescence to adulthood. Childhood is a vital time for the establishment of sustained health behaviors that tend to be carried throughout life. The existing body of research suggests obesity adversely affects every major tenant of social life. Obesity in childhood impacts human capital (Segal et al, 2020) resulting in lower educational outcomes (Carey, 2015), earnings, and household income (Black et al.,2018) and is linked to premature mortality (Reilly JJ et al., 2003). Early life nutrition is vital to sustaining positive health and socioeconomic outcomes in adulthood. The implications of nutrition to remedy and preclude externalized behavioral issues, cognition, and educational outcomes are too important to ignore (Liu and Raine, 2006).

The Role of Dietary Supplementation

When adequate nutrition is neither available nor accessible, alternative methods to health must be explored. Supplementation provides a succinct and effective tool that is analogous to diet. However, it must be clearly illuminated that diet and nutrient supplements are not mutually exclusive (Jacka et al., 2017). Nutrient supplements are not a replacement for a diet that meets Recommended Dietary Allowances (RDAs) as set forth by the Food and Nutrition Board, established in 1940. Still, it is inconclusive whether to focus research attention on the emphasis on food and diet or on nutrient supplements (Lichtenstein & Russell, 2005). Given how diets in the general public vary too broadly, prison food is, for the most part, highly regulated with inmates receiving limited food options. While exclusive dietary modification among prison groups might be possible, the use of supplementation allows for both a control and placebo group to be studied. Prisons are an ideal, controlled environment to conduct isolated-variable research, such as the introduction of nutritional supplements. Double-blind, placebo-controlled studies, as explored later, are the least subjective methodology for conducting randomized control trial (RCT) research (Kaptchuk 2001).

In the United States, it is estimated that 40% of the general population, which includes those from the ages of 1-5 years, are supplement consumers (O'Dea, 2003). The National Health and Nutrition Examination Survey (NHANES) has estimated one-third of children under 19 years of age consume supplements with female child consumption higher as compared to male children (Stierman et al., 2020). These survey findings also discovered a connection between increased supplement consumption and higher household education and income.

Much of the current research involves the study of specific micronutrients on increased performance, immunity, or physiology, etc. However, data is still limited on the impact of supplementation on youth and adolescents. What is known is that pediatric recommendations to address inadequate or excessive supplementation use have fallen short of proper guidelines (Martini et al., 2020). However, given data suggests certain societal groups can benefit from targeted supplementation, such an economical and accessible method for adequate intakes should be further explored and considered (Lichtensten and Russell, 2005). Given the presumed, promising merits, honed research into youth supplementation would aid in a healthy perspective on the use of supplements in nutritional interventions.

Nutrition Linkages

Aggression and Violence

The study of violence and aggression is examined by a host of interdisciplinary fields. While various theories are prevalent in looking at causation, there is still much to be learned about the concrete reduction of these social behaviors. A look into the impact of nutrition on these areas yields mixed results. Liu (2011) describes the need for further research into the risk reduction and prevention of violence and aggression for increased health and safety. Still, extensive research has shown associations between aggression and various advanced behavioral disorders like attention deficit disorder (ADHD), hyperactivity, impulsivity, and conduct disorders (Fishbein and Pease, 1994). Additionally, exposure to violence compromises the health and safety of children and is an increasingly pervasive public health issue. Aggression, depression, and cognitive challenges are all tied to the subjection to

violence within a family or community (Margolin and Gordis, 2004). Garnering enough widespread evidentiary support is key to the establishment of causation with this paradigm.

Anti-Social Behaviors

Theories behind antisocial behavior have long been posited. While exploring the mechanisms behind antisocial behavior cannot be done unilaterally, a nutritional-lens offers keen insight into these connective elements. Several explanations of the theory of antisocial behaviors have been explored. Research has established a causal link to suggest that diet may play a role in increasing antisocial or criminal behavior (Benton 2007; Hippchen, 1978). Findings from ecological studies have discovered linkages between diet and criminal behavior issues (Zaaberg et al. (2009). Predictors of criminal behavior and delinquency have stemmed from antisocial behaviors exhibited during childhood (Jackson, 2015). Such evidence lends significance to the need for further exploration into this period of child development. Some childhood risk factors of antisocial behavior include school truancy, vandalism, theft, animal cruelty, and defiance (Farrington, 2005). Such indicators in childhood clear the way for more extreme factors in adulthood. However, individual differences, due to evidence of environmental and genetic factors have been garnered to show variance in antisocial behavior (Baker et al., 2006). Only by grasping the full scope of micronutrient deficiencies can we really substantiate the role of nutritional sufficiency in antisocial behavioral outcomes.

Impulsivity

The role of impulsivity in the body's neuro-cognitive process is still being explored. What is known and established from a variety of studies is that impulsivity in childhood may predict more adverse behavioral issues as an adult. Babinski (1999), examined the effects of

hyperactivity-impulsivity in childhood on adult criminal activity, discovering these comorbidities hold a predictor for the crime of all types. This discovery indicates a disconnect between the brain and its behavior when traits of impulsivity are present. Impulsive behaviors involve key brain processes, specifically executive function, that involve control, problem-solving and logical thinking, regulations of attention and reasoning, ability to concentrate, and information processing (Foroozandeh, 2017). Impulsivity as a predictor of delinquent and criminal behavior is a resultant effect of diminished cognitive control.

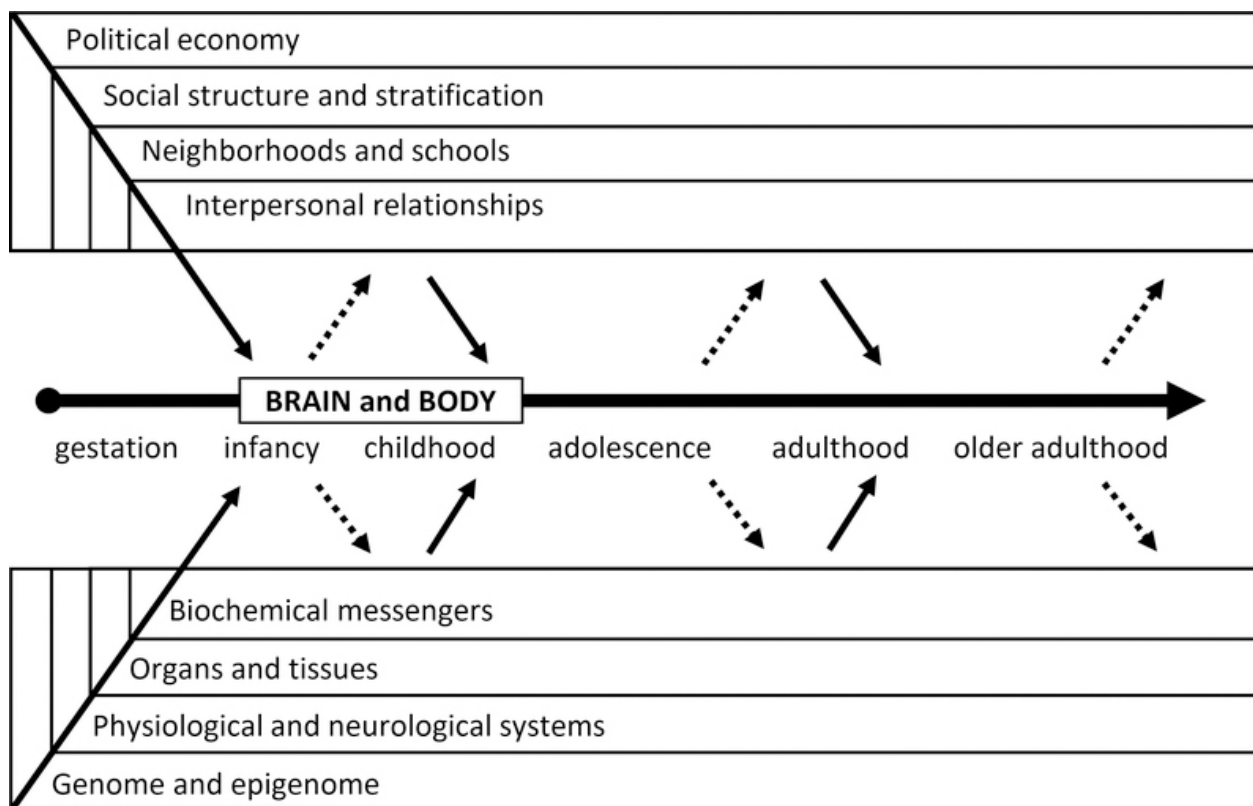
Understanding/Reframing Crime and Conflict

Theories of crime and conflict provide associations in the identification of social conflict, yet present variance in defining both concepts. As Turk (1966) notes, defining the conceptualized relationship between these subjects is rarely explicitly laid out by criminologists. The field of conflict theory was founded in the 19th century by Karl Marx. His work maintained that conflict is an inherent social reality due to competition for resources. Siegel (2000) also asserts that social conflict theorizes crime as born from existent societal clashes. Meanwhile, criminological theories look to identify and explain crime and its causes. Despite some overlap, the crime-conflict connection is bonded by the onset of violence (Wennmann, 2015). It is within this nexus that we look to further examine the concurrent relationship of conflict and crime.

Biosocial criminology is an interdisciplinary field centered around the theory that both biological and environmental factors influence criminal behavior (Eichelberger and Barnes, 2015). It spans multiple disciplines from neurophysiology to criminal justice to explain the causation of adverse conflictual behaviors. This approach, which has gained traction from

criminologists as the “biosocial paradigm,” provides further integration of the sciences, providing new methods and perspectives for research (Wright and Boisvert, 2009). It is within biosocial exploration that internal and external factors of behavior can be further explored. Figure D brings together both health and social injustices that highlight these internal-external influences on growth and development.

Figure D



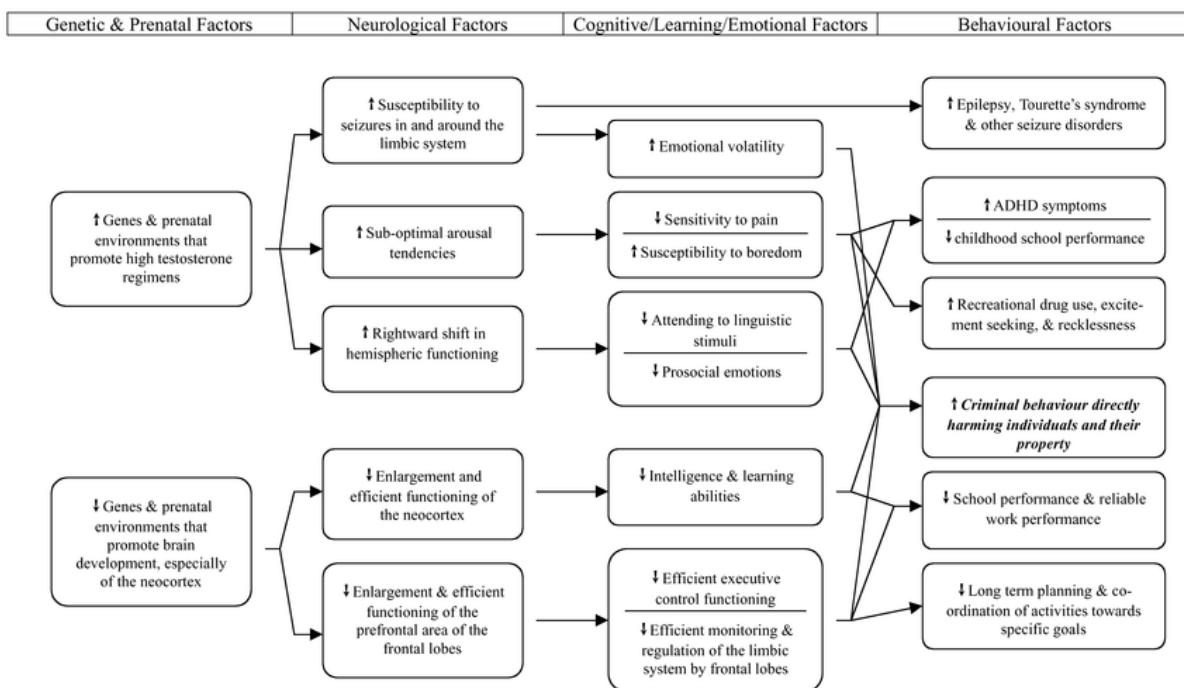
Source: “Conceptual Model of Biosocial Dynamics Across the Life Course” from Harris and McDade; Harris, Kathleen Mullan, and Thomas W McDade. “The Biosocial Approach to Human Development, Behavior, and Health Across the Life Course.” *The Russell Sage Foundation journal of the social sciences: RSF* vol. 4,4 (2018): 2-26. doi:10.7758/RSF.2018.4.4.01

Figure D above attempts to showcase the multitudinous biosocial mechanisms in health outcomes. The top issues reflect the outward/external modes of influence, while the bottom issues represent the inner/internal mechanics of bodily response. The necessity for each

type of biosocial phenomenon to occur cannot be overstated. These internal and external forces represent a complete, more integrated look at biological and environmental influences on the brain-body throughout life.

Ellis (2005) in the European Journal of Criminology looked to theorize how biological factors are linked to criminality. The idea introduced the evolutionary neuroandrogenic theory (ENA) of criminal behavior which makes predictions on the propensity for criminal offending. Figure E provides a more detailed view for the variety of factors that may lead to criminal behavior.

Figure E



Source: "A Theory Explaining Biological Correlates of Criminality" from Ellis, Lee. (2005). A Theory Explaining Biological Correlates of Criminality. European Journal of Criminology - EUR J CRIMINOL. 2. 287-315. 10.1177/1477370805054098.

Findings stemming from ENA theory indicate that impaired executive functioning and lower intelligence, as well as low social status (in males) are attributed to increased criminality (Ellis, 2005). These findings help to advance the notion that violent behavior is part genetic,

part environmental (Garcia-Arocena, 2015). Ellis' ENA theory is important to contextualizing biosocial links with antisocial and criminal behavior.

The United Kingdom's Institute for Food, Brain, and Behavior, founded in 1983, works to advance the field of nutrition research and the impact of brain function on behavior. The launch of such an organization stems from psychologist Bernard Gesch after observing improved sociability in communal eating for young offenders. Research by Gesch (2013) has questioned why global dietary standards do more to protect the heart than the brain and has explored the role of free will in decision-making. Gesch has called for the involvement of the brain in criminality research as brain function is central to behavior and decision-making. This idea claims that the brain's role in behavior may be more important in influencing conflictual behaviors than otherwise thought. If compounded nutritional insufficiency may affect individual choice, then might some maladaptive acts be performed unconsciously? Gesch and Ramsbotham (2009) purport that if a lack of iodine resulted in brain damage, there would simply be no choice in the matter of cause and effect. Taken further, this implication is that a lack of necessary nutrients may interfere with healthy brain function, thus provoking the notion of an absence in rational thought in stoking conflictual behavior. Furthermore, supposing a nutrient deficiency is not the fault of an individual but a result of structural mechanisms, how can one be blamed for their diminished cognitive functioning and consequent maladaptive actions? This is an important question worthy of careful consideration within the fields of criminology and conflict prevention.

3. Theoretical Framework

The theoretical framework of this research relies on well-established structural violence postulation and applies a lens from the budding peace-health paradigm. Additional conceptual tools for analysis examine the application of positive peace and nutritional justice. These theories attempt to serve as foundational support while answering the indicated research questions: (1) What is the relationship between peace and health? (2) How is inadequate access to healthy food and nutrition a form of violence?

Structural Violence

Johan Galtung, a Norwegian theorist, is considered the preeminent contributor to the field of peace and conflict studies. His 1969 work titled "Violence, Peace and Peace Research" presented newfound theories and contributions to this embryonic discipline, resulting in a multi-dimensional look at conflict theory. This initial typology of violence encompassed personal (direct, visible) and structural (indirect, invisible) violence concepts. It also distinguished the recognition of positive and negative peace. These two categories of violence were later expanded upon in 1990 when the inclusion of cultural violence (indirect, invisible) by Galtung was presented. It is true that direct violence is much easier for people to see and understand as opposed to indirect forms (Kent, 2006). While personal/direct violence is blatant and can be visible through murder, bullying, or violent extremism, structural and cultural violence are part of the societal fabric as underlying and unseen forms. These types relate to embedded colonialism, racism, or sexism and a spectrum of harmful attitudes and biases that are an omnipresent plague in everyday interactions and systems.

Galtung referred to structural violence as a “social injustice” that inhabits the waters and air in a natural, unseen manner (1969). Analogous to these basic life forms, structural violence penetrates societal and institutional systems that serve to infringe upon people’s fundamental needs. Poverty and hunger are the predominant examples of social injustice as these basic issues persist in virtually every nation. Galtung uses the example of starvation to highlight the paradigm of avoidability between the actual and the potential. The manifestation of violence is experienced when an act of injustice is avoidable (Galtung, 1969). Much of these afflictions are then sustained through further societal structures and mechanisms that acquiesce to the status quo.

Structural violence exemplifies the perpetration of injustice without explicit perpetrators. It facilitates conditions where violence is not unilateral and cannot be remedied through selective means (Galtung, 1989). Lack of food and inadequate access to proper nutrition are examples of forms of violence. Moreover, it perpetuates further violence by dictating who has the right to good nutrition. A look at nutritional justice will further examine this framing of violence on nutritional adequacy.

Nutritional Justice

The theory of nutrition justice is still in an embryonic stage. Hanieh et al. (2020) have used this analytical frame to emphasize the need for nutritional adequacy in global health amidst a *plague* of social injustice. It showcases a global need for nutritional sufficiency amidst the escalation of the double burden of malnutrition. This emergence is the prevalence of undernutrition combined with obesity/overweight as seen in both low and high-income

economies. The WHO has reported that a staggering “340 million children and adolescents aged 5-19 were overweight or obese in 2016” (2021). Further analysis of childhood malnutrition reveals an unsettling rise in global rates. The connection between malnutrition and inequity is strongly linked (Houssain, 2017). Through a nutritional justice frame, Hanieh et al. draw attention to the tenants of structural violence and how those experiencing malnutrition and other forms of marginalization all play a role in inequitable nutritional access (2020). Malnutrition, in all its forms, is *avoidable*. Historical roots of violence have continued to perpetuate unequal distribution and harm and hinder fundamental needs from being met. The structural underpinning of nutritional sufficiency is an avoidable offense that must be made visible to address this global concern.

Positive Peace-Health Connection

“Positive Peace is the attitudes, institutions, and structures that create and sustain peaceful societies” (Institute for Economics & Peace, 2022).

The Constitution of the WHO states, “The health of all peoples is fundamental to the attainment of peace and security and is dependent on the fullest cooperation of individuals and States” (1946). The interplay between health and peace is an important phenomenon in framing the connective elements of this work. This explicable relationship is uniquely interwoven with deep ties that are reliant on each other for advancement. Health necessitates peace and peace mediates health. Peace is part of the fabric of global and public health endeavors while these subjects, too, play an integral role in the contribution to peace. Factors such as gender and sexuality, political instability, minority underrepresentation, and socioeconomics all carry risk factors for increased health or social

disparities that inhibit fair and equitable societies. Such disparities are found globally regardless of healthcare access, educational opportunities, or high-income status (Levy, 2002).

The WHO's Global Health for Peace Initiative (GHPI) was launched following approval of the conceptual approach "health as a bridge for peace" to work both *in* and *on* conflicts (2020). The initiative will strengthen the continuity of health interventions in areas of conflict tackling issues of mediation and diplomacy, inclusive and accessible health services, and community violence reduction. Macqueen and Santa Barbara summarize five health-peace mechanisms for health work in areas of conflict: including "conflict management, solidarity with indigenous health workers, strengthening of the social fabric, public dissent and restriction of the destructiveness of war" (2000).

Galtung placed a higher precedent on the advancement of positive over negative peace. Gewel (2003) maintains that Galtung's vision within such dichotomous elements focused on violence prevention instead of violence reduction. Such an approach is embraced by this author to work towards alignment with violence prevention and the structural mechanisms impacting nutritional adequacy. A transition from negative to positive would require restructuring this work's intention, yet highlighting further avenues to expand further research. The below figure gives an idea of such expansion with the peace-health nexus.

Figure F



Source: "Positive peace and positive health are connected in a system with direct connections as well as structural drivers that are also produced by the system" from Peters, Laura E. R., et al. "Connecting Positive Peace and Positive Health in a Systems Approach to Sustainable Development at the Community Level." *ICSD 2021*, May 2022. *Crossref*, <https://doi.org/10.3390/environsciproc2022015046>.

Peters et al. (2022) assert that establishing *capabilities* rather than *challenges* should be the focus of linking the health and peace agenda. Exploration into the agenda of positive peace coupled with positive health provides a refreshing approach to sustainable development. Figure F demonstrates how both concepts are to cause integration for a positive-systems approach that is mindful of the abundance of diverse pathways to peace. A positive peace framework allows for transformation that is optimistic and seeks peaceful outcomes through peaceful work (Peters et al., 2022). This exploratory frame lends significance to the interconnection between positive health and peace outcomes as cyclically shown above.

Bridging Theories

The above theoretical frames serve as distinct, yet interwoven components within this work. Each has played a role in guiding the research forward, revealing points of connection, and

contributing further questions within this nexus. While structural violence was an already well-established theory of peace research, the crafted positive peace-health connection is still in a developmental stage. However, the fields of Peace Research and Global Health stand much to gain from one another. As stated by Confortini and Vaittinen, peace studies should “go beyond the metaphors about healthy societies and recognise concrete, embodied health as a pivotal study of peace/violence.” (2019; p. 3). This assertion firmly acknowledges the interdisciplinarity between these fields and how a holistic understanding of health and well-being can drive the Peace Research field forward. Furthermore, the notion of “embodied” health further encapsulates a key component of this research nexus. Krieger indicates that social disparities in health, ranging from inadequate sanitation and health care to economic deprivation or toxic exposures all have impacts on the body (2005). These are such patterns of discrimination and health inequity that can be cyclical and create a biological expression that can greatly impact health status. As such, embodiment is the ultimate result of one’s social, environmental, and biological surroundings (Ghane and Sweeny, 2012). This conceptual model within epidemiology highlights the need for increased collaboration in public and global health approaches to violence. This is especially true given equity is a central tenant in health care and both fields stand much to gain from increased dialogue (Confortini and Vaittinen, 2019).

Lastly, the element of nutritional justice is one such frame driving the bridge between these theories. It unearths questions relating to nutritional access and how invisible structural factors influence such inequity. It asks, who has the right to good nutrition? Moreover, does nutritional adequacy = nutritional justice? Only by addressing and resolving the direct and structural elements of food and nutritional inadequacy will we be able to shift our approach to achieving sustainable peace.

4. Methodology & Data

Overview

The primary focus of this research is to explore the role that nutrition may play in warding off conflictual conduct in juveniles. Utilization of a synthesis-based methodology was important to combine existing literature and create cohesion of research findings. The conversion of sources was crucial to examining the baseline validity of further exploration into this topic. It presents the work of various researchers attempting to gain insight into a rather similar and deeply unexplored nexus for nutritional interventions on conflictual reductions in juvenile prisons. Integration of these findings will attempt to provide a holistic review of available literature. It is with interest that these findings within juvenile detention centers might be applied outside a correctional setting and to the general adolescent population at large. Research findings will be applied to the field of peace and conflict research in order to explore alternative mechanisms for individual violence reduction. This chapter, first, aims to discuss the chosen research methodology and chosen studies for synthesis. Next, each chosen study is outlined in a synthesis table for cross-comparison of data findings and outcomes using the PICO tool for discussion that will be explained below. Finally, data limitations and ethical considerations will be discussed.

Approaching this topic required a compilation of all available research and studies. In order to account for personal interest and examine research gaps, the determination of the scope of the available studies was needed. This criterion was to specifically examine research that (1) focused on children, adolescents, or young adults and (2) studies occurring within juvenile offender populations. The omission of looking at adult populations alone significantly narrowed the search. In general, few studies within this field looked at juvenile populations,

which mainly took place within schools. Furthermore, the focus on research within correctional facilities further narrowed the available literature. This effort was purposeful in establishing a specified look at the role of nutritional interventions for youth and its impacts on their behavior. Findings may suggest a more significant impact of nutrient supplementation in youth due to the developing brain in-flux. Unsurprisingly, the sample size of studies and trials was highly manageable. A total of five available studies will be further discussed below.

Data Selection

The research was searched primarily within, but not limited to these electronic library databases: PubMed, EMBASE, and APA PsychNet. A sample of common search terms (see Table 1) were employed including *nutrition, supplementation, intervention, diet, behavior, juvenile, youth, delinquency, prison, conflict, violence, aggression, and maladaptive*. Electronic searches did not include a date range. It should be noted that no search for “peace” was included for lack of immediate relevance. As indicated in Table 2, inclusion criteria looked for research on young adults in juvenile correction centers. Studies without both criteria were excluded from this synthesis. No other exclusion criteria were employed. Variation in search terms and inclusion criteria aimed to be avoided. Furthermore, assessment tools for risk bias were not utilized.

| Table 1 | | | | | |
|----------------|------------------------|-------------------------|-----------------------|--------------------|------------------------|
| Group | Behavior | Concepts | Other Keywords | Location | Field |
| Child | Violence | Structural Violence | Supplementation | Prison | Peace and Conflict |
| Student | Violent | Direct Violence | Peace | Jail | Global Health |
| Youth | Conflict | Cultural Violence | Synthesis | Delinquency Center | Public Health |
| Adolescent | Conflictual | Peace | Therapy | School | Psychiatry |
| Young | Aggression | Health | Intervention | | Nutritional Psychiatry |
| Young adult | Antisocial | Peace | Behavior | | Psychology |
| Juvenile | Depression | Health | Nutritional Status | | Sociology |
| Delinquent | Externalizing behavior | Framework | Mental Health | | Neuroscience |
| Population | Maladaptive | Theoretical Framework | Food | | Biosocial |
| | | Conceptual Framework | Diet | | Criminology |
| | | Nutritional inadequacy | Impair | | Social Science |
| | | Nutritional sufficiency | Reduce | | |
| | | | Framing | | |
| | | | Adequate | | |

| Table 2 | |
|---|---|
| Inclusion and Exclusion Criteria | Quality |
| <i>Location</i> | No restrictions to global locations. |
| <i>Setting</i> | Studies conducted within juvenile prisons or detention/delinquency centers. |
| <i>Participants</i> | Children, adolescents, youth, and young adults <25 years of age. |
| <i>Study Design</i> | Double-blind, placebo-controlled, randomized trial. |
| <i>Outcome</i> | All study outcomes were to be accepted. |
| <i>Other</i> | Studies conducted in the English language. |

Synthesis of Research Findings

As indicated by Chalmers et al. (2002), terminology for research synthesis oftentimes lends similarities to meta-analysis and systematic review. It should be noted that these disciplines do differ with the focus of this work placed on research synthesis. The post-World War II period ushered in advancements by social scientists with the development of synthesis (Chalmers et al. 2002). *The Handbook of Research Synthesis and Meta-Analysis* provides a conceptualization of research synthesis as a research process. Cooper et al., (2009) have depicted the stages of research synthesis including defining the problem, literature review, analyzing data to interpret results and public introduction of findings. The exploration of data findings is to be discussed below.

To best showcase the main findings from each of the five studies, a method of standardization was needed. The PICO (Population, Intervention, Comparison, and Outcome) tool was selected to best synthesize all selected studies. PICO was not employed for the selection and eligibility of study criteria. This method is framed to explore the varying characteristics of research methodology, and study design, and to compare each work to best showcase findings (Cumpston, 2020). PICO is also used to attempt to formulate, guide, or answer research questions. This data specifically attempts to answer our second research question: Do diets have the capacity to lower individual rates of violent and conflictual behaviors? A PICO table was employed below to present the main findings for each of the five studies. Findings among the studies are then discussed within each of the four PICO sections.

PICO Table:

| Study | Population | Intervention | Comparison | Outcome |
|---|--|--|---|---|
| Effects of Nutritional Supplements on Aggression, Rule-Breaking, and Psychopathology Among Young Adult Prisoners (Zaalberg et al., 2010.) | 221 male youth prisoners ranging between 18-25 years of age; mean age is 21 years. Studies across eight Dutch prisons. | Daily lunchtime supplements of eight capsules. Two capsules included 25 vitamins and minerals, all others contained various fatty acids. Occurred over 1-3 months. | Active and Placebo. | Active group incidents were reduced as compared with placebo group resulting in a 34% reduction in the experimental group against a 14% increase within the control group. However, no other assessment markers completed by subjects and prison staff revealed any significant reductions in aggressive behavior. |
| The Effect of Randomized Vitamin-Mineral Supplementation on Violent and Non-violent Antisocial Behavior Among Incarcerated Juveniles (Schoenthaler, et al., 1997.) | 62 juvenile delinquents, aged 13 to 17 years in the United States. | Daily vitamin pill (morning) and two mineral pills (evening). Occurred for a 13-week period. | 13-week baseline compared with experimental period using rule violation reports for violent, non-violent and total rule infractions. Secondly, blood samples were taken from 26 habitually violent subjects during baseline and intervention. | Violent rule infractions resulted in a 28% net difference between the active and placebo groups. For the blood samples, 10 subjects had normal/low blood vitamin concentrations and 16 subjects had low levels. The 10 subjects with normal/low levels had 39 acts/violations during baseline and 37 during intervention. The 16 subjects with low levels had 131 violent acts during baseline and 11 during intervention. |
| Influence of supplementary vitamins, minerals and essential fatty acids on the antisocial behavior of young adult prisoners (Gesch, et al., 2002.) | 231 young adult prisoners, over age 18 in the United Kingdom. | Daily dosage of one vitamin/mineral capsule and four fatty acid capsules during lunchtime. Occurred from min. period of 2 weeks to 9 months. Average time was 142 days (placebo) and 142.62 days (active). | Placebo before and during intervention. | An average of 26.3% fewer offenses were committed as compared to the placebo group. An average of 35.1% fewer offenses were committed by those taking active supplements as compared to the baseline. |
| Omega-3 supplementation in young offenders: a randomized, stratified, double-blind, placebo-controlled, parallel-group trial (Raine, et al., 2020) | 145 young adult offenders aged 16 or older at Changi Prison Complex in Singapore. | Daily 200-ml drink with added 840mg of omega-3. | Three groups: omega-3, placebo, and control. | Decrease in self-reported aggressive and antisocial behavior resulting from Omega-3 supplementation in both the short and long term. |
| The Effects of Vitamin/Mineral Supplements on Serious Rule Violations in Correctional Facilities for Young Adult Male Inmates: A Randomized Controlled Trial (Schoenthaler, et al., 2021) | 449 young adults aged 17 to 24 years in the United States. | Daily vitamin-mineral supplement in line with 100% of Recommended Dietary Allowance (RDA) or a high dose version of the capsule. Occurred over 15-week period. | 100% of RDA dose, higher dosage above RDA or placebo. | The RCT for the 100% RDA resulted in 39% less rule violations than compared with the placebo group. The higher dose had no significant conclusions. |

Population

The studies were conducted across four countries and three continents of predominantly Western cultures: including The Netherlands, The United Kingdom, Singapore, and The United States. The age range of participants across all studies was between 13 and 25 years old. It should be noted that there were no numerical selection criteria for study participants based on age, only seeking terms relating to “youth,” “adolescent” and “young adult.” Each study had to fluctuate subject pools given the variability of movement within the justice system which resulted in fewer subjects at the end of each study outcome. This work deemed the number of all subjects in a study to be relevant and placed no preferred value on a greater or a smaller number of subjects involved in a study. These numbers ranged

from 62 participants to 449. Lastly, participants across all studies were almost all male offenders. Only one study (Schoenthaler et al., 1997) included female subjects, though no breakdown of the gender of participants was provided.

Intervention

All five studies used varying nutritional supplements and methods of distribution. All but one study used dietary capsules containing either vitamins/mineral compositions or fatty acids. The other (Raine et al., 2020) opted for participants to consume an omega-3-rich drink once daily in lieu of pills. The duration of each intervention also varied significantly. Findings from Zaalberg et al., 2010 indicated an intervention period between 1 and 3 months, while both studies from Schoenthaler et al., 1997; 2021, occurred over 13 and 15 weeks respectively. The study by Gesch et al., 2002, had an average length of 142.62 days for the active users and 142 days for the placebo group. Raine et al., 2020, whose intervention did not include capsules, used self-reporting for any changes in maladaptive behaviors. These reports occurred at month 0 for baseline measures and went to month 3 when treatment ended. However, self-reporting was also done at both 3- and 6 months post-treatment. The average dosage amount of each consumable was not taken into consideration for this work. The time of day the supplements were distributed nor the number of times per day were not given any significance in any of the study outcomes.

Comparison

Each study employed a placebo group for comparison of the active and/or control groups. All were randomized control trials (RCTs) and double-blind studies for further standardization of available studies. A notable comparison is the location of each study. Four out of the five studies were conducted in youth prisons, while (Schoenthaler et al.,

1997) was conducted in a psychiatric medical facility. This maximum-security site housed 13–17-year old juveniles considered to be habitual offenders. This was also the only indicated maximum-security facility out of all locations. All five studies looked at baseline levels of behavior prior to the start of each study. The duration of these baseline evaluations was not compared or evaluated.

Outcome

The results showed a statistical difference between the active and placebo group among all studies, specifically demonstrating some form of reduction in violent or aggressive behavior or rule violation breaking. Additionally, no adverse effects from supplementation were reported in all studies. A closer look into these outcomes will be discussed in the below findings.

Data Findings & Insights

All five studies exhibited results for the reduction of adverse behaviors during the supplementation intervention period. As compared with placebo groups, each study reported a decrease in violent or conflictual acts. Four out of five studies used incidents or serious rule violations within the prisons as assessment markers. Only one study (Raine et al., 2020) used self-reported assessment tools from the participating subjects over time. The other four studies each saw a drop in infractions by those in the active intervention group by 34%, (Zaalberg et al., 2010) 26.3%, (Gesch et al., 2002) 39%, (Schoenthaler et al., 2021) and 28% net difference between the active and placebo (Schoenthaler et al., 1997). Raine et al., 2020 also saw a decrease in the self-reported antisocial and aggressive behavior of

inmates. While each RCT had different methods of intervention as seen in the PICO table, all aimed to increase the baseline nutrient intake of subjects. Schoenthaler et al., 2021 specifically provided each inmate with 100% of one's RDA. Given no adverse effects, these studies lend significance to the role of increasing one's nutrient load, though each study stopped short of making definitive claims to support supplementation for behavior change. However, this finding is in line with the initially proposed theory: *adequate nutrition reduces the likelihood of conflictual behavior*.

One study employed blood samples to further gather data during baseline and intervention in Schoenthaler et al., 1997. One of the most statistically significant outcomes showed how crucial baseline rates of vitamin and mineral concentrations are within the body. There was a total of 39 violations during baseline and 37 during intervention for 10 subjects with normal/low blood vitamin concentrations, whereas 16 subjects with low blood vitamin levels had 131 violations during baseline and only 11 during the intervention. This insightful outcome demonstrates how groups most deficient in nutrients have the most to gain. This finding offers the notion that those most vulnerable and most in need of adequate nutrient intake levels stand to see the most behavior change. It also highlights the harm of not addressing nutritional injustices before incidents of conflictual behaviors may occur. Food insecurity and malnutrition underpin a key hallmark of nutritional justice; avoidability. Therefore, these incident reductions demonstrate the possibility of a new avenue to achieve peace through addressing nutrition.

Ethics and Limitations

Concerns regarding research on inmate populations are nothing new. However, it is increasingly important to ensure there are guiding principles that protect the integrity of inmates who may serve as research subjects. The Institute of Medicine (IOM) in the U.S. has a committee on Ethical Considerations for issues with the Department of Health and Human Services that include the use of research with prisoners (2007). Ethical issues raised by the IOM related to informed consent and a national registry for prison studies. The IOM raised the problem of providing research consent when the prevalence of cognitive and reading skills is low. This illustrates a need for further exploration into diverse methods for the recruitment of inmates and the potential omission of candidates for low mental processing. Secondly, the IOM proposed the notion of obligation in research involvement. Inmates may feel participation will provide an unpromised outcome or feel forced. Inmates should in no way feel obliged to participate in research studies. Lastly, the idea for a public database of prison studies would be helpful to first conceptualize the true body of research done within prisons to guide future inmate research (IOM, 2007). Out of the five studies that met the criteria, none listed any ethical considerations.

There is an abundance of Anglo-American prison studies involving the role of food (Vanhourche & Beyens, 2020). While other European nations have delved into food research in prisons, much of the overall research scope is diluted. This contributes to a lack of cultural and contextual relevance to lack of diversity in study areas outside the U.S. and the U.K. Further limitations include the homogeneity of research participants. Studies were almost all male participants, and while sensical in a segregated prison environment, more

research on women would surely yield interesting results. As this paper focuses on juvenile prisons, available data was limited to adolescence and young adults.

5. Conclusions

Overview

The goal of this paper was to explore the theory of poor nutrition on conflictual behavior outcomes. The research aimed to explore if adequate nutrition reduces any likelihood of maladaptive behavior within juvenile prisons. This work attempted to provide synthesized research to fill a gap for studies focused solely on juvenile and young adult inmates. Given advancing neurobiological research, the implication is that behavioral change is more likely to occur during development as opposed to adulthood. There is hope that nutritional interventions at the onset of externalizing behaviors could have the potential to impact future generations. The hope was for research results to have applicable elements outside of juvenile prisons.

Hunger, food insecurity, lack of accessible or culturally appropriate food, and nutritional insufficiency all encompass both direct and indirect forms of violence. Only As noted in George Kent's *Children as Victims of Structural Violence*, "much more harm results from child neglect than from direct child abuse," illustrating how inadequacies that have failed to act have done more harm than targeted violence (Kent, 2006). Positive peace postulates that merely the reduction or even abstention from violence or conflict is not enough. This notion encourages the eradication of structural elements that inhibit the growth of peace and

peace mechanisms. We simply cannot neglect the socioeconomic, cultural, social, and cognitive factors that play a role in health disparities and behaviors. While addressing these systemic issues are complex, it is vital for action. While this is done through multi-sectoral processes, research is a key driver in bringing policy and institutional change. More research garnered within the nutrition-behavior-peace scope will help to strengthen and solidify such a theory. Negative peace should *not* be the default approach to solving this issue.

Call for Collaboration

The cross-disciplinarity of this work cannot be overstated. Perhaps, this is due, in part, to the multidimensional nature of violence and conflict that extend to fields outside peace and conflict research. A variety of subfields under the peace and global health umbrella have been explored. These include epidemiology, nutritional psychiatry, biological psychology, criminal justice, and biosocial criminology among others. The field of peace and conflict studies does much to research post-conflict solutions and learn meaning and understanding from unfavorable events. This field is primarily responsive in nature, and while this discipline heavily produces an evaluative, lessons-learned approach, it does not always lead with solutions or mechanisms for prevention. While mediation and other conflict transformation approaches are available, these too, are responsive and seldom offer any preemptive deterrence.

Given the complex and interwoven relationship between diet, nutrition, and externalizing behaviors, this research area spans several important, yet distinct, research fields. A call for greater integration of research would be beneficial to both ensure and enhance the

principles of interdisciplinarity. Collaboration amongst the social, behavioral, and hard sciences would additionally aid in a more holistic landscape of evidentiary support. This area of research necessitates a joint effort among multiple fields for the public benefit. Akin to how the brain interacts with all avenues of the body to ensure proper functioning, this same synergy is needed to understand the diet-nutrition-behavior effect in young people.

Research Hesitancy

This author posits the idea that while additional research is needed to move this nutrition-behavior notion forward, research hesitancy may play a factor. It introduces a handful of questions poised at the reality of research advancement. Do people and governments want prison reform? Recidivism lowered? Do they want funding dollars directed at increasing inmate health? Resistance to prison reform is nothing new. The “get tough on crime” ethos that reverberates amongst governmental hardliners is part of the rhetoric that does little to advance efforts to improve prisons (Bohannon, 2009). It should be noted that while prisons themselves generate controversy, the juvenile justice system is no exception. Child and youth criminalization is a highly economic, racial, and fragmented global reality. The American Civil Liberties Union (ACLU) reports on the subjugation of a school-to-prison pipeline that keeps youth behind bars instead of in classrooms (2022). Reports of mistreatment have brought much questioning to the efficacy of such youth institution practices. It is possible that controversy over the ethics of juvenile prisons may disincentivize further research in this domain. The hope is that if the nutrition-violence effect is confirmed with prisoners, could poor nutritional status explain some of the violence and maladaptive behaviors by juveniles in schools or communities? This research hurdle, if not met, might

slow progress on the exploration of nutritional supplementation on inmate health and behavior.

Food for Thought

Much like the underpinnings of structural violence, the multitudinous factors influencing cognition and impulse are invisible and difficult to deduce. It is common practice to resort to individual or familial victim blaming when youth end up in juvenile prison. It is oftentimes seen as the fault of external influences coupled with one's intrinsic authority. The responsibility for one's actions is usually presented as a conscious choice between right and wrong. However, what if a propensity for inflicting violent or conflictual behaviors can be modified? For example, when a person is severely exhausted, cognitive function worsens. As demonstrated, nutritional inadequacy worsens cognitive abilities. Therefore, if sleep can remedy exhaustion, could nutrition remedy behavior? And if hidden hunger or a malnutrition deficiency is present, how might this invisible issue be addressed? If someone is not conscious of a deficiency or is unable to improve their diet and health status, can we claim behavioral immunity? To rework a popular phrase for *I'm not me when I'm hungry* to, *I'm not me when I'm malnourished*. This broadening of thought is important when considering all avenues for the birth of conflictual behavior. Are some behaviors simply out of our control? While research is weary to provide any definitive ties, strong linkages between nutrition and behavior have been established.

Looking Forward & Future Research

Research into the nutrition-conflict effect is limited, yet has demonstrated a causal link to behavioral outcomes. Findings from synthesized studies suggest those most nutrient-vulnerable have the most to gain from adequate intake levels. Supplementation represents a humane approach to mitigating conflictual behaviors, a methodology that can be replicated accessibly and at scale. It also presents the opportunity for nutritional education in correctional facilities that can be of keen individual benefit after sentences are served. As drawbacks remain cost and implementation, these mere downsides are minor compared to safer facilities and better health. In addition, the potential for healthier and more peaceful communities outside of prison.

Given an ever-increasing body of literature on nutrition and behavioral health, the time to interfere and act is now. If we want to change society, let's make it healthier! In March 2021, the first volume of NeuroPeace, *Neuroscience, and Peacebuilding: Exploring the Neurobiological Dimensions of Violent Conflict and the Peacebuilding Potential of Neuroscientific Discoveries, Part I: Individual Aggression* was released. It intends to support peacebuilding and violent conflict processes through accessible neuroscientific information. This is a significant step to bridge research fields for collaboration and shared, informed research. Similarly, as noted, the expansion of the field of nutritional psychiatry, too, offers a springboard for more research into dietary changes in behavioral health. The expansion of findings like the evolutionary neuroandrogenic theory (ENA) serves as exciting examples of where this study field is headed. The direction of growing health in prisons and communities will only make positive contributions to addressing inequities and advancing peace.

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