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Relationship Between Food Insecurity, Depression, and Race/ Ethnicity Among U.S. Adults Aged 60–69 Years

Patrick E. Crandon
Walden University

Walden University

College of Health Sciences and Public Policy

This is to certify that the doctoral study by

Patrick Crandon

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Review Committee
Dr. Jennifer Oliphant, Committee Chairperson, Public Health Faculty
Dr. Katie Callahan, Committee Member, Public Health Faculty
Dr. Sanggon Nam, University Reviewer, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
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Patrick E. Crandon

MS, Mercy College, 2004

BS, CUNY-Medgar Evers College, 2002

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Food insecurity (FI) and depression among older populations in the United States are public health concerns. Although FI has declined in the United States, it is a psychosocial stressor prevalent among the growing population of adults over 60. It is unknown to what extent FI contributes to depression among racial/ethnic minorities in this population. The purpose of this quantitative cross-sectional study was to examine the relationships between FI and race and depression among U.S. adults aged 60–69 years when adjusting for other variables. The social-ecological model was used to understand the interplay between individual and environmental factors that may contribute to FI and depression among older adults. Data from the 2015–2016 National Health and Nutrition Examination Survey data sets were analyzed by performing descriptive and inferential statistical procedures. The results indicated that race and FI were statistically significant predictors of depression. Chi-square tests of independence resulted in significant relationships between race ($p = .007$), marital status ($p = .006$), income ($p < .001$), FI ($p < .001$), and the dependent variable depression. The overall logistic regression model was statistically significant, $\chi^2(15) = 64.76$, $p < .001$. Individuals identified as non-Hispanic White and FI were more likely to be depressed (Wald = 17.45, $p < .001$, $OR = 3.96$) than those who identified as food-secure White and food-secure Black. The social change implications may include improving mental health and quality of life for older adults in targeted communities by tailoring public health messaging and communication strategies to vulnerable communities where health and racial disparities are prevalent.

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Dedication

I dedicated this work to my parents, especially my mother. Mom, I did it! To all my friends, family, and acquaintances whom I have “ghosted” in my academic life, this degree is also for you. There is enough time to discuss my academic work and other things of relevance. To the community and educational institutions that molded and influenced me in the first two decades of my life, Courtland, this one is for you and all the young and aspiring social change agents. For those who question my return to higher learning and the purpose of another degree, it is a worthy sacrifice that I would not trade for another. To everyone who reads this work, be blessed.

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Thanks to the entire team, especially Chair Dr. Oliphant, Member Dr. Callahan, and Reviewer Dr. Nam, for their gratitude and for giving me hope and building my confidence throughout the dissertation process. I greatly appreciate your support and commitment throughout this developmental struggle and learning process. To all the people who helped me on this tiring but rewarding journey of my academic career, thank you! Above all, I want to thank our Lord and Savior, Jesus Christ, for the protection, guidance, and favor bestowed on me in good times and challenging times. Thank you, Lord, for your grace and mercies in bringing me this far academically and preparing me in my pursuit to serve humanity as a good and faithful servant. Thank you!

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Section 1: Foundation of the Study and Literature Review

Food insecurity (FI), race, and depression among the older populations are diverse public health concerns. The U.S. population is aging, meaning that a quarter of the U.S. population will be over 65 years old by 2060 (Mather et al., 2015). This increase in overall life expectancy will incur more chronic and disabling problems for older adults (Chetty et al., 2016: Freedman & Spillman, 2016). Consequently, these events can result in more FI cases, untreated cases of depression, and extended racial/ethnic disparities in health and health care (Centers for Disease Control and Prevention [CDC], 2021). According to statistical estimates, by 2060 the older adult U.S. population will be over 98 million (CDC, 2020). Berkowitz et al. (2019) indicated that FI affects over 40 million Americans. In 2019, 18.5% of American adults had depression in the past 2-weeks, and 18.4% of adults age 45–65 experienced higher symptoms of depression (Villarroel & Terlizzi, 2020). Based on previous studies, increasing age, decreasing income, non-White race, and ethnicity are associated with FI (Nagata, Ganson, et al., 2021). These factors increase the presence of depression among the U.S. population age 60–69 (Ziliak & Gundersen, 2019). However, there is limited research addressing the potential challenges in an aging population through FI, race/ethnicity, and depression among U.S. adults age 60–69 (Nagata, Ganson, et al., 2021). More research is needed to examine the association of factors such as high FI rates, comorbid diseases, and other poor health outcomes significant in racial/ethnic minority communities (Paschal et al., 2020).

I examined the association between FI and depression and investigated differences by demographic and racial factors. I described the overall prevalence of FI in

a nationally representative sample of Americans 60–69 years old from the National Health and Nutrition Examination Survey (NHANES) 2015–2016 data set. McLeroy et al.'s (1988) social-ecological model (SEM) was used for theoretical guidance at multiple levels of influence throughout the study. The research questions in this study addressed challenges to the nutritional health and the social, economic, and mental health of an aging population in the United States.

Social Change Implications

FI, race, and depression are complex issues on the socioeconomic gradient, meaning there are many variations among the issues that can affect older adults' social, economic, and mental health. Therefore, examining the relationship between FI and depression among U.S. adults age 60–69 by race/ethnicity could influence social change (Ziliak & Gundersen, 2019). The implications include informing action at the local, community, and policy levels (a) to improve mental health leadership and advocacy in communities or groups affected by FI issues, (b) to improve the quality of life for older adults in targeted communities affected by the dual challenges of FI and depression, (c) to help reduce medical and health care spending attributed to FI and depression in the future, (d) to create opportunities for improved outreach and foster an understanding of older individuals and community needs, (d) to align public health actions to older adults' needs by increasing depression screenings for older care visits, and (e) to improve access to food benefits and tailor public health messaging to target FI and depression issues affecting older adults in historically underserved and unrepresented racialized communities.

Overall, these social change actions could help to illuminate how the health of the socially and economically disadvantaged older adult populations is determined and protected in the United States. The implication could increase knowledge about the exposure to risks and lack of resources linked to living conditions influenced by race and controlled by socioeconomic status (SES). The social change implications may also inform the levels of interpersonal and community influences of FI on racial/ethnic minority groups and the effects of depression through community messaging and advocating techniques. These measures could help inform geriatric practitioners, advocacy groups, families, and policymakers on possible effects of FI and depression as measured by race among various age groups. These measures could also help target racial and health disparities among vulnerable communities and further the mission to eliminate racism and ageism in health and health care. Section 1 contains the background of the research problem, the problem statement, the purpose of the study, the research questions posed for the study, the hypotheses, the theoretical foundation, the nature of the study, the scope and delimitations, the limitations, the significance, and the assumptions of the study.

Background

Given the need for additional research, the current study addressed the association between FI and depression and racial/ethnic disparities affecting health outcomes in the United States. FI and mental health researchers indicated a positive association between FI and depression, and this association has been well documented (Afulani, Coleman-Jensen, et al., 2018; Arenas et al., 2019; Brooks et al., 2019; Fang et al., 2021; Leung et

al., 2015; Maynard et al., 2018; Pourmotabbed et al., 2020). However, the research is lacking among disadvantaged, underserved groups of people in the United States (Leung et al., 2015). According to Feeding America and National Foundation to End Senior Hunger (n.d.), food-insecure older adults were 60% more likely to experience depression in the United States compared to food-secure older adults. Ziliak and Gundersen (2019) found FI problems most significant among racial/ethnic minorities, those with lower income, and those age 60–69. This relationship varies and remains complex among older adults with unique social and economic needs (Ziliak & Gundersen, 2019).

As the body of literature on FI and depression continues to grow, some previous findings on FI and depression were inconsistent and controversial (A. Brown et al., 2019). The results of these studies are relatively nascent (Brostow et al., 2019; Leroux et al., 2020; Nagata, Ganson, et al., 2021). Several researchers have reported the FI-depression association despite declining FI estimates (Bruening et al., 2017). One possible explanation for this association is the responsiveness of individuals with long-standing vulnerabilities to stressful life events (Fitzpatrick et al., 2021). Discrimination and limited access to money and resources are examples of vulnerability stemming from powerful social forces (Fitzpatrick et al., 2021). Fitzpatrick et al. (2021) noted the uneven FI distribution across racial and ethnic subgroups in the United States. Fitzpatrick et al. concluded that unequal distribution garners special attention to social vulnerabilities and may have exacerbated them regularly over long periods. Kira (2022) concluded that discrimination, oppression, and micro- and macroaggression in status hierarchies have

severe mental health consequences and chronic stress that increases the allostatic load in late-life events.

Other researchers noted the lack of quality research on mental health for older members of racial and ethnic populations (Taylor, 2020). Taylor (2020) noted a gap in racial minority population research and concluded that knowledge of the factors associated with depression and aging for racial and ethnic minority adults is imperative for ensuring the personal well-being of older adults, their families, and communities. Ziliak and Gundersen (2019) indicated that additional research is needed to extend the knowledge about the FI-depression relationship and the nutritional and financial well-being of adults age 60–69. This understanding is relevant because of the unique study population dynamics and diversity (Coleman-Jensen et al., 2018). The United States population is aging, and more than 25% of the population will be 65+ years old by 2060 (American Association of Retired Persons, 2019). Studies projected that this increase in overall life expectancy would also increase chronic health and health complications for older adults (Chetty et al., 2016: Freedman & Spillman, 2016). More research is needed to substantiate study findings and results (Bruening et al., 2017).

Problem Statement

The issue that prompted the search of the literature was that FI continues to be an ongoing concern linked to the uncertain access to food because of limited financial resources. Currently, FI affects over 40 million Americans (Berkowitz et al., 2019) and is associated with numerous preventable diseases including obesity, diabetes, and depression (Gundersen & Ziliak, 2015; Leung et al., 2015). Research has shown that FI

not only poses a health risk for vulnerable populations, such as older adults, but it is also a major contributor to health care system costs (Berkowitz et al., 2019). In 2018, almost 1 in 10 Medicare enrollees age 65 and over experienced FI (Madden et al., 2020). Researchers have documented that racial and ethnic disparities have been linked to FI issues at the community level (Hernandez et al., 2017; Morales et al., 2020; Odoms-Young & Bruce, 2018). Feeding America reported that Black individuals were more likely to be food insecure. Discrimination, poverty (19.5%), and financial issues are risk factors common in Black communities (Feeding America, n.d.). These factors disproportionately influence high FI rates; almost 20% of Blacks live in food-insecure households linked to these risk factors (Feeding America, n.d.).

The risk factors associated with FI are gender, age, race/ethnicity, family income, and marital status. These risk factors are also commonly associated with depression (Arenas et al., 2019; Brody et al., 2018; Brooks et al., 2019; Maynard et al., 2018). In 2019, 18.5% of American adults reported being depressed in the past 2 weeks, and 18.4% of adults age 65 and over reported experiencing symptoms of depression (Villarroel & Terlizzi, 2020). FI and depression estimates are not well known at the national level (Brooks et al., 2019; Gundersen & Ziliak, 2018; Petersen et al., 2019). The risks of FI and depression among various sociodemographic factors (age, race/ethnicity, gender) have not been well studied (Brooks et al., 2019). Arenas et al. (2019) conducted a meta-analysis of 57 articles and found a strong association between FI and depression, but the researchers did not include race/ethnicity. Coleman-Jensen et al. (2018) reported that FI remains complex and declining; however, other study findings indicated that adults age

60 and above had a higher rate of depression associated with self-reported FI rates (Brooks et al., 2019). These findings suggest that reportable incidence of FI cases (not reported) might be greater than the self-reported FI cases. Most studies reported on prevalence data, suggesting that FI cases influencing depression among individuals might be greater than the FI prevalence alone. Traditionally, men, immigrants, and certain underserved racial minority groups are reluctant to report depression symptoms because of social or self-stigmas (Hudson et al., 2018; Liu et al., 2017). Additionally, there is heterogeneity in these findings among populations age 60 or older (Leung et al., 2015). More research is needed to examine the association between FI (exposure) and depression (outcome) among adults aged 60–69 among various racial/ethnic groups in the United States.

Purpose of the Study

The purpose of this quantitative study was to examine the relationship between FI and depression among U.S. adults aged 60–69 by race/ethnicity. The dependent variable for this study was depression, and the independent variables were FI and race/ethnicity. The potential confounders that were included in the analysis were age, gender, household or family income, and marital status.

Research Questions and Hypotheses

RQ1: Is there an association between food insecurity and depression among adults aged 60–69 in the United States, after adjusting for potential confounders?

H_o1: There is no association between food insecurity and depression among adults aged 60–69 in the United States, after adjusting for potential confounders.

H_a1: There is an association between food insecurity and depression among adults aged 60–69 in the United States, after adjusting for potential confounders.

RQ2: Is there an association between race/ethnicity and depression among adults aged 60–69 in the United States, after adjusting for potential confounders?

H_o2: There is no association between race/ethnicity and depression among adults aged 60–69 in the United States, after adjusting for potential confounders.

H_a2: There is an association between race/ethnicity and depression among adults aged 60–69 in the United States, after adjusting for potential confounders.

RQ3: Is there an interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 in the United States?

H_o3: There is no interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 in the United States.

H_a3: There is an interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 in the United States.

Theoretical Framework

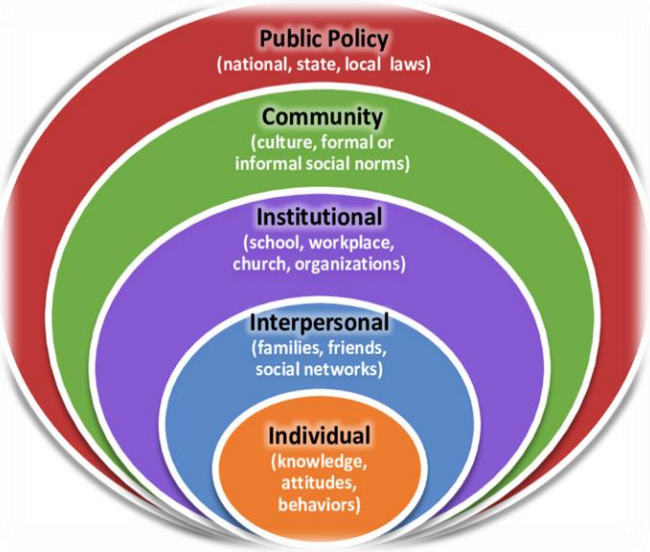
The social-ecological model (SEM) was developed by McLeroy et al. (1988) and offered a broader theoretical perspective to uncover complex public health challenges. This model integrates multiple levels of influence or domains that could impact the prevalence of FI leading to depression among the population age 60–69. This model served as a framework to understand the relationships between FI and depression and other mitigating factors, including age, racial/ethnic groups, and household income and wealth. The SEM is based on the idea that an interaction exists between the individual

and the environment. However, the SEM has become a valuable tool for exploring complex phenomena, including investigating multiple social and economic factors, such as FI and depression prevalence, and racial or ethnic disparities from the individual perspective to the environmental perspective. The SEM posits the interplay between the factors of the individual (age, sex, knowledge, belief, family income, peers, nutritional intake, race/ethnicity) and the environmental context (poverty, SES, health disparities, geographic location) resulting in positive or negative influences and effects (FI, depression).

The SEM provides a framework under which the influencing factors are categorized into five levels: intrapersonal, interpersonal, organizational, community, and public policy (see Figure 1). McLeroy et al. (1988) described the possible interventional strategies at varying levels of impact. McLeroy et al. suggested that interventions at the intrapersonal level aim to change an individual's knowledge, attitudes, beliefs, and perceptions. The interpersonal level addresses formal and informal social networks and social support systems, including family and friendship networks. The organization and the community levels involve modifying the community environment or services and the relationships among organizations. The public policy level involves creating or modifying public policies, including local, state, and national laws and policies.

Figure 1

Socio-Ecological Mode



Note. Adapted from McLeroy, Kenneth R., Daniel Bibeau, Allan Steckler, and Karen Glanz. 1988. "An Ecological Perspective on Health Promotion Programs." *Health Education Quarterly*, *15*(4), 351–377 and reprinted from the United Nations Children's Fund (UNICEF). 2015. "Module 1: Understanding the Social Ecological Model (SEM) and Communication for Development."

Nature of the Study

To answer the research questions in this quantitative study, I used a cross-sectional design that included secondary data. Quantitative methodology was appropriate to test the strength of association between variables of interest (see Howell, 2013). The study included secondary data from the 2015–2016 NHANES. This data set provided information on the health and nutritional status of the U.S. population. The NHANES contained all variables needed to explore the factors associated with FI and race/ethnicity

and depression among U.S. adults age 60–69. The research questions were answered using multivariate logistic regression analyses.

Literature Search Strategy

The keywords searched included *food insecurity*, *food security*, *food insecurity* and *health outcomes, depression, depression symptomology, food insecurity* and *depression, older adult health outcomes, older adult and depression*, *food insecurity* and *depressive symptoms*, *food insecurity* and *mental health, race, ethnicity, race/ethnicity, racism, health disparities, racial discrimination, ageism, elderly food security, older adult food security,* and *senior food insecurity, depression and United States*. I used the following databases and search engines: Mendeley, Google Scholar, CINAHL and MEDLINE, ScienceDirect, and PubMed.

Theoretical Framework

The association between FI, race/ethnicity, and depression among the 60–69-year-old population in the United States is a challenging public health concern that has yet to be adequately understood. McLeroy et al.'s (1988) SEM was used in this study to understand this public health concern. I focused on the intrapersonal level of the SEM because it related to the most significant barriers and facilitators of behavior change related to the study outcome. The other levels of the SEM were discussed in the study but not analyzed due to gaps in the NHANES data set.

The SEM integrates multiple levels of influence or domains that could impact the prevalence of FI and depression among the 60–69-year-old population. The model represents a visual rendition of the dynamic interplays between individuals and their

environments (McLeroy et al., 1988). Within this model, interconnected issues are multifaceted, meaning that many factors interact at different levels and to varying degrees. Using the SEM, McLeroy et al. (1988) posited the interplay between the characteristics of the individual and the environment.

Though the SEM often predicts the idea that an interaction exists between the individual and the environment, it has also become a valuable tool for exploring complex phenomena (McLeroy et al., 1988; Stokols, 1996). The model has been widely used by the research community and governmental organizations to address community, environmental, and policy issues, including health inequality and racial disparities in wealth and ageism (World Health Organization, 2021). The model is endorsed by the World Health Organization, the National Institute of Health, and the CDC. Moreover, the model assumes that appropriate changes in the social environment will instigate changes in individuals. The network of individuals in the population is essential for implementing environmental changes (McLeroy et al., 1988).

The philosophical underpinnings of the SEM originate from the work of Bronfenbrenner (1979) to understand human development in a nested arrangement of structures. Bronfenbrenner's (1977) ecological structures contain multiple interdependent systems nested within multiple levels of influence. Bronfenbrenner (1979) categorized these systems as the microsystem, mesosystem, exosystem, and macrosystem. As a successor, McLeroy et al. (1988) added variations to the model by categorizing the systems as intrapersonal, interpersonal, organizational, community, and policy level

factors. These five factors could support and maintain unhealthy or healthy behaviors in a social environment (McLeroy et al., 1988).

Individual Consideration

The first level of the SEM takes into consideration the individual perspective. According to Bronfenbrenner's model, this includes the microsystem, which comprises systems in the immediate environment in which a person is operating. Interaction within this system is bidirectional and involves complex relationships between the individual and the environment (Bronfenbrenner, 1979; McLeroy et al., 1988; Stokols, 1996).

Effects of the Intrapersonal Relationships

McLeroy et al. (1988) viewed this interaction as an intrapersonal relationship of the individual's knowledge, attitudes, beliefs, and perceptions with the individual's social environment. This level focuses on the dynamic social phenomena, such as understanding the roles of family or household influences on the nuanced behaviors of older individuals in a particular social setting. For instance, the target population in this study comprised racial minority and socioeconomically disadvantaged individuals. Therefore, a mistrust based on socioeconomic status or racial inequality in health and wealth should create barriers to some older adults' participation in programs (Burris et al., 2021; Leung et al., 2015). Some programs, including the Supplemental Nutrition Assistance Program (SNAP), can help prevent the prevalence of chronic diseases or FI in older adults (Keith-Jennings et al., 2019). However, older adults' cultural views and beliefs could create barriers that prevent them from accessing benefits to promote health and well-being. Characteristics such as the person's racial background, lower income category, and

personal beliefs could influence how likely they are to take preventive actions to promote health. For instance, food-insecure older adults sometimes postpone visits to their health care provider or cut meals because of financial insecurity, including limited or fixed financial situations (Coleman-Jensen et al., 2019).

According to the SEM, these situational threats to health and well-being are associated with aging and older adults, especially if resources are lacking in critical social and economic areas of concern. Knowledge, for example, could help in influencing necessary attitudes and decisions older adults can make to comply with socially supportive norms (Stokols, 1996). An individual brings personal knowledge, beliefs, and behaviors influenced by their family, friends, and proximal community (McLeroy et al., 1988). These characteristics can influence how a person behaves. For example, older adults could fear losing their independence and autonomy when their ability to shop for or cook their food is diminished. This loss of independence has been found to prevent older adults from accepting meal services or food assistance from the government and organizations (Keith-Jennings et al., 2019). Also, situations related to not having a companion to prepare or consume meals could lead to depression, poor eating habits, and FI (Burris et al., 2021).

The intrapersonal level is associated with an individual's knowledge about FI, nutritional needs, and the understanding that depression is a serious condition not to be ignored. Knowing these conditions could inform older adults about their susceptibilities to depression and FI and the perception of the overall threat. A basic understanding of the older adult intrapersonal perspective within the SEM framework is important to identify

racial minority individual susceptibility to stressors in the immediate environment (Bronfenbrenner, 1979; McLeroy et al., 1988; Stokols, 1996). The health promotion strategies that should help at this innermost level of the SEM include educational programs, support groups, and senior peer counseling (McLeroy et al., 1988).

Effects of the Interpersonal Relationships

The mesosystem includes the combination of two or more microsystems. This system incorporates the interrelations between the primary setting and the developing person at a particular time in their life (Bronfenbrenner, 1979). The system addresses the formal and informal social networks and social support system, including family and friends (Bronfenbrenner,1979). McLeroy et al. (1988) described this system as the interpersonal perspective. Similarly, the interpersonal level of the SEM consists of the older adult social network including family, friends, peers, health care providers, and several sociodemographic factors such as age range and household income. At this level of the SEM, social interactions among individuals in social networks and group settings could lead to elevated emotional and physiological stress (Stokols, 1996). Relationships with significant others, social networks, and support groups are important sources of influence on some older adults' health. The acquisition of close relatives and friendship networks could provide older adults with social resources including emotional support, social identity, and access to social contacts (McLeroy et al., 1988). Outside of social relationships, loneliness and isolation associated with FI can limit older adults' access to food when there is no assistance from a companion, family, or social network. This idea of FI could lead to cases of depression for some older adults.

Although these functional networks could help older adults avert FI and the interpersonal consequences of depression, they are accessible depending on either network characteristic (McLeroy et al., 1988). For example, some interpersonal characteristics at this level may have particular salience for racial/ethnic groups such as African Americans, Hispanics, and Asians (Odoms-Young & Bruce, 2018). Also, the stressful situation related to FI and other uncontrollable forms of stress could increase depression among racial/ethnic groups (Myers & Painter, 2017).

Depression among racial groups decreases overall self-worth or personal value and has been linked to interpersonal disparities in wealth and income in many marginalized groups (Williams & Cooper, 2019; Williams & Purdie-Vaughns, 2016). In retrospect, social relationships provide significant social resources and social support in fulfilling changes in social norms and social influences by rendering personal obligations and responsibilities to overall well-being (McLeroy et al., 1988). Accessing social networks can help change the social norms of FI prevalence among older adults. Social networks can also increase accessibility to less deviant FI behaviors and create alternative networks to support equitable access to essential resources for older adult health and well-being. One explanation relates to household or family income (interpersonal level) where lower income means that individuals in the household (social network) are more susceptible to the risk factors of FI and depression.

Environmental Consideration

The compounded impacts of FI, depression, and race are challenging public health concerns too complex to be understood from a single-level perspective (Stokols,

1996). Instead, proponents of the SEM (Bronfenbrenner, 1979; McLeroy et al., 1988; Stokols, 1996) recommended a more comprehensive approach that integrates organizational culture, community planning, and regulatory perspective (Stokols, 1996). According to McLeroy et al. (1988), the environment can act as a source of influence at organizational, community, and policy levels. The focus was to build on the SEM's foundation and move away from intrapersonal factors and processes that affect the individual toward the environmental determinants such as the effects of interpersonal relationships (McLeroy et al., 1988). According to Stokols (1996), the shift from personal focused to environmentally based and community-oriented health promotion is evident in some research, including developing cultural change strategies to foster socially supportive norms and healthfulness.

The Organizational Perspectives

The organization is analogous to Bronfenbrenner's (1979) concept of the exosystem, an extension of the mesosystem. This system embraces formal and informal social structures that do not contain the individual but involve the individual's immediate environment (Bronfenbrenner, 1977). These structures include significant institutions, neighborhoods, agencies of government, food distribution establishments and services, and informal social networks (Bronfenbrenner, 1977). Similarly, McLeroy et al. (1988) described this system as the organization, neighborhood, institutional level factor, and the community level factor that involves modifying the community environment.

For the current study, the organizational level of the SEM involved the health care system, policies, and structures working together to support older adults' FI needs and

well-being. This level includes policies and structures within the health care system and neighborhood that can influence or limit participation (McLeroy et al.,1988) in programs intended to increase food security. One example is the New York City Department for the Aging, a local governmental organization providing nutritional support to food-insecure older adults. The New York City Department for the Aging oversees Citymeals on Wheels, a nonprofit organization, in a public/private partnership to provide home-delivered meals to older adults in most significant social and economic need. Though organizational structures and processes differ, they can have substantial influences on the health and well-being of individuals (McLeroy et al., 1988). For instance, other organization programs can offer workplace retirement counseling and workshops for older adults planning retirement. These programs can provide information on health insurance plans and fund programs for making older adults aware of federal, state, and local benefits and how to access them. These organizational programs can influence how older adults respond to FI and related issues.

Another critical component under this level is organizational membership. Organizational membership includes churches, professional groups, and local neighborhood organizations that have positive and negative effects on the health of their members. Older adults often spend their free time in churches, professional groups, and local neighborhoods organizations (McLeroy et al., 1988). Organizational membership provides opportunities to gain access to large groups of people and builds social support groups under their membership.

Community Perspectives

The community is analogous to Bronfenbrenner's mesosystem that relates to the culmination of various organizations and groups in an area (McLeroy et al., 1988). These organizations and groups include families, informal networks, churches, voluntary associations, and neighborhoods (McLeroy et al., 1988). Communities can combine resources and ideas to improve community health. For instance, voluntary organizations such as neighborhoods and professional associations can serve as mediators or mediating structures between individuals and prominent political and economic environments (McLeroy et al., 1988; Stokols, 1996). These organizations can negotiate and lobby for food resources and programs in vulnerable neighborhoods and communities. Mediating structures serve as connections between individuals and the larger social environment and help deliver service to the community (McLeroy et al., 1988).

Changes in individuals without the support of these mediating structures is difficult to achieve. However, a community can help coordinate health events designated to educate and equip older adults with knowledge and materials to help prevent FI and provide health awareness about the seriousness of depression. Health promotion activities should include increasing coordination among community agencies and coalition building to influence community awareness, advocating for local health policies, and lobbying for resource expenditures (McLeroy et al., 1988). Communities often play a critical role in defining community initiatives, such as allocating resources and funding for program amelioration (McLeroy et al., 1988). For instance, communities can use their power to determine what issues are allowed to be placed on the public agenda. These

issues include setting up food pantries and food banks, providing information on accessing SNAP benefits, and providing food home delivery services through food on wheels programs.

On the contrary, community-level factors could limit access to affordable, adequate, and healthy nutritious foods for older adults. These factors can have political, social, and economic ramifications for aging communities. These factors often include convenience stores and small independent stores that are more common in food deserts than full-service supermarkets or grocery stores in terms of FI. Food deserts have higher food prices, lower quality foods, and less variety than supermarkets and grocery stores. Access to healthy food is important to the quality of life and well-being of aging communities comprising socioeconomically disadvantaged individuals. According to McLeroy et al. (1988), the most severe health problems will occur in communities with the least power and access to resources. They are the poor, the racial minorities, the rural, and those with serious health complications (McLeroy et al., 1988). In addition, congregate and home-delivered meal programs assist only 5% of eligible older adults in the United States (Campbell et al., 2015). Several program characteristics and other social, economic, biological, and psychological factors might explain low program participation and high FI rates among older adults.

Policy Perspectives

The macrosystem refers to the overarching institutional patterns of the culture or subculture, such as the economic, social, educational, legal, and political systems, which are the concrete manifestations of the systems (Bronfenbrenner, 1979). Macrosystems are

conceived and examined in structural terms and as carriers of information and ideology (Bronfenbrenner, 1979). According to the researcher, this level consists of the governing bodies responsible for establishing laws at the local, state, and federal levels of government (Bronfenbrenner, 1979; McLeroy et al., 1988). These agencies can plan initiatives, research, and access funding for FI and depression research related to aging and health disparities. For example, Bergmans and Wegryn-Jones (2020) suggested that FI-depression associations are moderated by macro-level context, including large scale economic, cultural, and social context where people live and age. The authors concluded that FI is a psychosocial stressor that has been repeatedly associated with depression among adults over age 50. FI influences on depression in older adults may be affected by the broader, macro-level context, which can be examined (Bergmans & Wegryn-Jones, 2020). According to Bergmans and Wegryn-Jones, when considering FI to be a source of psychosocial stressor, the intersection of the macro-level factor with food systems could determine older adults accessible coping strategy. For example, funding the Supplemental Nutrition Assistance Program (SNAP) helps address some barriers to accessing healthy foods, thereby reducing FI for the older adults. Although the SNAP prioritizes food access to eligible and needy older adults, this benefit does not reach all those who are eligible or needy; only 41% of eligible older adults are enrolled in the program (Burris et al., 2021; Lauffer, 2017). Researchers found that older adults are less likely to participate in food assistance programs even when accounting for socioeconomic differences (Bergmans & Wegryn-Jones, 2020).

SNAP Policy Level

The SNAP food initiative represents one of the largest food safety nets in the United States (Burris et al.,2021). This safety net provides monthly benefits to eligible low-income individuals and families to assist in purchasing nutritious food items (Burris et al., 2021). However, older adults are eligible to receive an average of $124/month in benefits (Lauffer, 2017). SNAP eligibility includes both income and asset limits. For a household of two, gross monthly income must be less than $1,784 (United States Department of Agriculture [USDA], 2018). Countable income or resources that include cash savings or retirement savings of more than $3,250 would result in ineligibility for SNAP participation (Burris et al., 2021; USDA, 2018). This is counterproductive because many older adults live on a low, fixed monthly income that limits their ability to purchase food. As a result, many food-insecure older adults are not eligible for SNAP assistance (Burris et al., 2021). Common barriers to older adults SNAP participation include lack of awareness of the program, confusion about eligibility requirements, difficulty with the application and re-application process, and stigma relative to the program (Lauffer, 2017). Limited funding, reliance on volunteers, and long waiting lists contribute also to reduce utilization and access to food delivery and assistance programs (Campbell et al., 2015).

Shanks et al. (2020) encouraged further development of food policies to mitigate the integrated crisis of FI to which low-income and vulnerable populations are particularly exposed. Nagata, Seligman, et al. (2020) argued that FI in the United States and symptomology of traumatic events such as COVID-19 are intertwined; they

exacerbate long-standing disparities among low-income persons and disproportionately affected marginalized populations. Nagata, Seligman et al. (2020) further recommended that policymakers expand legislation to address projected FI issues in the United States. The USDA implemented more funding, approximately $192.6 million, to promote strategies and knowledge to increase food security and food assistance programs in response to the pandemic. Although these programs have lessened some of the burdens of FI, Shanks et al. and Nagata, Seligman, et al. reiterated that further expansion of these programs would address the increases in the socioeconomic and health inequities of FI and depression in the Unites States.

Literature Review Related to Key Variables and/or Concepts

Overview of Food Insecurity in the United States

FI is a public health threat in the United States that can differentially affect anyone's health and social well-being (CDC, 2021). FI is defined as a condition with diminished or limited access to nutritious food due to a lack of money or resources (Frith & Loprinzi, 2017; Martin et al., 2016). Reader et al. (2020) described FI as a social and economic condition marked by inadequate food to live an active, healthy life. Feeding America, a large food advocacy organization in the United States, reported that many U.S. older adults are suffering from FI, and 60% are more likely to have depression. There are speculations that the number of FI cases will increase despite the declining trends (Ziliak & Gundersen, 2019). In addition to this public health threat, FI is an ongoing public health issue of national significance (Paschal et al., 2020). Even after many years and attempts to reach national goals to reduce FI to 6 % (Goldberg & Mawn,

2015), there remain mixed reviews about the state of FI in the United States. FI in the average U.S. household continues to increase amid a crucial demographic shift, including the rapid growth of the older U.S. population (Goldberg & Mawn, 2015). This demographic shift increased in the population's diversity, the evolution of minority cultures, and the impending pandemic trends. The U.S. Census announced that the U.S. population is more racially and ethnically diverse, increasing since 2010. New minorities are emerging beyond cultural and linguistic recognition to enhance their political rights, protect their interests, and avoid racial discrimination (McClain & Carew, 2018). The myriad stressors imposed by pre-pandemic and pandemic estimates have impaired mental health and well-being (Coley & Baum, 2021). Gundersen and Ziliak (2015) reported that 50 million people in the United States were food insecure, including 8% of older adults in 2016 (Coleman-Jensen et al., 2017). However, researchers have yet to document whether depression has continued to rise among the older U.S. population (Coley & Baum, 2021).

Questions remain as FI cases continue to permeate all levels of social, psychological, and economic parameters of American society. From 2017 to 2019, the estimated prevalence of FI by state ranged from 6.6 % in New Hampshire to 16.8 % in New Mexico (USDA, 2022). Among the distributed age groups, 10.8 % of people aged 60–64 were food insecure, and 9.6 % aged 65–69 were also food insecure. These findings indicate that people in the age group 60–69 are susceptible to the risk factors associated with FI. There might also be heterogeneity in the 60–69 age group influencing FI. Although estimates are that by 2050 the older adult population will double in size (Ziliak & Gundersen, 2019), the current rates of FI are expected to increase to post-pandemic

rates. Current data on the prevalence of FI among older adults are not yet available for analysis. However, pre-pandemic data could give insights into the prevalence and the impacts of FI among older adults by race.

Prevalence of FI Among Older Adults

Researchers have documented the presence of FI among older adults since 2001 as a potential problem drawing national attention (Ziliak & Gundersen, 2019). Over the last two decades, the number of older adults experiencing FI increased from 2.3 million to 5.5 million and is expected to reach 8 million by 2050 (Leung & Wolfson, 2021; Ziliak & Gundersen, 2019). This increase in FI rates is due to the U.S. population growth and aging during this same timeframe (Vespa et al., 2018). Researchers projected more older adults than kids by 2035 (Vespa et al., 2018), meaning that the U.S. population pyramid will become more rectangular with a smaller base (see Figure Appendix A). This rectangular pyramid phenomenon is an indication of the impending increase in FI prevalence and challenges for older adults. Consequently, more older adults will be living longer but with more chronic conditions.

Despite the constant decline in FI rates nationally, over 10 million older adults were found to be FI in 2014 (Ziliak & Gundersen, 2019). In 2018, 7.5% of households with older adults were FI, and 8.9% of households with older adults living alone were FI (Coleman-Jensen et al., 2019; Leung &Wolfson, 2021). In 2019, 10.5% of households were FI at least sometime during the year, less than in 2018 (Coleman-Jensen et al., 2019). Though FI rates were inconsistently fluctuating nationally, there were indications that the problem was even more sinister. More older people are projected to have FI as a

comorbid condition. According to Coleman-Jensen et al. (2019), FI remains complex and declining. Still, other study findings documented a higher prevalence of depression among adults aged 60–69 years old associated with self-reported FI cases (Brooks et al., 2019).

Trends in FI Prevalence

The projected threats of older adult FI rising proportionately with the nations' increasing older adult population is well documented (United States Census Bureau, 2020). Thus, the baby boomer generation, people who attained retirement age as of 2011, is driving this increase (United States Census Bureau, 2020). From 2000 to 2011, FI increased from 10.5 % to almost 14.9 % (Coleman-Jensen et al., 2019). In 2011, at the peak of the FI crisis, 4.8 million older adults were FI (Coleman-Jensen, 2019). Since 2011, FI has declined, but with some variations in the estimates until 2019 pandemic, FI could have increased.

Race and FI Prevalence in the United States

Although the rates of FI have fluctuated between 2000 and 2021, one trend that has continued to persist is the gap in the prevalence of FI between people of color and Whites (Odoms-Young, & Bruce, 2018). In the United States, being of a minority race is associated with an increased risk of experiencing FI and an increased risk of developing one or more chronic health conditions influenced by diet (Afulani, Herman, et al., 2015; Narcisse et al., 2021). Data on FI trends show that non-Hispanic Black and Hispanic households' FI rates were at least twice that of non-Hispanic white households (Coleman-Jensen et al., 2017; Odoms-Young & Bruce, 2018). For example, in 2018, 21.2% of black

households and 16.2% of Hispanic households reported FI cases, compared to 8.1% of White households (Coleman-Jensen et al., 2018). The evidence indicates that the inequality in FI rates among racial subgroups is tied to health disparities in the U.S. population, which could also be tied to overall racial disparities in health outcomes among racial groups. The current distribution by race indicated that one in five Blacks might experience FI in 2021 compared to one in nine White households (Coleman-Jensen et al., 2018). According to Odoms-Young, and Bruce (2018), higher rates of FI persisted among racial groups despite the removal of the social and economic disadvantages of FI. This disparity was evident in the substantial existence of wealth gaps between people of color and whites (Odoms-Young, & Bruce, 2018). The wealth of White households was 13 times the median wealth of Black and 10 times greater than Hispanic households (Odoms-Young, & Bruce, 2018). In addition, at the community level, researchers have documented that racial and ethnic disparities have been linked to FI issues (Hernandez et al., 2017; Morales et al., 2020; Odoms-Young, & Bruce, 2018).

FI is prevalent among racial/ethnic minority populations in the United States (Kimani et al., 2021). In 2019, the national FI prevalence rates remained unchanged (Coleman-Jensen et al., 2021). However, few health disparities were notable among subpopulations (Coleman-Jensen et al., 2021). From 2019 to 2020, FI households headed by non-Hispanic white adults decreased from 4.3 % to 3.8 % (Coleman-Jensen et al., 2021). In contrast, FI households headed by non-Hispanic black increased from 9.5 % to 11.8 %, and Hispanic from 7.8 % to 9.7 % (Coleman-Jensen et al., 2021).

On the socioeconomic spectrum, FI was found to be associated with low income, low educational attainment, belonging to a racial or ethnic minority, and maternal depression (Wu et al., 2018). The lack of money to buy food for adequate nutrition, a sign of poverty, could lead further to depression. Wu et al. (2018) tested the food inadequacy and mental health hypothesis. The authors examined the association between family SES, maternal depression, and household FI. They concluded that FI is a significant social problem that co-occurs with both poverty and depression. The family SES was predictive of later household FI, which was associated with later maternal depressive symptoms (Wu et al., 2018).

FI and Older Adults in the United States

While there is less known about specific characteristics of FI older adults, the older adult population is increasingly becoming the most populous age group (United States Census Bureau, 2020). Most of the factors that influence older adults' health and well-being in later years are associated with nutrition and access to healthy meals (Gundersen & Ziliak. 2015). FI limits older adults' ability to secure and consume nutritious foods regularly and timely, threatening their quality of life (Gundersen & Ziliak, 2015). Approximately a quarter of older adults in the United States have experienced marginal, low, or very- low food security (Gundersen & Ziliak. 2015). By contrast, the older adult populations aged 60 and over live longer, but 65% have two or more chronic conditions (Blaum et al., 2018; Burris et al., 2021). Approximately 80% of older adults in the United States suffer from other chronic diseases related to FI (AARP, 2019; Burris et al., 2021). Chronic disease prevalence among older adults is associated

with higher rates of FI (Jung et al., 2019), which also increases the financial strain or instability, which is visible in specific minority communities (Moss et al., 2020).

Studies indicated that older adults needed additional assistance beyond financial support, including transportation, preparing, and cooking food to avert the consequences of FI due to disease or impairment (Leung et al., 2015). Financial instability is often associated with health care costs and physical conditions that limit older adults' access to food and the preparation of meals (Burris et al., 2021). These conditions often lead to stressors, including depression, a leading mental illness in the United States (see National Institute of Mental Health [NIMH], 2021).

Overview of Depression and Race in the United States

Depression is among the leading mental illness in the United States. Often, this disease is ignored in older adult populations and reported as normal findings, which may not be treated (World Health Organization, 2017). Depression is a complicated mental health challenge among FI older adults. These challenges or complications can be mild but also life-altering, thus, affecting the emotional, social, and psychological well-being (U.S. Department of Health & Human Services, 2021). To be diagnosed with depressive disorder, a person must have experienced a depressive episode lasting longer than two weeks (Sousa et al., 2021). The most apparent symptoms of depression include changes in sleeping and eating habits, social withdrawal, feelings of hopelessness, anger, and prolonged sadness (U.S. Department of Health & Human Services, 2021). Without treatment, episodes in some people last a few months to several years (National Alliance on Mental Illness [NAMI], 2017). In the United States, about 21 million adults had at

least one major depressive episode in 2020 (NAMI, 2017). People of all ages and racial, ethnic, and socioeconomic backgrounds experience depression, but it affects some groups more than others (NAMI, 2017).

Depressive disorder, frequently referred to simply as depression, is more than just feeling sad or experiencing difficult times in life. According to NAMI (2017), it is a severe mental health condition that requires understanding and medical care. Prolonging depression, if left untreated, can be devastating for those who have it and their families (NAMI, 2017). Fortunately, many people can get better with early detection, diagnosis, and a treatment plan consisting of medication, psychotherapy, and healthy lifestyle choices (NAMI, 2017). Some will only experience one depressive episode in a lifetime, but for most, depressive disorder recurs (NAMI, 2017). According to NAMI (2017), a person's access to healthy food is tied to their mental health depression; likewise, mental health issues could also impact their ability to access healthy food (NAMI, n.d.). For instance, FI older adults with depression are at an increased risk of living in a household with inconsistent access to healthy food, are more likely to experience FI, and are less likely to afford mental health care (NAMI, n.d.).

Causes of Depression in Older Adults

According to some researchers, depression does not have a single cause; it includes biological, environmental, and psychological factors (Sousa et al., 2021). The most common type of depression in old age is linked to psychological factors, personality, and stressful life events (Sousa et al., 2021). A history of depression in earlier life may contribute to depressive illness (Sousa et al., 2021). For example,

experiencing traumatic situations at an early age can cause long-term changes in responding to fear and stress (NAMI, 2017). Life events and related stressors can 'trigger' a depressive illness in older adults' vulnerability to depression (e.g., those with money problems, complex life events, or low self-esteem). Laird et al. (2019) explained that the types of stressors encountered by older adults are not those faced by younger age groups. Late-life stressors are voluntary or forced retirement, chronic illness, financial stress, and loss of independence (Laird et al., 2019).

Referencing the intrapersonal level of the SEM framework, stressors/trauma are the internal pathways of events that happen to the individual internally (Kira, 2022). The pathways of events are interconnected through genetic, biological/pathogenic, and psychological trajectories (Kira, 2022). On the higher level, the interpersonal pathway includes the source of negative social interactions and relates to severe health and mental health consequences (Kira, 2022). On the other hand, higher level, systemic stressors and traumas are perpetrated by systems, such as, organizations, groups, and governments against an individual or members of an in-group or outgroup or a group as a whole and its members (Kira, 2022). According to Kira (2022), individuals that instigate or perpetuate systemic traumas' execution are members of the aggressive or domineering group. The main difference between interpersonal and systemic traumas is that the latter is firmly embedded in a social matrix and are directed at an entire group, affecting not only the individual victim but also his social group and community through secondary and tertiary traumatization channels (Kira, 2022).

Given the nature of this study, experiences of either individual or systemic stressors/traumas as discrimination and racialized health and health care can lead to depression symptomology among racial/ethnic groups. Kira (2022) concluded that discrimination, oppression, and micro and macro aggression in the context of status hierarchies have severe mental health consequences and produce the type of chronic stress that increases the allostatic load in late life events. There can be multiple causes of depression in older people (Sousa et al., 2021), which are linked to significant risk factors for late-life depression.

Johnson Nicholson et al. (2020) conducted a study on mental health outcomes among African American adults from Georgia and explored life course event experiences from childhood to the current material and psychosocial state. The authors found that the impact of childhood financial well-being is a factor not mediated through current life circumstances but has a direct positive influence on self-rated mental health at older ages (Johnson Nicholson et al., 2020). This finding emphasizes the impact and importance of early life factors on later life status and the complexities and pathways existing between early life experiences, current material and psychosocial resources, and mental health among older African American adults (Johnson Nicholson et al.,2020).

Byrd et al. (2020) researched the association between stress and depression and explored the longitudinal and bidirectional relationships between depressive symptoms and perceived stress using data from the Baltimore Study. They found that the bidirectional relationship between psychosocial measures of stress and mental health among Blacks in later life were more pronounced for those in their 60s, an age

differential, after adjusting for follow-up baseline stress, chronic health conditions, and demographic factors. Together these findings support ongoing efforts to better understand relationships between stress and mental health, specific features of the stress process, and possible age variations in how depression and stress are related (Byrd et al., 2020). Thus, the biological causes include specific life experiences and personality traits that are not well known (Korten et al., 2014).

Psychological trauma or stress is vital in predisposing the conditions that a life crisis can spontaneously occur or trigger a physical or mental illness (NAMI, 2017). Depression that first develops in later life, after 60, is more commonly associated with physical health problems that accompany aging (Johnston, 2021; Korten et al., 2014). Depression in older adults is sometimes difficult to diagnose, as the symptoms are often similar to aging (Sousa et al., 2021). Depression can affect people differently, depending on their age (NIMH, 2021). Features can include unexplained physical symptoms, memory loss, and behavioral changes (Sousa et al., 2021).

Older adults sometimes complain of a range of physical symptoms for which no adequate medical explanation can be found (Sousa et al., 2021). Although a depressive disorder can be a devastating illness, it often responds to treatment if adhered to, thereby altering the causal pathways between FI and depression. However, few studies have examined how older populations experience FI with depression by race. It is vital to address related factors contributing to the psychosocial problems of FI and factors specific to the causes of stressful life events leading to depression among older adults, 60–69, by race.

Prevalence of Depression Across Racial/Ethnic U.S. Older Adults

Hooker et al. (2019) commented that differences in the prevalence of depression among racial/ethnic groups early in life are linked to experiencing mental health challenges later in life. The diversity in the U.S. population is vital to understanding the prevalence of depression, more specifically across racial/ethnic older populations (Hooker et al., 2019). Hooker et al. (2019) analyzed data from racially diverse participants of the Medicare advantage plans. The researchers found that in the United States, older adults growing up with minority status increased the risk factor for depression (Hooker et al., 2019). These risk factors include more stressful life events related to the lack of education, inadequate lifetime income and financial resources, and less access to preventative health care (Hooker et al., 2019).

Similarly, Williams, Priest, et al. (2016) pointed out that racially and ethnically stigmatized people experience higher rates of illness and death in the U.S. and across multiple health outcomes. These disparities explain the earlier onset of illness and poor quality of care for racial/ethnic minorities (Williams, Priest et al., 2016). On the contrary, minority populations can also experience protective factors. Protective factors mean building more vital social circles. These social circles include more extensive social networks and stronger family and friendship ties that give opportunities to strengthen cultural views and present opportunities for resiliency (Hooker et al., 2019).

Hooker et al. also explained disparities in replicated self-reported SES and outcomes related to health, income, and education. For instance, lower depressive symptoms suggest better health, higher income, and higher levels of education for some

communities. Also, lower depression symptoms are lower among married people than a single or lonely person (Hooker et al., 2019). These disparities in older adult health present a unique challenge for current research. The older adult populations, 60–69, have created many unique challenges as they age. These challenges include changes in their health status, financial stability, lifestyle, and ability to remain independent (Gundersen & Ziliak, 2017). These challenges and a combination of multimorbidity conditions might have affected many FI and depression study results (Blaum et al., 2018; Burris et al., 2021, Jih et al., 2018). For instance, although there were declining FI rates, the prevalence of FI among the older populations remained constant for decades, and most studies lack a third variable, such as race/ethnicity (Brooks et al., 2019; Odoms-Young & Bruce, 2018). FI is independently associated with depression among low-income adults in the U.S., yet, this association differs across levels of diet diversity (Narcisse et al., 2021). According to Bruening et al. (2017), researchers need to conduct more insight to understand the mechanisms and pathways involved in the FI and depression association.

Race and Prevalence of Depression

According to Weinberger et al. (2018), the prevalence of depression increased significantly in the United States from 2005 to 2015. Currently, more research is needed to understand the macro-level, micro-level, and individual factors contributing to the increase in depression (Weinberger et al.,2018). Although depression is a leading cause of other health problems in the United States, depression is distributed across all race/ethnicity groups (Ettman, Cohen, et al., 2020). Is it possible that lack of assets, in the form of household income, is contributing to racial and ethnic differences in depression?

Ettman, Cohen, et al. (2020) explained that the unequal distribution of assets or wealth across racial/ethnic groups could influence depression. More specifically, social and economic differences across racial and ethnic groups could explain depression (Ettman, Cohen, et al., 2020). According to Brody et al. (2018), higher-income or more assets are associated with a lower prevalence of depression. Higher income can improve mental health or depression outcomes (see Ettman, Abdalla, et al., 2020, 2021; Ettman, Cohen, et al., 2020; Lê-Scherban et al., 2016). Stansfeld et al. (1998) concluded that higher income could also improve access to resources that should help reduce the effects of financial and other stressors. These mitigating efforts can serve as a proxy for greater social status and better mental health (Stansfeld et al., 1998).

On the contrary, Assari (2017) and Ettman, Cohen, et al. (2020) pointed out that a person's education, being married, and homeownership lower the prevalence of depression. In models unadjusted for assets, non-Hispanic Black and Hispanic persons had 1.3 times greater odds of depression and 0.8 times lower odds respectively than non-Hispanic White persons (Ettman, Cohen, et al., 2020). Non-Hispanic Black and Hispanic persons had a higher weighted prevalence of depression in the United States than non-Hispanic White persons (Ettman, Cohen, et al., 2020). Also, non-Hispanic Black and Hispanic persons had fewer assets than non-Hispanic Whites. However, when holding assets constant, minorities had better mental health than non-Hispanic White persons in the United States.

Given the historically unequal distribution of wealth in the U.S. population, it is not surprising that racial minorities that hold fewer assets would have an overall more

significant prevalence of depression. The United States population is vastly becoming more racially diverse. Essentially, this diversity needs more investigations primarily across the prevalence of depression in diverse racial/ethnic and older adult populations (Hooker et al., 2019). Unfortunately, there are some limitations in understanding the prevalence of depression concerning the methodological principles of collecting, analyzing, and categorizing racial and ethnic data (Hooker et al., 2019).

Determinants of FI and Depression in U.S. Older Adults

FI has been associated with depression in many studies in the United States and internationally (Maynard et al., 2018). FI and depression association often reflect many common at-risk factors among vulnerable subgroups with a greater risk among low income in the United States (Narcisse et al., 2021). In addition, most studies on this association are ongoing, cross-sectional, and limited to specific age groups and gender (Maynard et al., 2018). In a recent cross-sectional study, Nagata, Ganson, et al. (2021) pointed out a new focus on FI cases in the United States; FI has increased during the COVID-19 pandemic and affects vulnerable populations, placing them at higher risk for depression symptoms (Fitzpatrick et al., 2021; Lauren et al., 2021; Wolfson et al., 2021). Lauren et al. (2021) reported FI individuals were 1.71 times more likely to screen positive for depression during the pandemic. Wolfson et al. (2021) concluded that COVID-19 is negatively associated with depression and low income, which increase mental health disparities over the long term. In more extensive studies, Nagata, Ganson, et al. (2021) collected and analyzed data from over sixty thousand U.S. adults from the U.S. Census Household Pulse Survey. The authors concluded that FI was associated with

younger age, African American race, multiple races, Hispanic ethnicity, and reporting income below the federal poverty line. Although this study described the characteristics that lead to FI, the conclusion lacks what specific age groups were affected, even though the average age group was roughly 48 years old (Nagata, Ganson, et al., 2021). The age demographics clearly explain gaps in previous and current studies on age related determinants of health among the older populations. Studies that include a specific age range from 60–69 are limited.

Explaining this limitation in age, Arenas et al. (2019) conducted a full systematic review and meta-analysis examination of 57 peer-reviewed studies and 169,433 participants to address the effects of FI on mental health conditions such as depression, anxiety, and sleep disorders. At the time of review, Arenas et al. (2019) informed readers that there were currently no published systematic assessments or meta-analyses of this literature. Arenas et al. performed a systematic search of the literature in PubMed, PsycInfo, Embase, Scopus, and Web of Science. In a cross-sectional analysis, a meta-analysis showed that FI was associated with an increased risk of testing for depression in 42 studies (Arenas et al., 2019). The study findings indicated similar values for the highest risks of depression and anxiety. This systematic review and meta-analysis demonstrated a strong association between FI and depression, but there were some limitations on closer examination. First, there was a wide age range in most of the studies. Second, only a few studies provided data on age-specific groups. For instance, only five studies had participants 50 years old and above, and there were no inclusive male studies, even though there were ten women-specific studies (Arenas et al., 2019).

However, this study showed that there are still gaps in the age-specific range for assessing the relationship between FI and depression among the older populations in the United States, specifically among the 60–69 years old.

In addition, it is also not clear what role the current evidence on the association between FI and depression plays in the subsequent onset of depression in consideration of race/ethnicity. Few studies, to date, have comprehensively examined the association between pre-pandemic experiences of FI and the consequences or trauma leading to COVID-19 infections through race/ethnicity (Kimani et al., 2021). Kimani et al. (2021) concluded that the current evidence suggested that racial/ethnicity, income, and comorbidities, are associated with health outcome disparities. The gap between racial/ethnic minority groups and the White population persisted (Odoms-Young & Bruce, 2018). Racial/ethnic groups not represented (Lai et al., 2021), low-income households and individuals with comorbidities are constantly at risk of contracting preventable diseases (Williams, Mohammed, et al., 2010; Cutlier et al., 2021). As a result, addressing FI is an essential step in improving mental health and depression in general (Bergmans et al., 2019; Bergmans & Wegryn-Jones, 2020), but more importantly, among vulnerable age groups, 60–69.

In another extensive study covering the association between FI and depression and other determinants of health, Maynard et al. (2018) examined FI as a growing and persistent concern in the United States. The researchers conducted an extensive scoping review to characterize the state of FI and poor mental health as an ongoing concern in high-income countries, particularly among females (Maynard et al., 2018). Maynard et al.

identified 39 articles representing 31 unique studies/surveys. More than three-quarters of the articles used data from a version of the *USHFSSM* to assess FI (Maynard et al., 2018). To measure depression and depressive symptoms, the researchers used a range of mental health measures, including several validated scales such as *PHQ-9* (Maynard et al., 2018). Even though the results in the study showed associations between FI and depression, most assessed the relationship in low-income women (Maynard et al., 2018). Longitudinal analyses suggested a bidirectional relationship with FI increasing the risk of depressive symptoms or depression predicting FI among most articles (Maynard et al., 2018). In most of the articles, the focus was on several at-risk groups of women, including vulnerable subgroups of pregnant women and mothers and those women at risk of homelessness and violence (Maynard et al., 2018). Though Maynard et al.'s (2018) study showed the relationship between FI and depression in a vulnerable population of women, it failed to address this vulnerability by race/ethnicity among adults age 60–69. The evidence is clear that a gap existed based on the magnitude of the study. The average age of low-income women examined was close to 25 and 30 years and between 18 and 64 years. This age disparity adds complications and doubts to current study findings on FI and depression. The current understanding of this association is complicated and bidirectional, meaning explained by Bergmans et al. (2019) that the pathways by which FI leads to depression are poorly understood. It is critical that researchers understand, for example, the racial pathways leading to depression as a first step. For instance, is race a mediating factor in determining the association between FI and depression? Does race directly or indirectly affect or relate to the prevalence of FI cases and depression

symptomology in the United States? Finally, is race an impending force driving racial and ethnic disparities in health in FI-depression associations? These questions still need answers, especially in age-related contemporary research studies involving vulnerable communities and individuals, which are limited in scope.

Effects of FI and Depression in Older Populations

The prevalence of FI and depression in the United States has attained prominence, especially among older adults. Researchers have documented the presence of FI among older adults since 2001 as a potential problem drawing national attention (Ziliak & Gundersen, 2019). Brooks et al. (2019) used the 2005–2014 National Health and Nutrition Examination Survey to examine the associations between varying FI levels and clinically relevant depressive symptoms among adults over 60 years. The researchers found that varying levels of food security issues were associated with depressive symptoms. Nevertheless, in Berkowitz et al. (2019) study, the researchers found that higher FI prevalence was more strongly associated with higher health care costs. Gu et al. (2020) confirmed that depression is associated with increased direct healthcare costs for elderly patients with depression that could influence individuals and communities. Moreover, an increase in the prevalence of older adult FI will increase future health care costs, resulting in a lack of resources to prevent FI issues and the more severe case of depression in years to come.

Goldberg and Mawn (2015) conducted a retrospective cross-sectional study of secondary data from the NHANES. The researchers used descriptive, chi-square, and logistic regression to examine the antecedents of FI among older adults 60 years of age

and older. The researchers found that severe depression, financial support, and having ever received household food stamps were associated with FI among older adults. In the study, the authors used the SEM to describe the influence of FI in multiple spheres of influence among the targeted population. The SEM described the factors of FI and depression more succinctly. However, more study is needed to assess the complex nature of FI and depression and a third variable among the 60–69 years and older populations (Brooks et al., 2019; Goldberg and Mawn, 2015).

Meanwhile, Hernandez et al. (2017) assessed whether gender and race/ethnic disparities exist between FI and overweight/obesity among adults ages 18–59. The researchers used a cross-sectional 2011 and 2012 National Health Interview Survey data of 19,990 participants in a multivariate logistic regression test. Stratification of the test included gender and race/ethnicity to estimate the association between FI and overweight/obesity controlling for several demographics. Hernandez et al. (2017) found FI prevalent among blacks and Hispanics, regardless of gender. The study findings indicated that some groups of people are more vulnerable to FI, suggesting that there might be other potential behavioral and physiological factors influencing FI. These factors sometimes cause disparities among various groups of people. However, Smith et al. (2017) examined the distinct determinants of FI across a series of multilevel linear probability models. The authors concluded that having low levels of education, weak social networks, less social capital, low household income, being unemployed, and heterogeneity in the determinants of FI were associated with FI globally.

Race and Socioeconomic Status in the United States

"Race" has become a dominant but controversial force in determining many health outcomes, including FI and depression (CDC, 2021). However, there are a few assumptions about race. First, "race" is considered a socio-political construct. People created "race" for their own social and political purpose of giving legitimate dominance and power to one group of people over the other (Williams, Lawrence, et al., 2019). Second, "race" is a false classification of people not based on a fundamental biological or scientific truth (Aifah et al., 2021; Harrison, 2020). Third, race alone represents limited biological relevance to outcomes of interest, leading directly to socioeconomic inequalities and exposure to stressors such as depression (Assari, Smith, et al., 2019; Williams, Mohammed, et al., 2010).

Race and ethnicity are dual social constructs, a combination viewed as race/ethnicity (O'Keefe et al., 2015). *Social constructs* are ideas created and accepted by the people in a society (Merriam-Webster, n.d.) to address the cultural factors and social dynamics. *Social constructs* give rise to maintained values and beliefs (Witkin, 2012). More relevant, the classification of "race" is an illusion (Harrison, 2020). According to Harrison (2020), the idea of race rests on imaginary, arbitrary, and invented rules, concepts, and cultural categories. "Race" has nothing to do with an individual's physical, intellectual, and mental health capacities (Harrison, 2020). Researchers categorized race based on shared physical characteristics and ethnicity as shared cultural traits (Wheeler & Bryant, 2017). Mersha and Abebe (2019) reported that race and ethnicity are related; "race" refers to a person's physical appearance, such as skin color and eye color. On the

other hand, ethnicity refers to cultural heritage, language, social practice, traditions, and geopolitical factors (Mersha & Abebe, 2019).

Historically, race and ethnicity represented powerful influences on interpersonal and group experiences (Wheeler & Bryant, 2017). Some of these experiences in the United States include traditional racial bias, discriminatory practice, and social hierarchy in health and health care (Bailey et al., 2017). These racist ideologies, to date, are still supported and persist in organizations and institutions in the United States (Villarosa, 2019). Williams, Lawrence, et al. (2019) described racist ideologies or racism as an organized social system that assigns power, privilege, and dominance to one racial group over others. Racism unjustifiable devalues self-worth, distributes less power, and allocates different valued societal resources and opportunities to groups defined as inferior (Williams, Lawrence, et al., 2019).

Recently, the American Medical Association [AMA], (2020) recognized race as a social construct and concluded that accepting race as a biological paradigm exacerbates health disparities. These health disparities often result in adverse health outcomes for vulnerable communities (AMA, 2020). Specifically, many in the scientific and research community contested that race is not a scientifically proven concept regarding biological or genetic variations among people (AMA,2020). Also, because “race” is attributed to phenotypic features, there is a mistaken tendency to see “racial” characteristics as biological, which historically has fueled claims of racial superiority (Duggan et al., 2020; Villarosa, 2019). Some researchers contended that the lack of scientific evidence about

"race" undermines the concept of racial superiority of some "races" over other "races" by categorizing skin color among others (see Braveman & Parker Dominguez, 2021).

For decades, in the United States, the concept of "race" was used to categorize people in research studies, but today, many scientific communities have denounced this term (Aifah., 2021). The reality is that "race" is not entirely biological but more of the human society that matters (Duggan et al., 2020). Although the meaning of race is socially rather than scientifically constructed, "race" presents some new and complex ideas that challenge many long-standing assumptions and norms (Aifah et al., 2021; Williams, Lawrence, et al., 2019). The conflation between "race" and "racism" is challenging to navigate. Often these conflicts are documented through the myriad effects of "racism" rather than by "race" (AMA, 2020). Williams, Lawrence, et al. (2019) explained that the countless impacts of racism resulted in the difference in health outcomes attributed to race.

Consequently, racial/ethnic minorities face many challenges, including higher FI rates and more depression symptoms discussed earlier (Jung et al., 2019). These racial and ethnic challenges are well documented concerning health disparities and racial inequality (Bailey et al., 2017 & Wheeler & Bryant, 2017). According to the National Council of Aging (2015), racial and ethnic minorities have lower nutritional intakes, a risk factor for FI among older people. In addition, the Centers for Disease and Prevention (2020) reported that racial and ethnic minorities are more likely to suffer from food-insecure chronic diseases like obesity, diabetes, depression, and other preventable health

conditions. As a risk factor, “race” is more likely to be a proxy for influences like structural racism (AMA, 2020).

Racism in the United States

Racism like FI is a psychosocial stressor that functions at multiple levels of influence; it is motivated by unequal power and differences in health and health care outcomes (Williams, Lawrence, et al., 2019). Racism can affect health in multiple ways, including structural, cultural, and individual-level racism (Williams, Lawrence, et al., 2019). Racism is a public health threat (CDC, 2021). It is rooted in the structures, policies, practices, and norms that assign value and determine opportunity in the United States economy (CDC, 2021). According to the CDC report, racism unfairly advantages some and disadvantages others throughout society. Like FI and depression, racism negatively affects people’s mental and physical health, preventing them from attaining their highest level of health (CDC, 2021).

Racism has been the most consistent evidence of adverse health effects concerning mental health challenges such as depression (Bailey et al., 2017). Communities and individuals exposed to structural racism or any form of racism are at greater risk for poor health outcomes (CDC, 2021). Recent data show that racial and ethnic minority groups throughout the United States experience higher rates of illness and death from preventable diseases than their White counterpart (CDC, 2021). For instance, the life expectancy of non-Hispanic Blacks is four years lower than that of White Americans (CDC, 2021). To better understand the variations on how racism operates and contributes to poor health, Mersha and Abebe (2019) suggested the use of “race” to

describe health disparity in societies characterized by racial categories and “ethnicity” to explain traditions, lifestyle, diet, and values.

In some research, “race” is used as a proxy for “racism” to address the societal problems related to structural racism in the context of health disparities (Marsha & Abebe, 2019). Aifah et al. (2021) cautioned that racism in science and medicine requires a complete rejection of false claims that attempt to link racial differences in health outcomes to genetic variations. This caution means that research on race or racism should focus on and highlight the social and structural root cause of racial disparities without attempting to support biological linkage based on race (Aifah et al., 2021).

Socioeconomic Status

SES measures are used in research to classify people as belonging to a specific socioeconomic group (Daganzo et al., 2018; Darin-Mattsson et al., 2017). Traditionally, SES is determined based on information about individuals or households’ education, occupation, and income levels (Hoebel et al., 2017). Often “race” is linked to SES (Williams, Lawrence, et al., 2019). For instance, studies found that African Americans and some minority groups live well below poverty (Nam et al., 2015). Further, the study reported that racial/ethnic minority groups have less economic and noneconomic resources and live in less favorable environments (Nam et al., 2015). Such inequitable distribution of wealth and health is complex and shared in the United States (Khullar & Chokshi, 2018). Wheeler and Bryant (2017) reported that among racial and ethnic groups, these complex factors are well documented and explained in health disparities and inequalities in health outcome studies. Also, studies of the social determinant of

health (SDOH) have found socioeconomic inequalities in health linked to SES (Darin-Mattsson et al., 2017). For example, people with low SES are more likely to have poor health and die younger than those with higher SES (Fiscella & Williams, 2004). These health inequalities are experienced from early life and often persist well into old age, undermining healthy aging (Khullar & Chokshi, 2018; MacGuire, 2020).

Income and Poverty

Race influences other socioeconomic factors, including income (Khullar & Chokshi, 2018). Independently, income is often considered an indicator of material resources and is positively associated with longevity (Hoebel et al., 2017). Specifically, lower-income or upper-income groups are often used in research studies to monitor or understand how the social patterning of resources affects health (Braveman et al., 2010). According to Webel et al. (2016), social resources are constructs that have consistently been observed to improve and maintain health. On the contrary, people with low income have less money to spend taking care of themselves, paying for food, and going to the doctor (Leung et al., 2015). According to Leung et al. (2015), these conditions arconsistently associated with FI and depression and are more visible in racial minority communities (Khullar & Chokshi, 2018). Khullar and Chokshi (2018) indicated that Black Americans have lower incomes and shorter life expectancies than white Americans. There are many reasons for such racial health disparities, including financial hardship, discrimination, and deleterious physical and mental health effects (Khullar & Chokski, 2018). In addition, Laraia et al. (2017) explained that stressors associated with lower income increase the risks of chronic disease and complications. Generally, income

often intersects with many other social risk factors (Khullar & Chokshi, 2018). Likewise, low income is a sign of poverty, a socioeconomic disadvantage linked to adverse conditions such as inadequate nutrition and lack of opportunity to gain wealth (Jung et al., 2019; Laraia et al., 2017). These conditions represent complex interplays in the social environment and are cumulative across stages of life and family and neighborhoods (Robinette et al., 2016). In the United States, poverty is measured by comparing a person's or family's income to a set of poverty thresholds or minimum amount of income needed to cover basic needs (Institute for Research on Policy, n.d.).

Contributors to Racial Disparities in Older Adults' Health

The U.S. population is strongly divided along racial lines and differences, suggesting links between social disadvantage and health (Braveman et al., 2010). Researchers found that health differences, for example, are rooted in neighborhoods and communities and how people are treated (Bailey et al., 2017). The service offered to individuals, neighborhoods, and communities could foster a better understanding of racism as it affects vulnerable communities. A prominent researcher pointed out that SES indicators are patterned by race (Williams, Lawrence, et al.,2019). In another document, Williams, Priest, et al. (2016) informed readers that SES is a complex and multidimensional concept comprising a range of factors. These factors permeate different levels in individuals and neighborhoods and include economic resources, power, and prestige that can influence health at different times in the life course (Williams, Priest, et al., 2016). For instance, Asians have the highest median household income, but Black earn 59 cents, and Hispanic earns 70 cents for every dollar of income that a White person

earns (Williams, Priest, et al., 2016). Racial differences in economic status are unjustified (Williams, Priest, et al., 2016). For every dollar of wealth that White households accumulated, Asian households have 83 cents, but Blacks households have 6 cents, and Hispanic households have 7 cents (U.S. Census Bureau, 2014; Williams, Priest, et al., 2016).

These differences in SES contribute to racial disparities in health because people with lower SES will have poorer health and a greater risk for chronic diseases (Steptoe & Zaninotto, 2020). This phenomenon is termed the socioeconomic gradient, where high income can lead to a healthy lifestyle, and those at the lower end of the income distribution have fewer enabling resources (Steptoe & Zaninotto, 2020). The socioeconomic gradient applies to depression and FI. Depression and FI are more prevalent in lower socioeconomic groups than in the higher socioeconomic groups (Hoebel et al., 2017). A study found that low SES is associated with a higher prevalence of depression and linked to FI (Laraia et al., 2017). For instance, people with higher income tend to live in healthier neighborhoods and have higher educational attainment and more social capital (Khullar & Chokshi, 2018). Low SES neighborhoods are associated with higher mental and physical health rates, suggesting more significant cumulative damage to the body's physiological regulatory systems (Robinette et al., 2016).

Racial Discrimination in FI

According to the SEM, the older persons' interpersonal experiences with perceived racism may cause emotional and psychological problems (Assari, Smith, et al.,

2019). These problems are sometimes expressed in traumatic symptoms of depression, and overall poor health (Phojanakong et al., 2019). FI has been associated with depression and mental distress, especially in individuals already under higher stress and those socially isolated (Jones, 2017; Martin et al., 2016). However, whether this disruption in health functions occurs at the interpersonal or policy levels, race/ethnic discrimination and healthcare disparities contribute to poor health in many settings (Odoms-Young, & Bruce, 2018). According to Phojanakong et al. (2019), racial discrimination can disproportionately affect a person's social and economic well-being. It is more likely that racial and ethnic disparities in health and the social determinants limit household food security (Phojanakong et al., 2019). Thus, this burden is disproportionately high among racial/ethnic minority groups (Nam et al., 2015; Odoms-Young, & Bruce, 2018). For example, Burke et al. (2018) investigated the association between lifetime racial discrimination and FI among African American food-insecure households with children in South Carolina. After adjusting for other demographic and socioeconomic confounders, the researchers found that racial discrimination was associated with increased odds of being FI (Burke et al., 2018). Even though this relationship between race/ethnicity and FI exists, it is complex and entangled with other risk factors, such as poverty, lack of wealth, and financial insecurity (Odoms-Young, & Bruce, 2018). Therefore, racial discrimination and racism create food inequalities across racial/ethnic groups (Burke et al., 2018; Odoms-Young, & Bruce, 2018).

Racial Disparities in FI

There is inequality in household food insecurity rates among the racial/ethnic groups (Morales et al., 2020; Nam et al., 2015; Odam-Young, & Bruce, 2018). For blacks, the racial wealth gap could be traced back to 400 years of inequality in wealth, contributing to low-paying jobs and difficulties acquiring wealth and savings, which could prevent adverse outcomes like FI and depression. Though the income gap between White and Black families still existed, in 2018, Black families had 58% of the income of White families. The poverty rate among blacks' doubles that of Whites (10.5%). Black individuals and families may need more savings, better-paying jobs, and assistance from families or friends or the government to avert FI. This financial dependency or wealth gap, often prevalent among minority groups, is influential in encouraging financial needs, further affecting a group or family's ability to acquire and accumulate wealth. However, such inequality could be perpetuated or reinforced by racial inequality, including structured racism, which is a multilevel system of ideologies, institutions, and processes that have created and reinforced or redefined racial/ethnic inequities (Gee & Hicken, 2021; Neely et al., 2020).

FI and Depression Among Vulnerable Subgroups

FI affects older people at various social and economic levels. For example, low household income indicates a lack of wealth and financial instability. Financial instability in the household could be linked to generational wealth gaps for some racial and ethnic groups. Most baby boomers (60–69 years old), who are Black, experience this wealth gap in their life course (Jung et al., 2019). This wealth gap often causes someone of African

descent to constantly worry about passing this on to the next generation of family members. They sometimes sacrifice food and nutrition for the financial security of the family or household, which is a condition of FI. Should this behavior continue over a long period, it could lead to depression. Also, living on a fixed income often puts many older adults of all races/ethnicity at risk for FI and nutritional health problems (Jung et al., 2019). Maynard et al. (2018) researched evidence of food insecurity among vulnerable subgroups. In most cross-section studies, the study results showed an association between depression and food insecurity among women in high-income countries; however, the researchers cautioned the need for more comprehensive policies and programs to showcase the complex links and challenges in public health. This study's importance is tied to linking evidence of vulnerable groups to FI issues and depression.

On the other hand, Pak and Kim (2020) examined the associations between FI and health outcomes in older adults. The authors used the Supplemental Nutrition Assistance Program (SNAP) enrollment as a mitigating variable to assess the adverse health consequences associated with FI security and depression. The researchers concluded that FI remained a significant risk factor for depressive symptoms conditional on SNAP enrollment. However, because some seniors or older adults are not receiving SNAP benefits, it is essential to know how and why this impacts the prevalence of FI and depression among older adults.

Definitions

Age: Defined as a categorical variable by the following three groups: 18–39, 40–59, 60–69, 70–79, 80 and over. These groupings were consistent with age categories recommended by the NHANES analytic guidelines.

Depression: Depression (major depressive disorder) is a common treatable and serious medical illness that negatively affects a person's feeling, thinking, and acting. It can lead to feelings of sadness, and a variety of emotional and physical problems (American Psychiatric Association, 2020).

Disparities: Racial or ethnic differences in the quality of health care that are not due to access-related factors or clinical needs, preferences, and appropriateness of intervention. (Institute of Medicine).

Food deserts. Communities that lack affordable and nutritious foods.

Food insecurity: Food insecurity is defined as the disruption of food intake or eating patterns because of lack of money and other resources. The ranges for food insecurity are (1) low food security – indicators of food access limitations but no reduction in food intake and (2) very low food security – disrupted eating patterns and reduced food intake (USDA).

Food security: Reports on (1) high food security – no food-access problems or limitations and (2) marginal food security one or two indicators of food access limitation (USDA).

Gender: A binary variable defined as "male" or "female."

Health disparities: Differences in the incidence, prevalence, mortality and burden of diseases, and other adverse health conditions that exist among specific population groups in the United States (U.S. Department Health and Human Services. Healthy People 2010).

Health care disparities: Differences or gaps in care experienced by one population compared with another . . . within the scope of health care delivery, these disparities may be due to differences in access to care, provider biases, poor provider-patient communication, poor health literacy, or other factors (U.S. Department of Health and Human Services Agency for Healthcare Research and Quality (AHRQ)).

Health disparity: A particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage (U.S. Department Health and Human Services. Healthy People 2020).

Health equity: Attainment of the highest level of health for all people (Hill-Briggs et al., 2021). Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities (U.S. Department Health and Human Services. Healthy People 2020).

Household income: Defined in four categories, roughly following the interquartile range for the categorical variables of income: $0–$19,999; $20,000–$44,999; $45,000–$74,999; ≥$75,000.

Low food security: Reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake (USDA).

Race/Hispanic origin: A categorical variable across 5 mutually exclusive categories: “non-Hispanic white”, “non-Hispanic black”, “Hispanic”, “non-Hispanic Asian”, and “other” (Ettman, Abdalla, et al., 2020).

Very low food security: Reports of multiple indications of disrupted eating patterns and reduced food intake (USDA).

Assumptions

Based on the knowledge of the SEM, several critical assumptions of concern were anticipated from the onset. The first assumption is that the study population may relate to experiencing higher levels of FI and depression associated with factors found on the intrapersonal level of the SEM. Second, the significance of FI is an indication that an individual does not have the resources to provide a consistent and stable intake of healthy and nutritious food. Depressed and food insecure individuals often worry they will run out of food or cannot afford a balanced meal, or skip meals because of financial worries or inadequacies. The third assumption is that the study population and the factors influencing their nutritional intake or access to nutritious food at the community level are closely related. Fourth, there is an association between race/ethnicity and depression among the adult population age 60–69 in the United States. The ubiquitous influences of FI and the challenges of food-insecure environments may have older adults feeling down, depressed, and hopeless, have little interest in doing things or have thoughts of being better off dead. These influential thoughts may be relevant because people from different races/ethnicity started from different positions regarding their mental health. Adverse life events, like food security, would aggravate depression symptoms, which may affect well-

being when determined as very low. Marginalized groups, people of color, or adults 60 years or older feared the worst outcomes more often in preretirement years. Finally, participants in the NHANES questionnaires will provide honest answers to the survey.

Scope and Delimitations

This study focuses on understanding the risk factors and characteristics that would lead to depression in adults 60–69 years from different race/ethnic groups in the United States (U.S.). The links between FI and depression are explored with relevance to the SEM at the individual and community levels. This study aims to assess the interplays between the individual and the environmental factors influencing the relationship between FI and depression when controlling for the sociodemographic variable in the study population.

The study builds on previous research on FI and depression and is limited to a nationally representative sample of adults aged 60–69 years from the 2015–2016 NHANES datasets. NHANES is an annual cross-sectional survey conducted by the U.S. government in the 50 states. The administration of NHANES is done through household interviews and mobile exams, with Computer-Assisted Personnel interviews for the depression screener. This study excluded individuals younger than 60 and for missing data. The study examined validated household food insecurity and depression measures, adjusting for sociodemographic and health characteristics hypothesized to influence these relationships.

Limitations

There are some limitations to look out for. First, this study is not intended to present specific hypothesized causal relationships between FI and depression. Second, the relationship between FI and depression may be bidirectional, meaning depression could be both an outcome and a risk factor for food insecurity. Third, because the nature of the data in this study is cross-sectional, the information is available in 2-year cycles, which restricts the study by not providing an opportunity to conduct a longitudinal study involving a specific age group. Finally, because some of the data are self-reported, likely, some participants may at least misrepresent or give interviewers inaccurate information, which could skew the study results.

Significance

This study is significant because FI and depression among the older population in the U.S. are a public health concern. This study contributes to public health by providing a better understanding of the relationship between FI and depression to hopefully prevent poor mental health and depression among the older population as they transition through the more vulnerable stages of their lives. This study's findings could help providers increase or improve communication with older adults from racial and ethnic groups at risk of FI and depression. These findings could also provide insights for public health practitioners and food policy advocates for increasing opportunities for health policy discussions on how race and ethnicity impact food insecurity and improve social and health problems. The social change implication of this study is to present a case on FI and depression on racial/ethnic disparities in health among the older populations and improve

mental health leads in communities or groups that are affected. This approach could improve the quality of life for older adults in targeted communities, reducing medical and healthcare spending in the future and opening opportunities for improved outreach. These opportunities can establish strategies for understanding older individuals and communities and aligning public health actions to their needs. These strategies include increasing depression screenings for elderly health care visits, improving access to food benefits, and tailoring public health messaging to target food insecurity and depression issues affecting older adults.

Summary and Conclusions

The compounded effects of FI, race and depression represent public health concerns with multiple dimensions and far-reaching consequences for older adults in the United States. From the FI perspective of older adults, 60–69 years of age, readers may understand that FI involves older adults' social, economic, and physiological well-being in the aging process. In this process, some older adults could have comorbidity conditions in addition to FI, which put them at greater risk of depression. The prevalence of depression among the growing aging U.S. population is a significant concern relevant for this study. Although the research community has found an association between FI and depression, many mediating variables could have influenced this association. Among those variables are race and ethnicity, ages 60–69, and gender, not addressed exclusively in some studies. Addressing these gaps in this study is essential because the older adult dependence on others draws much research consideration and attention. However, the focus of this study is more on racial and ethnic disparities in health, financial insecurity,

and the wealth gap among the older adults' subgroups that are problematic. Understanding these social and economic consequences of FI leading to depression will open the discourse on how structural racism and inequality in health and wealth and the long-term effects can be instrumental in the prevalence of FI and the deleterious consequences of depression on older adults. New studies could build on this legacy to strengthen the findings, especially by including more diverse populations and vulnerable subgroups.

Section 2: Research Design and Data Collection

This quantitative study addressed the relationship between FI and depression among U.S. adults age 60–69 by race/ethnicity. The dependent variable for this study was depression, and the independent variables were FI and race/ethnicity. The potential confounders included age, household income, and marital status. Section 2 includes the research design and rationale, methodology, population and sampling procedures, instrumentation and operationalization of constructs, operationalization of each variable, data analysis plan, threats to validity, ethical procedures, and a summary.

Research Design and Rationale

Cross-Sectional Study Design

A cross-sectional design was appropriate for this study to answer the research questions. Despite the limitations in generalizing a causal relationship, a cross-sectional design is helpful for studies with time and resource constraints and is relatively inexpensive to conduct (Wang & Cheng, 2020). Adopting this study design allows for ease in time management, meaning less time is spent completing a project than in longitudinal studies. Additionally, a cross-sectional study is simpler to conduct because the data on all variables are collected once for an evaluation. Researchers can measure prevalence for all factors under investigation, including multiple outcomes and exposures simultaneously (Wang & Cheng, 2020). In the current study, the cross-sectional design was used to provide insights for future planning and allocating resources in population studies (see Wang & Cheng, 2020) and to add strength to what was already known about the research topic.

Because cross-sectional studies have observational methodological designs, the exposure and the outcome are measured simultaneously for the study participants (Rothman & Greenland, 1998). This design often takes a snapshot of a group of individuals simultaneously (Rothman & Greenland, 1998). Cross-sectional studies are appropriate for evaluating a large sample, screening, and generating hypotheses regarding study outcomes (Rothman & Greenland, 1998). Due to a relatively short time commitment and fewer resources to conduct the study, a cross-sectional design can be used to describe the characteristics of the sample, study the associations, and analyze aggregated data from multiple individuals (Cataldo et al., 2019). Cataldo et al. (2019) affirmed that this study design could be used to establish associations but no inferential causal relationships in the generalized study findings. Although widely used, cross-sectional studies can be primarily descriptive. They can also be used to draw inferential conclusions from prevalent data despite the well-known limitations to seeking causality and the difficulty of collecting incidence data (Chen et al., 2020).

Research Design Constraints and Limitations

The association in a cross-sectional study measures the exposure and outcome instead of exposure and developing the outcome (Rothman & Greenland, 1998). However, there are a few limitations and biases in evaluating a cross-sectional study. First, there is no evidence of a temporal relationship between the exposure and outcome; they are assessed simultaneously (Rothman & Greenland, 1998). There is a lack of evidence to show that the exposure caused the outcome (Rothman & Greenland, 1998). For studies in which exposure is not an inherent trait but one that develops over time,

causality is often unclear (Rothman & Greenland, 1998). Second, a cross-sectional study is used to evaluate prevalent data instead of incident data outcomes and excludes people who develop the outcome but die before the study. There is a bias toward including individuals with more applicable survivorship (Rothman & Greenland, 1998).

Additional Challenges

The first challenge is precision. Rothman and Greenland (1998) referred to precision as the lack of random error or variation in a study's estimates. In observational studies, random variation occurs from the participants sampled and how variables are measured. Possible samples of individuals in a study may be missing. Thus, the sample selection introduced random variation. The measurement of critical variables also introduces random variation. Next, because most observational studies include potential confounding variables, random variation due to the measurement of these variables will likely exist (Carlson & Morrison, 2009). A more extensive study and one with more balanced groups will produce more precise estimates (see Rothman & Greenland, 1998).

Similarly, the proportion of subjects with the outcome and the distribution of subjects across key covariates will impact the efficiency and the precision of the study estimates (see Carlson & Morrison, 2009). According to Carlson and Morrison, it is generally helpful to consider the standard deviations of estimates and the width of confidence intervals in evaluating estimates from observational studies. A significant standard deviation relative to the estimate indicates low precision, and a wide confidence interval for estimates of association indicates low precision (Carlson & Morrison, 2009). According to Rothman and Greenland (1998) a general challenge of observational

research is validity, whereas precision lacks random error, validity refers to a lack of systematic error.

Methodology

Population

The target population for the current study included a nationally representative sample of 9,971 noninstitutionalized U.S. civilian residents from the 2015–2016 NHANES survey cycle (National Center of Health Statistics [NCHS], n.d.). Adult participants age 60–69 were chosen from this sample and stratified by race/ethnicity criteria. The NHANES design had oversampled Hispanic, non-Hispanic Black, and non-Hispanic Asian population subgroups among the estimates (NCHS, n.d.) to increase reliability and precision. Also oversampled were older adults, low-income Whites, and other people at or below 185% of the poverty guidelines established by the Department of Health and Human Services (NCHS, n.d.).

In the 2015–2016 NHANES cycle, of the 15,327 people selected from 30 survey locations, 9,971 completed the interview. Of the 9,544 examined, 322 were missing data because of nonresponse (NCHS, 2018). However, after stratification for age and gender, the unweighted sample size for the 60–69 age group in the current study was 1,557 screened participants, of which 917 or 55.5% were interviewed and examined. The gender distribution was male with 449 or 54.5% unweighted response rate, female with 482 or 58.3% unweighted response rate, and 32 with nonresponsive or missing data.

Sampling Procedures Used by the Original Creators of the Data Set

NHANES uses a complex, multistage probability design to sample the civilian, noninstitutionalized population residing in the 50 states and DC (Chen et al., 2020). Sample selection for NHANES followed several stages: selection of primary sampling units, which are counties or small groups of contiguous counties; selection of segments within primary sampling units that constitute a block or group of blocks containing a cluster of households; selection of specific households within segments; and selection of individuals within a household (Chen et al., 2020). Since 1999, the principal sample design has consisted of multiyear, stratified, clustered four-stage samples, with public-use data released in 2-year cycles (Chen et al., 2020).

Procedures to Access Data

NHANES is unique in collecting person-level demographic, health, and nutrition information from personal interviews. The mobile examination center collects standardized physical examinations (Chen et al., 2020). The in-home personal interview includes demographic, socioeconomic, dietary, and health-related questions (NCHS, 2018). Highly trained medical personnel in the mobile examination center perform the examination component that consists of medical, dental, and physiological measurements and laboratory tests (Chen et al, 2020). NHANES public-use data files can be linked using the standard survey participant identification number (variable name: SEQN; Chen et al., 2020). Merging information from multiple NHANES 2015–2016 data files using SEQN ensures that the appropriate information for each survey participant is linked correctly (Chen et al., 2020). Additionally, the number of records in each data file varies

depending on gender and age profiles for the specific components. The confidential and administrative data are not released; some recoded variables also help protect the confidentiality of survey participants (Chen et al., 2020).

Data Set and Source

Because the NHANES consists of de-identified secondary data released to the public for research purposes, the NCHS Research Ethics Review Committee has approved the investigational procedures under #2011–2017 (NCHS, 2022). All NHANES survey participants provided written informed consent; all health information collected is strictly confidential and protected by health care privacy laws (NCHS, 2018). Because NHANES is a nationally representative survey of the civilian noninstitutionalized U.S. population, the estimates are reliable for this aspect of the U.S. population (Chen et al., 2020). For NHANES 2011–2016, the sample weight was post stratified to population totals obtained from the American Community Survey and based on the 2010 U.S. census (NCHS, 2018). The sample size for the American Community Survey is about 13 times larger than that of the Current Population Survey (NCHS, 2018). This larger sample size resulted in a more diverse and reliable population estimate to quantify the magnitude of people with a particular condition. This data set was the best source because it represented a cross-section of the U.S. population capable of providing data to answer the research questions and test the hypotheses in the current study.

Power and Sample Size

Due to the complexities of the NHANES sample design, assumptions can be made about the variability of the sample estimates to validate the study. For instance, if

the sample size is small, it lacks the precision to provide reliable answers to the research questions. The alternative is a waste of time and resources if the sample size is too large. Researchers often use statistical power analysis to determine an adequate sample size for a study (Kyonka, 2018). Power analysis allows researchers to make important decisions about the population based on a representative sample (Kyonka, 2018). The factors that determine statistical power mathematically are α (alpha), β (beta), effect size, and sample size. Knowing the value of any three factors makes it possible to solve for the fourth (Kyonka, 2018). A priori power analysis involves computing the sample size required to detect an effect of a given size with the desired power (Kyonka, 2018). Conducting a priori power analysis, researchers decide on the most significant Type I and Type II error rates. Researchers are willing to tolerate the most negligible effect they consider to be meaningful, then use those values to solve for the required sample size (Kyonka, 2018).

Determining the Sample Size

In determining adequate sample size, researchers have to predetermine the significance level, effect size, power, and estimated variance (Kyonka, 2018). Often, the statistical level, set at $\alpha = 0.05$, is the probability of wrongly rejecting the null hypothesis and committing Type 1 error. However, if the alpha is too conservative, evidence from the findings might fail to reject the null hypothesis in a substantial population effect (Kyonka, 2018).

Effect size is the degree to which the null hypothesis is false (Cohen, 1988). Effect size measures the distance between the null hypothesis's specified value and the alternate hypothesis's specified value. Cohen (1988) standardized effect sizes into small,

medium, and large values. The effect size to test for regression analysis is small = 0.02, medium = 0.15, and large = 0.35. When the effect size is small, it is more difficult to detect the degree of deviation from the null hypothesis.

Statistical Power

According to Cohen (1988), statistical power determines whether the probability in a statistical significance test rejects the null hypothesis for the value of an alternate hypothesis. Power is 1- β, where beta is the probability of wrongly accepting the null hypothesis when it is false (committing Type II error). With low power in a study, the risk of committing a Type II error is higher, meaning there is little chance of detecting a significant effect that can give a bad result. The effect is there, but the power is too low to detect it. If the power is too high, a slight difference in the effect is detectable, meaning that the result is significant, but the effect size is of no value ($n = N$). To avoid these problems, Cohen suggested fixing the power at 0.80, a convention for general use. However, this value is not fixed, which can be adjusted depending on the type of test, sample size, effect size, and sample variation (Kyonka, 2018).

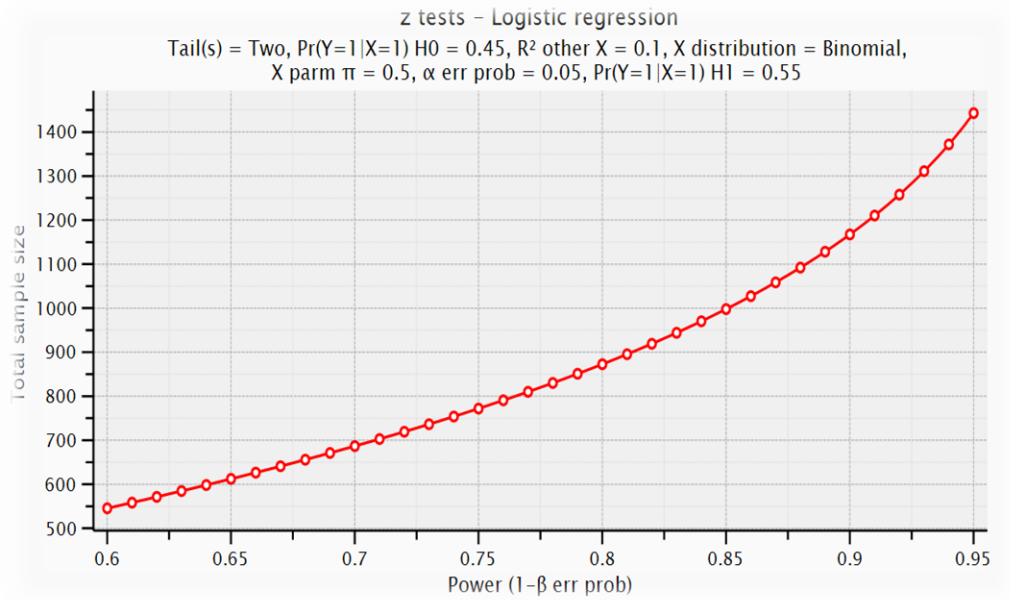
Statistical power tests the ability to detect an effect of a given sample size and is an essential consideration in research design. A Type I error is present after failing to detect a meaningful effect when one is present, and falsely detecting a meaningful effect that is not there is a Type II error. When hypotheses are tested, failure to consider statistical power in the initial planning stages can produce sample sizes that are too small or too large.

Conventionally, in hypothesis testing studies, the sample size must be 80% certain of identifying a statistically significant outcome should the hypothesis be valid for the population, with *p* for statistical significance set at 0.05 (Andrade, 2020). I used a priori statistical power analysis with G*Power 3.1.9.7 to calculate the minimum sample size with a power of 0.80, the medium effect size of 0.30 or 0.15, and α of 0.05 (see Figure 2). The NHANES sample size of 917 participants was sufficient to detect a significant logistic model for this study. Rejection of the null hypothesis occurs if the *p* value is less than 0.05. The effect size represents the strength of the relationship between the dependent and independent variables. In quantitative studies, a sample size that provides at least 80% power at a 95% confidence interval (CI; $p = 0.05$) is usually accepted, but effect size must also be taken into consideration (Cohen, 1988).

Considering the seriousness of Type II and Type I errors, the cost of obtaining data, and time constraints, the sample size of 917 was adequate and manageable for the current study to answer the research questions and test the hypotheses. According to the G*Power software analysis, a sample size of 917 could detect and be effective at the desired power equal to the minimum of or even more prominent (see Figure 2). Reducing the sample size would have reduced the power value to below 80%, which would have been undesirable. As a result, 917 participants in the NHANES 2015–2016 survey could be randomly selected from the target population to participate in this study.

Figure 2

Power Analysis



Note. Reprinted result of a priori statistical power analysis conducted using G*Power 3.1.9.7 software tool showing the minimum sample size with a power of 0.80, the medium effect size of 0.30 or 0.15, and α of 0.05 were used. The sample size of 917 is above the threshold value of 80% for this study.

Instrumentation and Operationalization of Constructs

Depression Measurement

The *Patient Health Questionnaire -9*(*PHQ-9*) will assess depressive symptoms in this study. The administration of this instrument is through a computer-assisted personal interview at the NHANES mobile examination center. The *PHQ-9* has nine items based on the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (*DSM-1V*) criteria for diagnosing depressive disorders (American Psychiatric Association, 2000;

Kroenke et al., 2001). Of the nine depressive categories defined in the *DSM-IV*, major depression is the most prevalent type in the general population. The *PHQ-9* score can range from 0–27 in severity as a severity measure. In this study, individuals categorized with 0–4 have no depression and depression, with a score of 5 and more. The *PHQ-9* assesses how often the respondent has been affected by a depressive symptom over two weeks and assigns values. The values are 0 to 3 points (0 = not at all, 1 = several days, 2 = more than half of the days, 3 = nearly every day).

The *sensitivity* and *specificity* of the instrument have been tested extensively in primary care and clinical settings (Kroenke et al., 2001). The scores 0–4 indicate the absence of a depressive disorder, and scores greater than 10 have a *specificity* and *sensitivity* of 88% for the diagnosis of major depressive disorder (Kroenke et al., 2001). This screening instrument validates against independent structured diagnostic interviews in clinical and general population studies (Kroenke et al., 2001). *PHQ-9* could serve as a validated depression severity measure and a diagnostic instrument for the *DSM-IV* depressive disorders (Kroenke et al., 2001; Kroenke et al., 2010). The *PHQ-9* has a record for use in the implementation stage with medical patients, likely synonymous with the older population and consistent with either chronic medical illness or depression.

According to Kroenke et al. (2001), the *PHQ-9* is more beneficial because of its brevity, flexible use as a diagnostic algorithm, and severity score. This instrument has a proven record of having excellent test-retest reliability, criterion, construct validity, and responsiveness to detect meaningful change over time (Kroenke et al., 2001). As a dual-purpose instrument, the *PHQ-9* has the potential to establish depressive disorder

diagnoses and grade depressive symptom severity. The *PHQ-9* measure analyzed the data and address two critical questions in this study: Is there an association between FI and depression among adults aged 60–69 years in the United States, controlling for potential confounders? Second, is there an association between race/ethnicity and depression among adults aged 60–69 years in the United States, controlling for potential confounders?

Food Security Measurement

Food security is defined as the access by all people, at all times, to enough food, for active, healthy life. Although most U.S. households consistently maintain food security, some households experience low food security, a form of FI, during the year. Previous study findings have consistently reported that income and poverty measures do not provide transparent information about food security, even though FI stems from constrained financial resources (see Bickel et al., 2000). Additionally, food security data shows that many low-income households appear to be food secure, whereas a small percentage of non-poor households appear FI (Bickel et al., 2000). The reasons for these differences or variations are not yet well understood. How to handle the competing demands for limited resources and food availability, especially for vulnerable communities, warranted a good and reliable food security measuring instrument. Prior to 1995, there was a need for a reliable measuring instrument to provide independent, more specific information on this dimension of well-being than can be inferred from income data alone in the United States (Bickel et al., 2000).

In responding to a national consensus for a standard mechanism and instrument for defining and obtaining data on the prevalence of FI in the United States, the United States Department of Agriculture developed the U.S. Food Security Supplement Model (*USFSSM*) in 1995. This instrument has been the "gold standard" for food security measurements and methodologies both nationally and internationally. The *USFSSM* estimates are published in annual reports and widely used by government agencies, the media, and advocacy groups across programs and at the national, state, and local levels. The *USFSSM* has established validity and reliability because of its stability and robustness as a measure across years and major population subgroups. Because of the usage and consistencies, the *USFSSM* reasonableness could be established as a reliable instrument to answer the research questions in this study. Reliability concerns how a measurement of a phenomenon provides stable and consistent results (Carmines & Zeller, 1979).

Currently, *USFSSM* has been used to monitor and assess the extent and severity of food insecurity in U.S. households. NHANES administered the *USFSSM*, an annual, nationally representative survey of over 50,000 participants. To measure FI, USDA developed a numerical food security scale and a related categorical food-security status measure. These measurements have face, content, and construct validity because they measure what was supposed to be measured. These measures are relevant to the target population in the study. They strongly correlate with items in the contents of the literature review that conclusively describe the food security situation of U.S. households during the preceding 12-month period (Nord, 2012). These validated measures have now

presented continuous national data on household food security in the United States during the 2015–2016 NHANES cycle.

In developing the *USFSSM*, USDA uses the Rasch model to select and order questions by the severity of FI so that responses arrive at the categories of FI (Nord, 2012). The Rasch model increases the reliability and internal consistency of the scale and measurement of the *USFSSM* (Nord, 2012). The primary purpose of the food security measures in this study is to estimate the prevalence of food insecurity in the United States.

USDA publishes a report each year summarizing food security results. Out of the 50 questions collected by this survey instrument about food security, only ten assess adult FI on the scale intended to estimate the prevalence of food security. These questions ask about all households with income below 185 % of the poverty line (Nord, 2012). These questions generally reference the household experience over the lack of money to meet basic food needs and the perception of inadequate quality or quantity (USDA, 2022) of reduced food intake that led to FI. Overall, these questions measure whether a household is food secure and the severity of FI. The concepts that include worrying about acquiring enough food for oneself and family range from the least severe form of FI to the most severe, skipping or cutting back on food because of money problems (USDA, 2022). The food security scale continues to serve a continuing role as the government's primary measure of FI and the well-being of the U.S. population (USDA, 2022).

Operationalization for Each Variable

Outcome Variable

Depression: Depression is a common psychiatric condition with widespread consequences at the individual and community levels. Internationally, depression is among the leading non-fatal diseases today (Rancans et al., 2018). Long-term consequences of depression include reduced quality of life, risk of suicide, increased hospital admission rates, increased risk for chronic medical conditions, and stigmatization (Rancans et al., 2018).

Table 1

Depression Measure

Variable	Working definition	DPQ measure
Depression (DPQ)	Depression (major depressive disorder) is a common severe and treatable medical illness that negatively affects a person feeling, thinking, and acting. Depression can lead to feelings of sadness, and a variety of emotional and physical problems (American Psychiatric Association, 2020)	Score: 0–4 no DP Score: ≥ 5 DP

Note. A nine-item depression screening instrument (variable name prefix DPQ), also called the Patient Health Questionnaire (Kroenke & Spitzer, 2002; Kroenke et al., 2001), was administered to determine the frequency of depression symptoms over the past two weeks. A follow-up question assessed the overall impairment of the symptoms. Response categories for the nine-item instrument "not at all," "several days," "more than half the days," and "nearly every day" were given a point ranging from 0 to 3. DP=depression. The instrument incorporates DSM-IV depression diagnostic criteria (Spitzer et al., 1999).

In the United States, major depression is most common among individuals with mental disorders that can cause severe impairments and interfere with or limit one's ability to carry out major life activities (NIMH, 2021).

Explanatory Variable

The research community defined FI as a concept that refers to the social and economic problem of lack of food due to economic deprivation or lack. Some standard definition used in the United States for FI is that FI exists whenever nutritionally adequate and safe foods are unavailable, or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain. According to the USDA, FI is a

household-level economic and social condition of limited or uncertain access to adequate food (USDA, 2022).

Table 2

Food Insecurity Measure

Variable	Working definition	FSSM measure
Food Insecurity (FSQ)	FI is a person's inability to acquire adequate food because of insufficient money and other resources for food in socially acceptable ways. (USDA)	1/ 2 =FS 3 ≥ FI

Note. 1= Adult full food security: no affirmative response in any of these items; 2 = Adult marginal food security: 1–2 affirmative responses; 3 = Adult low food security: 3–5 affirmative responses; 4 = Adult very low food security: 6–10 affirmative responses; Affirmative responses for *FSSM* questions are defined as: "often true" or "sometimes true" (i.e., codes 1 or 2) for items FSD032a, FSD032b, FSD032c, answered "yes" (i.e., code 1) for items FSD041, FSD061, FSD071, FSD081, FSD092. answered "almost every month", or "some months but not every month" (i.e., codes 1 or 2) for items FSD052, FSD102.

FI scale consisted of 10 survey questions for all households. These questions cover the FI range of severity of conditions and behavioral characteristics. FI households are classified as food insecure if they affirm over three items. Adult-only households are classified as FI if they affirm six items (USDA).

Table 3

Demographic Variables

Variable name	Description	Code or value
RIDAGEYR (Age)	Age in years of the participant at the time of screening, 0-79, 80+. Individuals 80 and over are top coded at 80 years of age in NHANES.	0 – 79, 80 (Re classified as dummy variable- re-code 0 -59 =1(baby, young adults and middle-aged adults are excluded in the analysis), 60–69 = 2 (old adults included), 70 -79 = 3, 80+ =4 (Older adults excluded in final analysis).
RIDRETH3(Race/ethnicity)	Recode of reported race and Hispanic origin information, with Non-Hispanic Asian Category	1-Mexican American(H) 2-Other Hispanics(H) 3-Non-Hispanic White(NHW) 4-Non-Hispanic Black(NHB) 6-non-Hispanic Asian(NHA) 7-Other race. (1 and combined as 1=H)
DMDMARTL (Marital status)	Both males and females 20 years - 150 years	1-Married 2-Widowed 3-Divorced 4- Separated 5-Never married 6- Living with partner
INDFMPIR (Household-income)	A ratio of family income to poverty guidelines.	0–4.98
INDFMIN2 (Family-income)	The total annual family income or individual annual income (for households with one person or households comprised of unrelated individuals).	< $20,000 or ≥ $20,000 categories were used to report the family (or individual) income. (≤$20,000 = low-income, ≥$20,000 = above low-income)

Data Analysis Plan

Using a nationally representative sample of United States older adults from NHANES 2015 - 2016 data, I sought to determine whether FI is associated with self-reported depression and whether this association varies by racial/ethnicity adjusted by

age. To analyze this data, I used the IBM Statistical Package for the Social Science (SPSS) statistical software to describe and draw conclusions about the factors or effects leading to the findings. Because this is a cross-sectional study, and my interest was in drawing inferential conclusions from prevalent conditions, I performed the following steps to test the hypotheses and answer the research questions: (a) The descriptive analyses in Part 1, (b) the inferential analyses in Part 2, and (c) the multivariable logistic regression in Part 3. According to Simpson (2015), the first step in identifying relevant inferential statistics for a study is to consider the type of research question as being illustrated here:

RQ1: Is there an association between food insecurity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders?

H_o1: There is no association between food insecurity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders.

H_a1: There is an association between food insecurity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders.

RQ2: Is there an association between race/ethnicity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders?

H_o2: There is no association between race/ethnicity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders.

H_a2: There is an association between race/ethnicity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders.

RQ3: Is there an interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 years in the United States?

H_o3: There is no interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 years in the United States.

H_a3: There is an interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 years in the United States.

Based on the research questions, hypotheses, and the predictors and outcome variable level, it was possible to make a model prediction to best fit the data and explain the outcome of these associations. To investigate these relationships, I used exploratory data analysis, outlined in the following:

Part 1 Descriptive Statistics

In this part, I performed univariate descriptive analysis to describe the collected information such as the range of values, average, and the most common category. A baseline report of the study population's demographic and clinical characteristics should help readers learn more about the sample.

To get familiar with the data set, I displayed the data records and performed univariate analysis to analyze one variable at a time. I used the frequency distribution table, bar graphs, or pie charts to display the data by proportion or percentage. Because this study was cross-sectional, estimates of the overall proportion or, more specifically,

the prevalence of depression needs to be known. This concept is vital for interpreting the odds ratio and examining the relationships between each independent variable and outcome (depression) using a significant level of 0.20 to screen for candidate independent variables for the multivariable model.

Part 2 Inferential Statistics

I conducted bivariate analyses using the chi-square test of independence to determine the magnitude of association between the exposure variables and the outcome variable. This test determined the effect of each explanatory variable on depression, ignoring the effect of the other variables. The bivariate analysis is a good tool for screening potential predictors to be the candidate to be entered into the initial model. Using this study's chi-square test of independence, I tested the null hypothesis, using odds ratio, 95% Confidence Interval (CI), and significant p value set at $\alpha = .05$, that no association exists between depression and the other predictor variables (the variables are statistically independent). If the variables are not statistically independent, the null hypothesis is rejected if the p-value is less than 0.05. The p-value of 0.2 or lower and the effects on the outcome would determine the model. Bivariable data analysis involves analyzing the relationship between two variables and could be used to test simple hypotheses of association and causality (Bertani et al., 2018).

Part 3 Multivariable Logistic Regression

Step 4 Multivariable Analysis: Logistic Regression

This is the final part of the model-building techniques. This technique helps to derive the best-fitting, most parsimonious, and reasonable model to describe the

relationship between depression and a set of predictors to determine the best outcome. I conducted logistic regression to ensure that all main affects and two-way interaction of the variables are well fitted in the model using odds ratio and 95%CI. Interacting variables will be eliminated if they lack statistical significance. I choose the final model with all main effect based on clinical judgement and estimating adjusted odds ratios from the logistic regression model. Multiple regression analysis often considers the influence of multiple predictors on an outcome simultaneously. The knowledge gained from these inferential statistics allows inferences and generalizations beyond the study sample to other groups.

Step 5 Assessing Model Adequacy

This step test checks for the model's goodness of fit (GOF) and closely assess any meaningful changes in variables interaction and model adequacy (Fagerland & Hosmer, 2013). A poor GOF is an indication that it would be difficult to generalize the study finding to other similar situations.

According to Pridham et al. (2022), missing data are ubiquitous in aging studies because they distort the analysis results in the study. In the NHANES documentation, observed missingness is prioritized for evaluation if they are present in the dataset. This evaluation could determine whether the data are usable without additional re-weighting for item non-response. As a general rule, if 10% or less of data for the primary outcome variable for a specific component is missing from the dataset, it is usually acceptable to continue the analysis without further evaluation or adjustment. If more than 10% of the data for the outcome variable is missing, further examination of respondents and non-

respondents to the outcome variable in question is necessary. This examination could determine whether imputation of missing values or adjusted weights are necessary. Although the missing data in this study is negligible, imputation is applicable to unlock the missingness and reduce any study bias in the final analysis (Sperrin & Martin, 2020)

Assumptions

Before fitting a logistic model to a dataset, the following assumptions are necessary: (a) Assumption #1, the outcome variable is binary, meaning that the response variable only takes on two possible outcomes, (b) Assumption #2, the observations are independent, meaning that the observations in the dataset are independent of each other. There is a random pattern. Violation of this assumption occurs if there is no random pattern, (c) Assumption #3, there is no multicollinearity among the predictor variables. Multicollinearity occurs when two or more independent variables are highly correlated. The presence of multicollinearity is problematic when fitting and interpreting the model. One way to detect multicollinearity is by measuring the strength between the predictor variables in a regression model and determining the variance inflation factor (VIF), (d) Assumption #4, there are no extreme outliers. Logistic regression assumes no extreme outliers or influential observations in the dataset. The most common way to test for extreme outliers and influential observations in a dataset is to calculate Cook's distance for each observation and remove them if present, (e) Assumption #5, logistic regression assumes a linear relationship between each predictor variable and the Logit of the outcome variable. The Logit is Logit (p) = log (p / (1-p)), where p is the probability of a positive outcome. The easiest way to evaluate this assumption is to use a Box-Tidwell

test, (f) Assumption #6, the sample size is sufficiently large. Logistic regression assumes that the sample size of the dataset is large enough to draw valid conclusions from the fitted logistic regression model.

Threats to Validity

Reliability and validity are concepts applied to instruments such as rating scales and screening tools. Validity describes how well an instrument does what it is supposed to do. For example, does an instrument that screens for depression do so with high sensitivity and specificity? Reliability describes the consistency in obtaining study results. For example, if an instrument that rates the severity of depression is administered to the same patient twice within an hour are the scores obtained closely similar? In observational studies, internal and external validity test the strength and value of the study.

Internal Validity

Internal validity refers to the strength of the inferences from the study (Carlson & Morrison, 2009). There is high internal validity if there is proof that the exposure causes the change in the outcome. There is low internal validity if there is a difference in the outcome caused by a systematic error in the study. The critical question in assessing internal validity is whether observed changes can be attributed to the exposure and not to other possible causes (Carlson & Morrison, 2009). The internal validity can be compromised by not having a control group.

Internal validity examines whether the study design, conduct, and analysis answer the research questions without bias (Andrade, 2018). Internal validity examines how

systematic error (bias) is present. Such systematic errors can arise through selection, performance, detection, and attrition bias (Andrade, 2018). If internal validity is compromised, it can occasionally be improved, for example, by a modified plan of analysis. However, biases can often be fatal (Andrade, 2018).

External Validity

External validity can generalize study results to a universal population, meaning the conclusion in one study could hold in other places and times (Carlson & Morrison, 2009; Rothman & Greenland, 1998). As such, internal validity is a prerequisite for external validity. The study must demonstrate that the "exposure" is the cause of variation in the outcome before one can generalize that the exposure more universally causes the outcome (Carlson & Morrison, 2009). For example, in studies conducted on samples, if sampling is random, the sample is representative of the population. The study results can be generalized to the population sampled, but the results may not be generalizable to other populations. External validity is poor for studies with sociodemographic restrictions. These studies exclude severely ill and suicidal patients or patients with personality disorders, substance use disorders, medical comorbidities, and studies that disallow concurrent treatments. External validity is also limited in short-term studies of patients who need long-term treatment for months to years. External validity, like internal validity, is based on judgment and is not a computed statistic (Andrade, 2018). If the sample is not representative, it lacks external validity, evident in studies with small sample sizes. Because of this, one cannot be sure that the conclusions drawn about cause-effect relationships apply in different domains or to people in other

geographic locations. The best way to demonstrate the external validity of research results is to replicate results in different populations, places, and times (Carlson & Morrison, 2009).

Ethical Procedures

As this study involved secondary analysis of anonymized previously collected data, research ethics approval will be sought from the Research Ethics Committee of Walden University for permission to proceed with this study. I will follow the guidelines of the university to undergo required ethics training and seek approval before conducting analysis on the sample. However, for the NHANES dataset, it was confirmed that collecting the original data for the study received ethics approval and that all participants provided informed consent.

Summary

This section was pivotal in presenting the methodological details of the proposed study, including the rationale for selecting a quantitative research method used for data collection, its analysis, and its interpretation. The details and discussions from this section provided a thorough explanation of the quantitative approach used and the hypothesized relationship between the dependent and independent variables of interest. This study used a cross-sectional quantitative research methodology and secondary analysis of a national representative sample of 9,971 non-institutionalized United States population sub-sample from the 2015–2016 NHANES survey cycle. This sub-sample is used throughout to observe and assess the complex interactive relationships between FI and depression and race/ethnicity among participants aged 60–69 in the United States.

The cross-sectional study design draws on descriptive and inferential conclusions from prevalent data from NHANES despite the well-known limitations to seeking causality and the difficulty of collecting incidence data. Although this cross-sectional study described the prevalence of FI conditions and depression outcomes of interest among racial groups, NHANES' robust data collection method and procedures overshadowed the study design limitations.

The NHANES design has an oversample of subgroups to increase the reliability and precision of the estimates. This larger sample size resulted in a more diverse and reliable population estimate to quantify the magnitude of people with FI and depression conditions. NHANES was the best source because it represents a cross-section or demographic of the United States.

I concluded this section by discussing the sample strategies and procedures according to the robustness of the NHANES methodology, threats to validity and reliability, and the ethical issues emanating from the secondary research. The data collection method involves collected observational data that systematically described information and knowledge of the research problem and the capabilities to answer the research questions and justify the hypotheses. This knowledge and capabilities are demonstrated further in the following result section of the study.

Section 3: Presentation of the Results and Findings

The purpose of this quantitative cross-sectional study was to examine the relationships between FI, depression, and race/ethnicity among U.S. adults age 60–69 years, when adjusting for marital status and family or household income. In this study evidence was provided to support the association between FI and depression but less was known about the effects of racial/ethnic individuals age 60–69 with depression or whether race/ethnicity was a mediating factor in the FI-depression association. Three research questions addressed these relationships:

RQ1: Is there an association between FI and depression among adults age 60–69 in the United States, adjusting for the potential confounders?

RQ2: Is there an association between race/ethnicity and depression among adults age 60–69 in the United States, adjusting for the potential confounders?

RQ3: Is there an interactive effect or relationship of race/ethnicity and FI to depression among adults age 60–69 in the United States?

The corresponding null hypotheses for the questions stated that there is no association between FI and depression among adults age 60–69 in the United States, there is no association between race/ethnicity and depression among adults age 60–69 in the United States, and there is no interactive effect or relationship of race/ethnicity and FI to depression among adults age 60–69 in the United States. The alternative hypotheses stated that there is an association between FI and depression among adults age 60–69 in the United States, there is an association between race/ethnicity and depression among

adults age 60–69 in the United States, and there is an interactive effect or relationship of race/ethnicity and FI to depression among adults age 60–69 in the United States.

In this section, I present the results of the statistical analyses to answer the research questions. The aim was to obtain both descriptive and inferential components of statistics. The descriptive component was to describe the NHANES study sample, and the inferential component involved using information obtained from the sample to describe a larger population. The inferential component included the estimation, the CI and hypothesis testing (*p*-value). I examined the NHANES 2015–2016 data set and analyzed the secondary data on the sample of noninstitutionalized U.S. adults aged 60–69 from various racial/ethnic backgrounds. I present the results in text narrative supported by tables, graphs, and charts, and highlight the potential issues. I conclude this section by summarizing the answers to the research questions and providing transitional material to Section 4.

Accessing the Data Set for Secondary Analysis

After receiving approval # 09-30-22-0606722 from the Walden University Institutional Review Board, I uploaded and evaluated the following NHANES 2015–2016 cycle data files from the CDC web site: (a) food-security (FSQ), (b) depression (DPQ), and (c) demographic (DEMO). The files were validated and saved on my password-protected computer. The data files were then merged using IBM SPSS Statistics for Window. Version 28.0 software with the participants unique ID number. The NHANES sample included a collection of cross-sectional data of a nationally representative sample of noninstitutionalized U.S. civilian residents (N = 9,971). The data

were collected from personal interviews in the homes of participants and in mobile examination centers in the 50 states from the 2015–2016 NHANES survey cycle, and de-identified (NCHS, n.d.). The survey questions addressed demographic information such as race/ethnicity, age, gender, family, and household income. The survey questions included depression and food-security information assessed by the *PHQ-9* and *USFSS* questionnaire, respectively.

Exploring the Data and Univariate Analysis

In this subsection, I describe the data for analysis in accordance with the steps in Table 4 and use descriptive analysis to summarize the data in Table 5. I conclude by providing the results of the univariate analysis (see Tables 6–9 and Figures 4–9).

Table 4

Data Exploratory Steps

Step	Activity
1	Data importation and initial evaluation of the accuracy of the data
2	Screening for missing data
3	Executing data transformations
4	Examining the distribution of the data
5	Evaluating the relationships between items and composite scales

Note. Although this process is presented as a series of linear steps, the process may be circular. For example, an examination of the distribution of the data in Step 4 may necessitate a return to Step 3 to transform the data to ensure they meet the assumptions of the planned quantitative analyses (see Scherbaum & Shockey, 2015).

To understand the raw data and the properties of the data set, I followed these steps to prepare the data for quantitative analyses to answer the research questions and test the hypotheses of the study. These steps formed the basis for understanding the accuracy, the level of missing data, and the variability of the data set to conduct the transformation necessary to prepare the data for the quantitative analyses (see Scherbaum & Shockey, 2015).

Data Importation and Evaluation

The data importation and evaluation process involved using SPSS to download the targeted data from the CDC's data source files. The copies of the files were sorted and merged into a single data set according to the respondents' unique ID number. After completing this review and modification, I performed frequency analysis to screen the

raw data of every targeted variable in the data set to address problematic data entry errors.

NHANES Sample Data Screening

The data were scrubbed for missing variables and validated using SPSS before I statistically analyzed the data. Cases with missing data coded 9 = don't know or 7 = refused were dropped or not assigned a value for the final analysis. Missing system data were flagged and coded as -1 for maintaining the denominator of the sample size and did not affect the final analysis.

Figure 3

Population Sample

Figure 3 shows the sample for the study taken from a national control sample of 316,481,044 nationwide; 15,327 individuals of all ages were screened, 9,971 were

interviewed, and 9,544 were screened and examined. After restricting the cases in the study by age group 60–69, I determined the final sample size of 949 participants who were interviewed, of which 917 were examined including 449 male and 468 female participants. The final distribution included the targeted variables in Table 5.

Table 5

NHANES 2015–2016 Summary of Targeted Population Sample Variables, N = *949*

	Depression	Food insecurity	Age	Race/ethnicity	Marital status	Income
Valid	866	914	949	949	946	872
Missing	83	35	0	0	3	77

Demographic Distribution

The initial data set consisted of 9,971 cases. After removals to account for the inclusion criteria of adults age 60–69, the final sample was reduced to 949 valid cases. Missing data (< 10%) were replaced with a median of the respective variables. Age of participants ranged from 60 to 69 years, with M = 64.08 years (SD = 2.89). The most prevalent race/ethnicity categories were Hispanic (Mexican American and other Hispanic, n = 370, 39.0%), non-Hispanic White (n = 254, 26.8%), and non-Hispanic Black (n = 214, 22.6%). Most of the sample consisted of married individuals (n = 550, 58.0%). Approximately 75% of the sample had income levels greater than $20,000. The descriptive statistics for age are presented in Table 6 and Figure 4. The frequencies and percentages for the nominal-level variables are presented in Table 7. Bar charts for the demographic characteristics are presented in Figures 4–7.

Table 6

Summary Statistics for Age

Variable	*N*	Min	Max	*M*	*SD*
Age	949	60	69	64.08	2.89

Figure 4

Bar Chart for Age

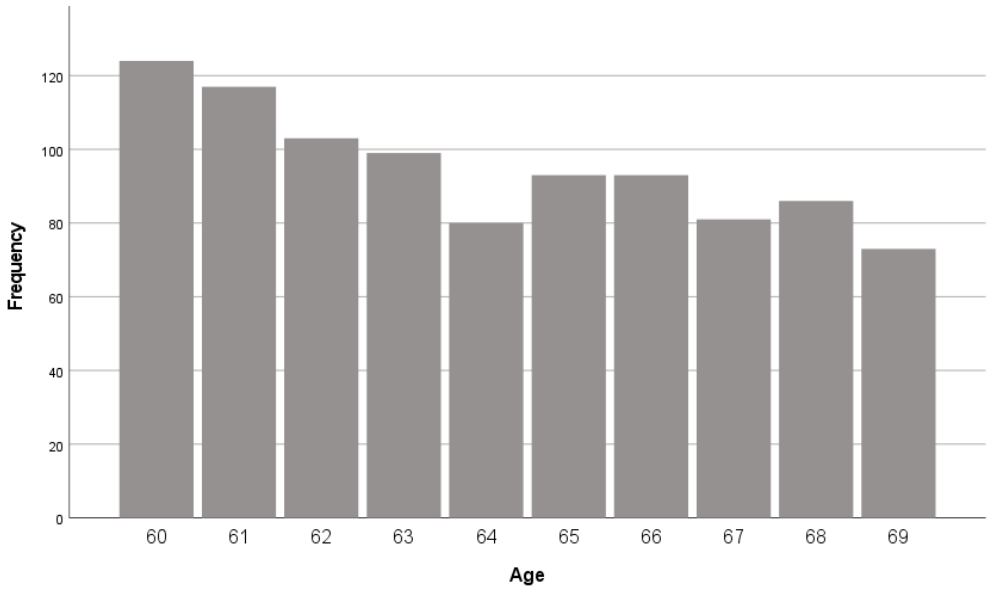


Table 7

Frequencies and Percentages for Demographics

Variable	*n*	%
Race/ethnicity		
Hispanic	370	39.0
non-Hispanic White	254	26.8
non-Hispanic Black	214	22.6
non-Hispanic Asian	85	9.0
Other race	26	2.7
Marital status		
Married	550	58.0
Widowed	79	8.3
Divorced	148	15.6
Separated	38	4.0
Never married	86	9.1
Living with partner	48	5.1
Income		
< $20,000	253	26.7
≥ $20,000	696	73.3

Figure 5

Bar Chart for Race

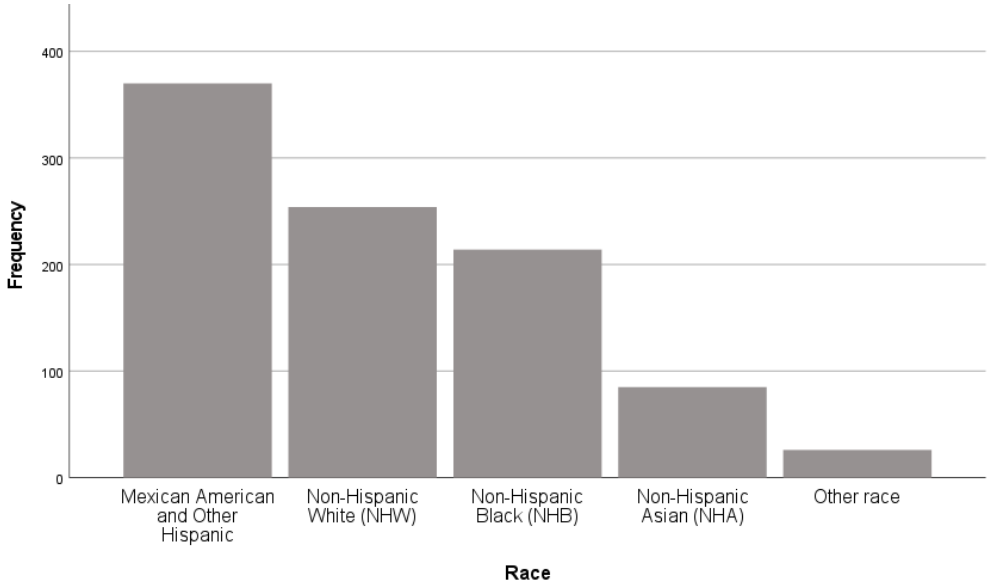


Figure 6

Bar Chart for Marital Status

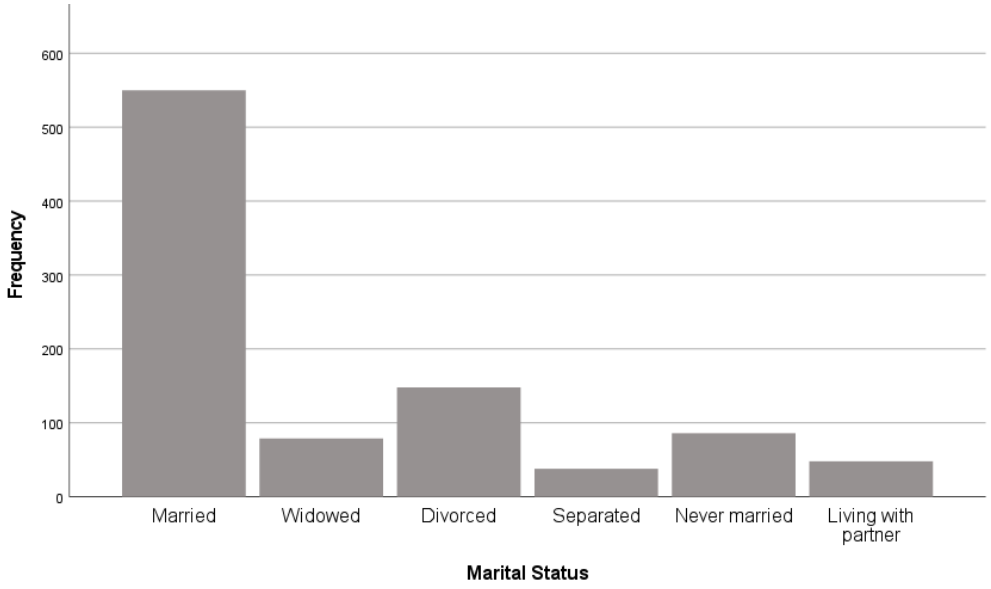
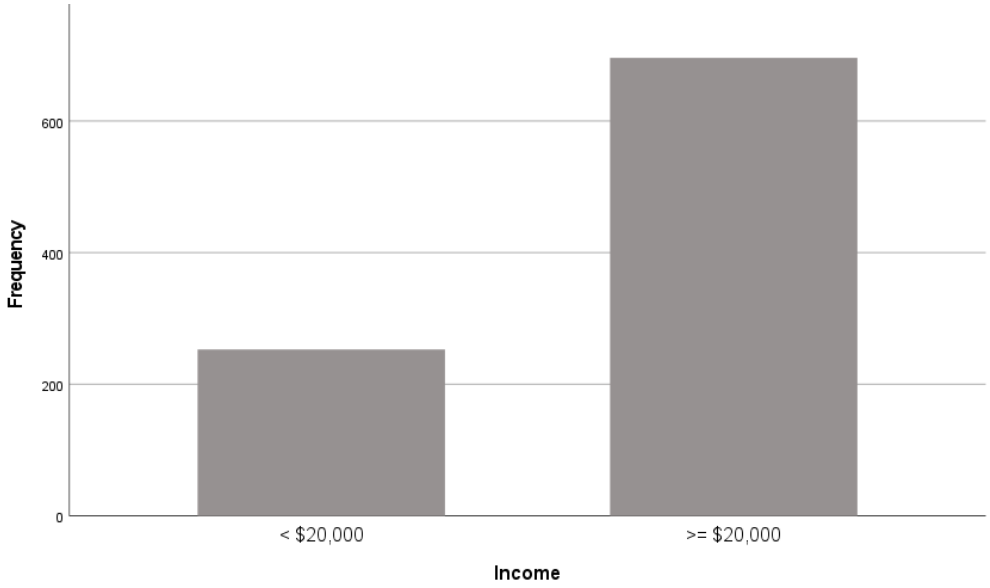


Figure 7

Bar Chart for Income



Food Insecurity and Depression

Composite scores were developed for FI and depression from the FSQ and DPQ, respectively. The composite scores were developed by computing a sum from the relevant items on the questionnaires. FI scores ranged from 2.00 to 10.00, with M = 3.34 (SD = 2.16). Depression scores ranged from 3.00 to 27.00, with M = 5.64 (SD = 3.88). The descriptive statistics for food insecurity and depression are presented in Table 8.

Table 8

Summary Statistics for Food Insecurity and Depression

Variable	*N*	Min	Max	*M*	*SD*
Food insecurity (FSQ)	949	2.00	10.00	3.34	2.16
Depression (DPQ)	949	3.00	27.00	5.64	3.88

Food insecurity and depression were transformed to nominal-level variables through use of cutoffs on the interval-level scores. Food insecurity was coded into two levels: food secure (1–2 on composite score) and food insecure ($\geq$ 3 on composite score). Depression was coded into two levels: no depression (0–4 on composite score) and depression ($\geq$ 5 on composite score). Food insecurity consisted of 596 individuals (62.8%) who were categorized as food secure and 353 individuals (37.2%) who were categorized as food insecure. Depression consisted of 521 individuals (54.9%) who were categorized as not depressed and 428 individuals (45.1%) who were categorized as depressed. The frequencies and percentages for the nominal-level variables are presented in Table 9. Bar charts for the demographic characteristics are presented in Figures 8–9.

Table 9

Frequencies and Percentages for Food Insecurity and Depression Groups

Variable	*n*	%
Food insecurity		
Food secure (1–2 on composite score)	596	62.8
Food insecure (≥ 3 on composite score)	353	37.2
Depression		
No depression (0–4 on composite score)	521	54.9
Depression (≥ 5 on composite score)	428	45.1

Figure 8

Bar Chart for Food Insecurity

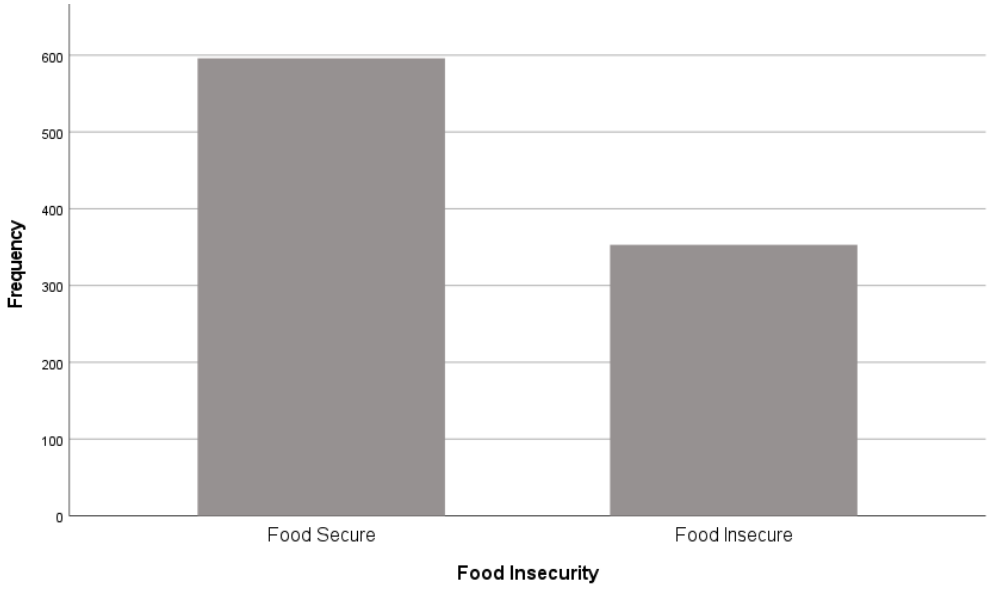
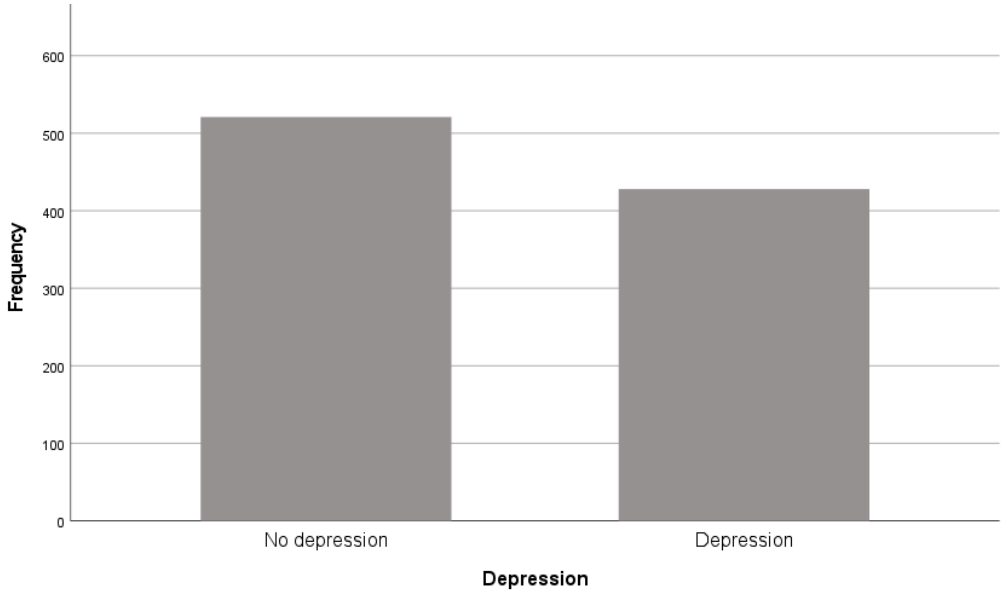


Figure 9

Bar Chart for Depression



Bivariate Analyses

A point-biserial correlation was conducted to examine the association between age and depression. There was not a significant relationship between age and depression, $r_{pb} = .02$, $p = .523$. Due to non-significance of the relationship between age with depression, age was not included in the regression modeling as an independent variable. The primary utilization of age in the study was to narrow the sample to 60–69-year-old individuals. Table 10 presents the findings of the point-biserial correlation.

Table 10

Point-Biserial Correlation Between Age and Depression

Variable	Depression	
	r_{pb}	p
Age	.02	.523

A series of chi-square tests of independence were conducted to examine the association between race, marital status, income, and FI with depression. Race/ethnicity was significantly associated with depression, $\chi^2(4) = 13.99$, $p = .007$. Marital status was significantly associated with depression, $\chi^2(5) = 16.48$, $p = .006$. Income was significantly associated with depression, $\chi^2(1) = 18.18$, $p < .001$. Food insecurity was significantly associated with depression, $\chi^2(1) = 27.42$, $p < .001$. Due to significance of all the chi-square tests, all four variables were included as independent variables in the logistic regression model. Table 11 presents the findings of the chi-square tests.

Table 11

Chi-Square Tests for Nominal-Level Independent Variables by Depression

Variable	Depression				
	No depression	Depression	χ^2	df	*p*
Race/ethnicity			13.99	4	.007
Hispanic	201 (38.6%)	169 (39.5%)			
non-Hispanic White	122 (23.4%)	132 (30.8%)			
non-Hispanic Black	123 (23.6%)	91 (21.3%)			
non-Hispanic Asian	60 (11.5%)	25 (5.8%)			
Other race	15 (2.9%)	11 (2.6%)			
Marital status			16.48	5	.006
Married	330 (63.3%)	220 (51.4%)			
Widowed	33 (6.3%)	46 (10.7%)			
Divorced	69 (13.2%)	79 (18.5%)			
Separated	18 (3.5%)	20 (4.7%)			
Never married	45 (8.6%)	41 (9.6%)			
Living with partner	26 (5.0%)	22 (5.1%)			
Income			18.18	1	<.001
< $20,000	110 (21.1%)	143 (33.4%)			
$\geq$ $20,000	411 (78.9%)	285 (66.6%)			
Food insecurity			27.42	1	<.001
Food secure	366 (70.2%)	230 (53.7%)			
Food insecure	155 (29.8%)	198 (46.3%)			

Assumption Checking for Logistic Regression

The first assumption of a logistic regression is that the outcome variable is binary. This assumption was supported for the current analysis due to depression being a binary outcome: no depression (coded 0) and depression (coded 1). The second assumption was that the observations are independent of each other. This assumption was supported due to each of the individuals providing an independent survey response. The third assumption, absence of multicollinearity verifies that the predictor variables were not highly correlated. According to Stevens (2010), variance inflation factors (VIFs) lower than 10 indicate a low association among predictors and there was low collinearity among the predictors. All the VIFs were lower than 10, indicating that there was absence of multicollinearity, and the assumption was supported (see Table 12).

Table 12

Variance Inflation Factors (VIFs) for Predictors

Predictor	VIF
Marital status (reference: married)	
Widowed	1.09
Divorced	1.17
Separated	1.05
Never married	1.19
Living with partner	1.05
Income (reference: < $20,000)	
≥ $20,000	1.24
Race (reference: non-Hispanic White)	
Hispanic	1.57
non-Hispanic Black	1.51
non-Hispanic Asian	1.24
Other race	1.09
Food insecurity (reference: food secure)	
Food insecurity	1.18

Assumption four indicates that there are no extreme outliers. Cook's distance was calculated for each observation. Das and Gogoi (2015) indicate that Cook's distance values greater than 0.45 indicate extreme outliers and these cases should be subsequently removed. The highest Cook's distance value in the dataset was 0.18, indicating that there were no extreme outliers, and the assumption was supported. Assumption five indicates that there should be a linear relationship between each predictor variable and the logit of the outcome variable. Due to each of the predictor variables being nominal-level measurements and not interval-level, the linear relationship could not be assessed. Assumption six indicates that the sample size is sufficiently large. The data consisted of 945 cases, which exceeds the *a priori* power analysis calculation of 917 cases as a minimum. The assumption for a sufficiently large sample size was supported.

Multivariate Logistic Regression Analyses

RQ1: Is there an association between food insecurity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders?

H_o1: There is no association between food insecurity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders.

H_a1: There is an association between food insecurity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders.

RQ2: Is there an association between race/ethnicity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders?

H_o2: There is no association between race/ethnicity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders.

H_a2: There is an association between race/ethnicity and depression among adults aged 60–69 years in the United States, after adjusting for the potential confounders.

To address research question one and two, a multivariate logistic regression was conducted to examine the predictive relationship between FI, race/ethnicity, and depression, after controlling for marital status and income. Due to the categorical nature of the predictor variables, marital status and race/ethnicity were dummy coded. Marital status was dummy coded with "married" being treated as the reference category. Race was dummy coded with "non-Hispanic White" being treated as the reference category.

The findings of the overall regression model were statistically significant, $\chi^2(11) = 57.70$, $p < .001$, indicating that collectively there was a significant predictive model. Approximately 7.9% of the variance in depression could be explained by the predictor variables. Marital status (widowed) was a significant predictor (Wald = 5.12, $p = .024$, $OR = 1.78$), indicating that individuals who were widowed were 78% more likely to be depressed in comparison to married individuals. Race (Hispanic) was a significant predictor (Wald = 6.76, $p = .009$, $OR = 0.64$), indicating that individuals who were Hispanic were 36% less likely to be depressed in comparison to non-Hispanic White individuals. Race (non-Hispanic Black) was a significant predictor (Wald = 7.54, $p = .006$, $OR = 0.58$), indicating that individuals who were non-Hispanic Black were 42%

less likely to be depressed in comparison to non-Hispanic White individuals. Race (non-Hispanic Asian) was a significant predictor (Wald = 10.41, $p = .001$, $OR = 0.41$), indicating that individuals who were non-Hispanic Asian were 59% less likely to be depressed in comparison to non-Hispanic White individuals. FI was a significant predictor (Wald = 16.97, $p < .001$, $OR = 1.85$), indicating that individuals who were food insecure were 85% more likely to be depressed in comparison to individuals who were food secure. Due to significance of FI and race/ethnicity in the model, the null hypotheses for research question one and two were rejected. Table 13 presents the findings of the multivariate logistic regression.

Table 13

Multivariate Logistic Regression With Race and Food Insecurity Predicting Depression After Controlling for Marital Status and Income

Predictor						95% CI	
	B	*SE*	Wald	*p*	*OR*	Lower	Upper
Marital status (reference: married)							
Widowed	0.58	0.25	5.12	.024	1.78	1.08	2.93*
Divorced	0.34	0.20	2.98	.084	1.41	0.95	2.08
Separated	0.42	0.35	1.43	.232	1.52	0.77	3.00
Never married	0.17	0.25	0.44	.505	1.18	0.72	1.94
Living with partner	0.03	0.31	0.01	.919	1.03	0.56	1.89
Income (reference: < $20,000)							
≥ $20,000	-0.32	0.17	3.55	.060	0.73	0.53	1.01
Race (reference: White)							
Hispanic	-0.45	0.17	6.76	.009	0.64	0.46	0.90*
Black	-0.54	0.20	7.54	.006	0.58	0.40	0.86*
Asian	-0.89	0.28	10.41	.001	0.41	0.24	0.71*
Other race	-0.69	0.43	2.53	.112	0.50	0.22	1.17
Food insecurity (reference: food secure)							
Food insecure	0.62	0.15	16.97	<.001	1.85	1.38	2.49*

Note. Overall model fit: $\chi(11) = 57.70$, $p < .001$, Nagelkerke $R^2 = .079$, Hosmer and lemashow test(HL-Test) $X^2(8) = 4.31$, $p = .829$.

The Wald statistic ($X^2(11) = 57.70$, $p < .001$) was used to assess the contribution of the individual predictors or the significance of individual coefficients in the model (Bewick et al., 2005). Table 14 presents the degree to which the predicted probabilities agree with actual outcomes in the classification table (Boateng & Abaye, 2019). The overall correct prediction, 62.0 % shows an improvement over the chance level which is 50%. With the classification table, sensitivity (41.4%) measures the proportion of correctly classified events and false positive, whereas specificity (78.9%) measures the proportion of correctly classified nonevents and false negative. False positive and false negative can also be measured. The false positive measures the proportion of observations misclassified as events over all of those classified as events (Boateng & Abaye, 2019). The false negative measures the proportion of observations misclassified as nonevents over all of those classified as nonevents (Boateng & Abaye, 2019).

Table 14

Multivariate Logistic Regression (1) Classification Table

			Predicted		
			Depression*		Percentage
	Observed		No depression	Depression	correct
Step 1	Depression*	No depression	411	110	78.9
		Depression	251	177	41.4
	Overall percentage				62.0

Note. The cut value is .500, sensitivity = 41.1%, specificity = 78.9%.

RQ3: Is there an interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 years in the United States?

H_o3: There is no interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 years in the United States.

H_a3: There is an interactive effect or relationship of race/ethnicity and FI to depression among adults aged 60–69 years in the United States.

To address research question three, a multivariate logistic regression was conducted to examine the interactive effect of race and FI to depression. The original intention was to develop one model with the main effects (RQ1 and RQ2) and the interaction effects (RQ3) combined. However, several interaction terms were automatically removed from the calculations due to redundancies and high collinearity with the previous regression model. Therefore, a separate regression model was developed to independently examine the interaction effects. The interaction, Race*Food Insecurity, was dummy coded with non-Hispanic White and Food Secure being treated as the reference category. There was a total of nine combinations of race and FI. Marital status and income were also included as control variables, as indicated in the previous regression model.

The findings of the overall regression model (2) were statistically significant, $\chi^2(15) = 64.76$, $p < .001$, indicating that collectively there was a significant predictive model. Approximately 8.8% of the variance in depression could be explained by the predictor variables. The interaction category non-Hispanic White and food insecure (Wald = 11.98, $p < .001$, $OR = 3.16$) was statistically significant, indicating that individuals identified as non-Hispanic White and food insecure were 216% more likely to be identified as depressed in comparison to individuals identified as White and food secure. The interaction category non-Hispanic Black and food secure (Wald = 4.19, $p = .041$, $OR = 0.61$) was statistically significant, indicating that individuals identified as

non-Hispanic Black and food secure were 39% less likely to be identified as depressed in comparison to individuals identified as non-Hispanic White and food secure. The interaction category non-Hispanic Asian and food secure (Wald = 5.26, p = .022, OR = 0.48) was statistically significant, indicating that individuals identified as non-Hispanic Asian and food secure were 52% less likely to be identified as depressed in comparison to individuals identified as White and food secure. Due to significance of an interaction effect in the model, the null hypothesis for research question three was rejected. Table 15 presents the findings of the multivariate logistic regression.

Table 15

Multivariate Logistic Regression With Race and Food Insecurity Interaction Predicting Depression After Controlling for Marital Status and Income

Predictors						95% CI	
	B	*SE*	Wald	*p*	*OR*	Lower	Upper
Marital status (reference: Married)							
Widowed	0.60	0.26	5.41	.020	1.81	1.10	2.99*
Divorced	0.31	0.20	2.32	.128	1.36	0.92	2.01
Separated	0.38	0.35	1.20	.273	1.47	0.74	2.91
Never married	0.17	0.25	0.45	.500	1.19	0.72	1.96
Living with partner	0.08	0.31	0.07	.792	1.09	0.59	2.00
Income (reference: < $20,000)							
≥ $20,000	-0.31	0.17	3.29	.070	0.74	0.53	1.02
Race*food insecurity (reference: White and food secure)							
Hispanic and food secure	-0.23	0.21	1.14	.285	0.79	0.53	1.21
Hispanic and food insecure	0.18	0.22	0.65	.421	1.19	0.78	1.84
White and food insecure	1.15	0.33	11.98	<.001	3.16	1.65	6.06*
Black and food secure	-0.49	0.24	4.19	.041	0.61	0.39	0.98*
Black and food insecure	0.30	0.28	1.12	.290	1.35	0.77	2.35
Asian and food secure	-0.74	0.32	5.26	.022	0.48	0.25	0.90*
Asian and food insecure	-0.25	0.48	0.28	.598	0.78	0.30	1.99
Other race and food secure	0.18	0.60	0.09	.771	1.19	0.37	3.87
Other race and food insecure	-0.58	0.59	0.98	.321	0.56	0.18	1.77

Note. Overall model fit: $\chi(15) = 64.76$, $p < .001$, Nagelkerke $R^2 = .088$. (HL-Test) $X^2(8) = 4.60$, $p = .800$.

The Wald statistic ($X^2(15) = 64.76$, $p < .001$) was used to assess the contribution of the individual predictors or the significance of individual coefficients in the model (Bewick et al., 2005). Table 17 presents the degree to which the predicted probabilities agree with actual outcomes in a classification table (Boateng & Abaye, 2019). The overall correct prediction remains the same as in model 1 with 62.0 % showing an improvement over the chance level which is 50%. However, sensitivity (40.9%) measure is less, whereas specificity measure increases to (79.7%). The false positive measures the proportion of observations misclassified as events over all of those classified as events (Boateng & Abaye, 2019). The false negative measures the proportion of observations misclassified as nonevents over all of those classified as nonevents (Boateng & Abaye, 2019). Higher sensitivity and specificity indicate a better fit of the model (Boateng & Abaye, 2019). Meanwhile, the Hosmer and lemashow test ($X^2(8) = 4.60$, $p = .800$) maintains the model's adequacy of $p > 0.05$, meaning that the model fits the data about 80%.

Table 16

Multivariate Logistic Regression (2) Classification Table

			Predicted		
			Depression*		Percentage
	Observed		No depression	Depression	correct
Step 1	Depression*	No depression	415	106	79.7
		Depression	253	175	40.9
	Overall percentage				62.2

a. The cut value is .500, sensitivity = 40.9%, specificity = 79.7%

Summary

In this section, the results of the data analyses were presented. Descriptive statistics were examined for the demographics and variables of interest. Bivariate analyses were conducted to examine the two-way relationships between the independent variables and depression. Multivariate logistic regressions were utilized to examine the predictive relationships between the independent variables and the outcome, depression. Food insecurity was a significant predictor in the model, such that individuals who were identified as food insecure had higher likelihood of depression. Race was a significant predictor in the model, such that Hispanics had lower likelihood of depression in comparison to non-Hispanic White individuals. The interaction category, non-Hispanic White and food insecure, was statistically significant, indicating that individuals identified as non-Hispanic White and food insecure were more likely to be identified as depressed in comparison to individuals identified as non-Hispanic White and food secure. Non-Hispanic Black and non-Hispanic Asian individuals identified as food secure were also less likely to be identified as depressed in comparison to individuals identified as non-Hispanic White and food secure. The null hypotheses for all three research questions

were rejected. In the next section the findings will continue to be explored with connections to literature.

Section 4: Application to Professional Practice and Implications for Social Change

The main aim of this study was to first confirm the findings of previous research that there is a relationship between FI and depression. Second, I examined whether there are moderating variables affecting the FI-depression relationship. The criteria necessary to satisfy these two quantitative relationships were established and satisfied. First, I conducted a literature review to assess recent research to support the study parameters. Second, I evaluated the appropriate measurement tools and data sources suitable for the study parameters. Third, I planned the proper data analysis and alignment strategies that included a multivariate framework and the SEM. Because of data availability limitations, time constraints, and financial constraints, this study was restricted to a cross-sectional design that addressed whether FI, race, and depression among U.S. adults age 60–69 were related. The overall objective was to determine the interactive effects of the targeted predictor variables (FI and race) to the outcome variable (depression) after adjusting for covariates, especially income and marital status.

Summary of Key Findings

Although this study had limitations that may reduce generalizability, the goals were realized. Descriptive statistics were examined for the demographics and variables of interest. Bivariate analyses were conducted to examine the two-way relationships between the independent variables and depression. Multivariate logistic regressions were used to examine the predictive relationships between the independent variables (FI and race) and the outcome variable (depression). FI was a significant predictor in the model, such that individuals who were identified as food insecure had higher likelihood of

depression. This significance confirms previous findings and observations. Race was also a significant predictor in the model, such that Hispanics had lower likelihood of depression in comparison to non-Hispanic Whites. This significance also establishes race/ethnicity as a moderating variable and a possible candidate for future studies. The interaction category, non-Hispanic White and food insecure, was statistically significant, indicating that individuals identified as non-Hispanic White and food insecure were more likely to be identified as depressed in comparison to individuals identified as non-Hispanic White and food secure. Non-Hispanic Black and non-Hispanic Asian individuals identified as food secure were also less likely to be identified as depressed in comparison to individuals identified as White and food secure. Though the null hypotheses for all three research questions were rejected, the interpretations of the findings may form grounds for future study that include race/ethnicity stressors, discrimination, and health disparities.

Interpretation of the Findings

Regarding RQ1 (Is there an association between food insecurity and depression among adults age 60–69 in the United States, after adjusting for the potential confounders?), Multivariable Logistic Regression findings indicated that 46.3% of food-insecure adults age 60–69 were more likely to be depressed. The findings were statistically significant (95%CI: 1.38–2.49, $p < .001$) and consistent with the findings of the research community that an association existed between FI and depression. The finding addresses the age-related gap in the FI-depression association and adds to the repository of cross-sectional findings. In addition, this finding has far-reaching

implications for the health and social well-being of U.S. adults age 60–69. First, it exposes this population's vulnerability to the stressors of FI in connection with depressive symptomology. Byrd et al. (2020) found that depressive symptoms were also associated with stress, chronic health conditions, and demographic factors. Second, the bidirectional relationships between FI and depression are complex and complicated to report. According to Byrd et al., this association is more pronounced for people in their 60s compared to those in their 50s.

Together these findings support ongoing efforts to understand relationships between stress (FI) and mental health (depression), specific features of the stress process, and possible age variations in how depression and stress (FI) are related (Byrd et al., 2020). Third, the finding confirms that FI is a risk factor for depression in the 60–69 age group, meaning that people exposed to FI in the targeted age group are more likely to be depressed, irrespective of their income status. People in the sample who made less than $20,000 per family income were 37% more likely to become depressed than those who made more than $20,000 (*OR* = 0.73, 95% *CI*:0.53–1.01). However, income was nonsignificant in the model ($p > 0.05$), meaning that income may not be a protective factor for FI-depression but a confounding factor. This supports the assumption that many mediating variables could influence the FI-depression association. Among those variables are race and ethnicity and age 60–69, which were not addressed exclusively in some studies. Though the current findings may not be generalizable to a fraction of the U.S. population, they establish a foundation for future research on the 60–69 population's health and other associated risk factors. For instance, researchers could investigate the

historical effects of wealth on the FI-depression association, considering that wealth and income can be defined as distinct financial variables with different implications in research.

For RQ2 (Is there an association between race/ethnicity and depression among adults age 60–69 years in the United States, after adjusting for the potential confounders?), race/ethnicity was a significant contributor to the model (Wald: X^2 (4) = 15.051, p = .005). The findings indicated that race was associated with depression due to sufficient statistical significance ($p < .05$) to reject the null hypothesis. There were variations in the findings after adjusting for all of the covariates in the model (Hispanics = 36%, non-Hispanic Blacks = 42 %, non-Hispanic Asian =59 % compared to non-Hispanic Whites). Hooker et al. (2019) used disaggregated racial and ethnic categories data from the federal database. After adjusting for sociodemographic covariates, Hooker et al. found that 19% Hispanic-Mexican, 46% Hispanic-Puerto Rican, 57% Hispanic-Cuban, 29% other-Hispanic, and 84% multiple Hispanic ethnicities reported screening higher rates of depression compared to non-Hispanic Whites. Also, 20% of non-Hispanic Blacks, 67% of Asian Indians, 30% of Filipinos, 82% of Native Hawaiians/Pacific Islanders, and 50% of older adults reporting two or more races showed similar results of screening higher positives for depression compared to Whites. Weinberger et al. (2018) found that depression prevalence increases significantly for the youngest and oldest age groups (men and women), non-Hispanic Whites, the lowest income group, and the highest education and income groups. The rate of increase in depression was significantly more rapid among youths relative to all older age groups (Weinberger et al., 2018).

The current study indicated significant depressive symptoms in non-Hispanic Whites. However, there were some variations in the prevalence of depression reported across segments of the targeted population. This observation indicates that certain racial and ethnic groups are at higher risk of exposure to depression than others. In some studies, Non-Hispanic Black and Hispanic persons had a higher weighted prevalence of depression in the United States than non-Hispanic White persons (Ettman, Cohen, et al., 2020). Also, non-Hispanic Black and Hispanic people had fewer assets than non-Hispanic Whites. However, when holding assets constant, racial minorities had better mental health than non-Hispanic Whites in the United States. Compared to previous literature, these findings conflict with some results about depression symptomology among racial/ethnic groups. Future research into understanding the macro level, micro level, and individual factors that are contributing to the increase of depression, including factors specific to demographic subgroups, would help to direct public health prevention and intervention efforts (Weinberger et al., 2018).

For RQ3 (Is there an interactive effect or relationship of race/ethnicity and FI to depression among adults age 60–69 in the United States?), the findings of the overall regression model were statistically significant, $\chi 2(15) = 64.76$, $p < .001$, indicating that collectively there was a significant predictive model. The interaction category non-Hispanic Whites*FI (Wald = 11.98, $p < .001$, $OR = 3.16$) was statistically significant, indicating that individuals identified as non-Hispanic White and food insecure were 216% more likely to be identified as depressed in comparison to individuals identified as White and food secure. The interaction category non-Hispanic Blacks*FS ($OR = 0.61$,

95% CI:0.39–0.98, $p < .05$) was significant and non-Hispanic Blacks*FI (*OR* = 1.35, 95% CI:0.39–0.98, $p > .05$) was nonsignificant compared to non-Hispanic Whites*FS. The interaction category Hispanic*FS (*OR* = 0.79, 95% CI:0.53–1.21, $p > .05$) was nonsignificant and Hispanic*FI (*OR* = 1.19, 95% CI:0.78–1.04, $p > .05$) was significant compared to non-Hispanic Whites*FS. The interaction category non-Hispanic Asians*FS (*OR* = 0.48, 95% CI:0.25–0.90, $p < .05$) was significant and non-Hispanic Asians*FI (*OR* = 0.78, 95% CI:0.30–1.99, $p > .05$) was nonsignificant compared to non-Hispanic Whites*FS.

These findings show heterogeneity; for example, food-insecure Hispanics, Blacks, and Asians were less likely than Whites to be depressed. The findings show a weaker association for racial minority groups than food insecure non-Hispanic Whites (216%). Assari, Burgard, et al. (2015) found similar results between chronic medical conditions and depression. Whites were more likely than Blacks to report symptoms of depression. According to Assari, Burgard, et al., this type of relationship is paradoxical. Blacks had less frequent depression despite a higher prevalence of chronic medical conditions than Whites in the United States (Assari, Burgard, et al., 2015).

This paradoxical finding could be explained as Black resiliency over specific risk factors (Keyes, 2009). The risk factors include experiencing greater social inequality and exposure to discrimination, and higher rates of physical morbidity (Keyes, 2009). Findings also showed that controlling for perceived discrimination increases the Black advantage (Keyes, 2009), suggesting that Blacks would have even better mental health outcomes for discrimination (Keyes, 2009).

Race Differences and Cumulative Exposure to Stress

The Black-White health paradox is synonymous with a higher FI rate associated with psychological distress (Allen et al., 2018) but a lower prevalence of depressive symptoms associated with poor subjective well-being (Frongillo et al., 2019) among Blacks compared to Whites. L. L. Brown et al. (2020) examined this paradox among older Blacks and concluded that Blacks had similar or better mental health than Whites, despite differential cumulative exposure to stress. Nguyen (2020) suggested that among older Blacks and Hispanics, religion and religious institutions act as social buffers consistent with resources of psychosocial support and tangible assistance for building social capital. Steers et al. (2019) reported that negative coping skills used by Blacks lower their rate of depression but increase their chances for chronic conditions and higher morbidity.

Socioeconomic Gradient

Another precedent that contradicted this finding is the context of the socioeconomic gradient. The socioeconomic gradient means higher income can lead to favorable health outcomes and fewer enabling resources for the low-income person (Steptoe & Zaninotto, 2020). Although income was an influencer in the current model, it was nonsignificant ($p > 0.05$). This study's findings show that higher income, being married, and being White is synonymous with higher SES as protective factors. Following the Black-White health paradox and the socioeconomic trend, more Blacks should be depressed in this population than Whites, considering the wealth gap in the United States. This gap could be traced to a time when one race started from invisibility

to stereotyping to social inequality to experiencing discrimination, compared to other groups that were compensated for ending slavery in the United States.

Overall, these findings could inform future studies. First, racial and ethnic data should be disaggregated in future studies (Hooker et al., 2019). Doing so would help researchers unmask the potential impact of previously aggregated data that were the focus of some contradictory findings. This approach could be pivotal for informing policymakers and advocacy groups to target groups in need of mental health resources and food distribution services (Hooker et al., 2019). Adopting these measures over time could help decrease health disparities and ensure equal distribution of mental health resources and services to needy people and vulnerable communities (Hooker et al., 2019).

High-risk groups or individuals can receive targeted health messaging specific to the groups' culture highlighting the risk and underlying causes for depression in their constituents. For instance, research targeting the real causes of depression, including stress from discrimination, may inform future assessment strategies and treatments (Hooker et al., 2019). Second, as the aging population grows and diversifies, effective screening and treatment protocols will become the norm. Therefore, the data and findings from the current study may be used by health care organizations and community-based groups to target their services to those at increased risk of depression. Depression is not a normal or an inevitable part of aging but a preventable and treatable condition; prevention and intervention efforts are appropriate and invaluable (National Institute on Aging, 2021). Third, developing new interventions or translating existing interventions targeted to cultural groups that have been shown to have high prevalence rates of

depression will be necessary. Because of higher health care utilization among the aging cohorts living longer, receiving treatment for depression would positively impact individuals, families, and health care costs (Hooker et al., 2019).

Table 17

Synthesis of the Findings in the Context of the Theoretical Framework

SEM Framework	Finding	Interpretation	Implication	Health promotion/intervention
Intrapersonal**:** a person beliefs, action, and perceptions**.** Internalized racism Stereotype threats	1.RQ1 2.RQ2	1) Unequal distribution of FI 2) Racial disparities in depression outcome	(a) The burden of FI facing disadvantaged individuals are different from individuals with greater advantages (APA,2017). (b) Gaps in available resources: Limited social and economic resources for disadvantaged individuals. (c) Adverse life events: Limited options and coping resources for handling discrimination and threats. (d) Social isolation, increase stress exposure and barriers to access necessary resources.	Individualized counseling, screening to address coping skills and building trust, and healthy lifestyle choices should be encouraged to address food security barriers
Interpersonal: the interactions between people-both within and across differences. Interpersonal and institutionalized discrimination Inequalities inequity	1.RQ1 2.RQ2 3.RQ3	1) Unequal distribution of FI 2) Racial disparities in depression outcome 3) Interpersonal interaction between Race, FI and depression	(a) Social and economic disadvantages may undermine financial stability and social support structures. (b) Racial disparities in marriage: lower-income individual less likely to marry. (c) Increasing disparities in material assets for individuals and racial/ethnic minorities in income, assets, and overall wealth (d) Gaps in social support from social circles, peers, etc. (e) Racial and ethnic disparities in health outcomes.	1) Interpersonal group counseling, screening to reduce psychological trauma/stressors and FI threats. 2) Effective intervention and communication strategies to: (a) reduce health disparities, (b) to better understand the(FI) stress process, (c) to identify potential moderators variables, including factors at the individual, family, and community level, (d) to address the varied needs of individuals in different socio-economic context. 3) Interpersonal communication and collaboration (media) to reduce physical and psychological barriers and threats.

Table 17 synthesizes the findings of the study according to the individual levels of the SEM. The SEM acts as the conceptual framework to guide future research that may identify multiple factors contributing to health outcomes disparities. The use of recommended intervention strategies is designed to improve the health and social well-being of older adults and may also indicate methods to address FI and the development of depression in other population groups with similar social conditions and health trends. Since this study was cross-sectional, analyzing the results with the SEM can help us to understand the FI-depression relationship and to define the study parameters for future studies.

Consistent with the SEM (McLeroy et al., 1988), the findings show that the key intrapersonal variables (FI, race/ethnicity, income, and marital status) were independently associated with depression. However, most of these variables were nonsignificant in the final model, except FI and Race, suggesting they might be less influential at the higher levels of the SEM. Because of their statistical significance in the findings, all the variables were considered baseline risk factors for depression. Therefore, a basic understanding of these factors is important to identify an individual's susceptibility to stressors and the perceived vulnerabilities in the immediate social environment (McLeroy et al., 1988).

Food is essential for nutritional well-being and in satisfying a basic human need that should be made accessible to all. Individuals uncertain of having or unable to acquire enough food because of money or resources increase their likelihood of being food insecure and depressed. According to the SEM, when there are perceived threats to

someone's ability to provide food for themselves or their family, the outcome can be stressful for some individuals (McLeroy et al., 1988). FI is an individual, household, and neighborhood-level economic and social condition describing limited or uncertain access to adequate food (USDA, 2022). Stressful or adverse life events from FI may often be accompanied by socioeconomic hardship and other risk factors, including financial barriers, racial tension, and health disparities. These factors are significant influencers at all levels of the SEM. According to the American Psychological Association [APA] (2017), individuals from minority and vulnerable groups are more susceptible to these at-risk stressors. For example, data shows that minority groups have higher rates of FI than non-Hispanic White people (USDA, 2022). FI disproportionately affects persons from racial and ethnic minorities and socioeconomically disadvantaged populations (USDA, 2022). In 2021, 20 % of Blacks, and 16 % of Hispanics, compared to 7% of White households, experience FI (USDA, 2022), even with the decrease in FI rates.

In this study, I found food insecure Blacks were less likely to experience depression compared to food insecure White. Although these results are complicated and varied, it consistently shows that FI is unequally distributed and associated with depression. The FI-depression relationship is strongly influenced by race (non-Hispanic White), and marital status (widower), suggesting links to stressful life events, discrimination, and social isolation. Compton and Shim (2015) described the situation as the unequal distribution of food, inadequate access to healthy food, and policies leading to continuous anxiety, frustration, powerlessness, shame, guilt, and disconnection from others. The other finding indicates that the FI*race/ethnicity interaction influencing

depression with non-Hispanic White is highly favored over other groups of racial minorities. This finding suggests an overlap between race and SES. The meaning is that the outcome (depression) may have been influenced by various socioeconomic (income) and marital status (marriage) subsets and varies considerably among food-insecure racial subgroups.

Implications of the Findings (SEM Levels)

Table 17 shows that these ubiquitous findings have implications at the SEM's intrapersonal and interpersonal levels:

Intrapersonal

- The burden of FI facing disadvantaged individuals are different from individuals with greater advantages.
- Gaps in available resources: Limited social and economic resources for disadvantaged individuals.
- Adverse life events: Limited options and coping resources for handling discrimination and threats.
- Social isolation, increase stress exposure and barriers to access necessary resources.

Interpersonal

- Social and economic disadvantages may undermine financial stability and social support structures.
- Racial disparities in marriage: lower-income individual less likely to marry.

- Increasing disparities in material assets for individuals and racial/ethnic minorities in income, assets, and overall wealth.
- Gaps in social support from social circles, peers, etc.
- Racial and ethnic disparities in health outcomes.

Health Promotion Strategies and Recommendations

According to the American Psychological Association (2017) when social position shapes stress exposure and consequently leads to disparities in health outcomes, these stress exposures are unjust and costly and can be prevented and addressed. The health promotion and intervention strategies include (a) addressing health disparities that requires interventions that reduces threats and improve resources to the social and physical environment; (b) intervention that targets the physical and psychological stress processes; (c) development of effective programs to prevent and eliminate disparities in stressful health outcomes. Overall, these measures depend on a clear understanding of both FI stress exposures and the pathways through which various attribute of stress contributes to health and health disparities in the target population.

Intrapersonal Level. At the intrapersonal level, the health promotional strategies include individualized food security and depression counseling to address (a) coping skills for individuals contemplating retirement and building trust to improve healthy lifestyle choices to address food security barriers. Additionally, older adults who show signs of salient FI behaviors should be screened for adverse life events, including discrimination, financial barriers history, and nutritional habits. Screening could help limit adverse health outcomes and ensure timely referral of those in need to available

food and nutrition support programs. These support programs include SNAP, Child and Adult Care Food Program, local emergency food services. Other assistance includes nutrition outreach and education programs for vulnerable FI individuals.

Interpersonal Level. At the interpersonal level of the SEM, diverse policies and social norms affect individuals and families and community access to sufficient, safe, and nutritious food. Risk factors at the interpersonal level of the SEM can trigger or interact with more complex and nuanced behavior factors in the model. Because of group dynamics at the interpersonal level, elevated emotional and psychological traumas or stressors are common (Stokols, 1996). The social relationships (family circles, peers, etc.) linked to adverse outcomes at this level includes health and healthcare disparities, discrimination, and stressful life events. Social relationships provide significant social resources and social support in fulfilling changes in social norms and social influences by rendering personal obligations and responsibilities to overall well-being (McLeroy et al.,1988).

Screening. Interpersonal group counseling and screening are important at this level for food-insecure older adults as well as children to address food insecurity threats and traumas in families and households similar to other social risk factors (education, employment, income, and housing).

Accessing Social Networks. The social norms of food-insecure depressed individuals are ingrained in the components of social networks. Accessing social networks can help change these ubiquitous, pervasive, and persistent social norms of food-insecure/depression prevalence, often linked to inequities in resources, money,

power, and choices among older populations. These social norms are driven by the unequal distribution of food and money among historically marginalized people. Social networks influence fewer deviant FI behaviors and create alternate networks to support equitable access to essential resources for older adult health and well-being. A social network that includes close relatives and friendship networks could provide older adults with emotional support, social identity, and access to social contracts (McLeroy et al., 1988).

Absence of Social Relationships. Social relationships are ways to make meaningful connection between older adults, family, and community. In the absence of social relationships, loneliness and isolation associated with FI can limit older adults' access to food when there is no assistance from a companion, family, or social network. This idea of FI could lead to cases of depression for some older adults, especially marginalized groups. Also, the stressful situation related to FI and other uncontrollable forms of stress could increase depression among racial/ethnic groups (Myers & Painter, 2017).

Implications of the SEM

The implication of these findings is important in understanding and improving the social and communication relationships between older adults and community advocates. For example, when working with older adults, community advocates may use the SEM to take into consideration all factors that may contribute to depression, whether these are within the family itself or because of issues present in their community or that are found in society as a whole. This may include issues such as, history of poor education,

disabilities, shortage of jobs, poor budgeting skills, unemployment, lack of public transport and prejudice from other racial/ethnic groups. By working in this way, advocates and professionals can build from a view of everything that is contributing to a situation and so can put in place relevant and practical solutions to improve the lives of older adults, and their families and their social network. Additionally, effective communication can help build trust and avoid social tension, allow access to sufficient, safe, and nutritious food, and open opportunities for mental health professionals and advocates to share their voices with the affected communities.

Racial and ethnic challenges are well documented concerning health disparities and racial inequality in vulnerable communities associated with health outcome disparities. However, disrupting the trajectory of adverse health outcomes and advocate for changes can effectively improve the social and economic, and health outcomes of the older populations. First, it is critical that future researchers understand, for example, the racial pathways leading to depression throughout the life course. For instance, does race directly or indirectly affect or relate to the prevalence of FI cases and depression symptomology in the United States? Is race an impending force driving racial and ethnic disparities in health in FI-depression associations? Although association was found, these questions still need answers, especially in age-related contemporary research studies.

Second, even though the research community understands the role of race in determining FI-depression relationship, more should be done to examine inter group relationships in age-related vulnerable communities and individuals. Race base research variables should be disaggregated accordingly to truly reflect the diverse needs of

individuals and community in research. Doing so could directly or indirectly increase reporting on the SDOH and mental health affecting specific racial groups in all jurisdictions in the United States.

Limitations of the Study

There are some limitations to look out for in this study:

1. This study is not intended to present specific hypothesized causal relationships between FI and depression.
2. The relationship between FI and depression may be bidirectional, meaning depression could be both an outcome and a risk factor for food insecurity.
3. Because the nature of the data in this study is cross-sectional, the information is available in 2-year cycles, which restricts the study by not providing an opportunity to conduct a longitudinal study involving a specific age group.
4. Because some of the data are self-reported, likely, some participants may at least misrepresent or give interviewers inaccurate information, which could skew the study results.

Additionally, most studies that relate to the findings and including this study measures depressive symptoms at only one-time point, making it difficult to evaluate older adults who may show different patterns of depressive symptoms over time. Lacking is the importance of social context and the intersectionality of processing social identities to explore within and between group comparison of older adults in the study. Although this study explored the nuanced behaviors and relationships between race/ethnicity, food-insecure stress, and depressive symptomology, it lacked some crucial with-in-group

effects or variability to generalize the findings using the aggregated racial data and analyses. The outcome of this nuanced psychosocial relationship requires a contemporary research approach that includes disaggregated racial data or datasets and methodology. For example, the findings of this study did not capture a demographic of non-Hispanic Black Caribbean men whom Taylor (2020) confirmed had higher rates of depression than others racial/ethnic groups. As outlined, this lack of specific group representation in aggregated(between-group) study findings shows weakness. Overcoming this weakness can be thoughtful for contemporary researchers to cultivate within-group differences (disaggregation) in their study parameters and analyses. This approach could be valuable for older adult population studies to improve findings specific to targeting social identities and resources (Mcleroy et al., 1988) of people needing services and interventions. According to Taylor (2020), with-in variabilities in religious affiliations, linguistics, historical experiences, circumstances, and differences, impact or deepen our understanding of mental health.

Disaggregation of racial categories in future studies will help researchers look at participants' life experiences, circumstances, and meaningful differences that may lead to cumulative stress or depression. Kim et al. (2020) described the importance of acknowledging relevant life conditions, such as immigration status and experiences, and the social conditions affecting non-Hispanic Asian groups to assess mental health. This understanding is necessary for developing culturally appropriate responsive interventions for specific target groups that include over 20 subgroups with heterogeneous characteristics (Kim et al., 2020). What would be the outcome of the mental health status

of historically marginalized older adults be if future research embarks on exploring within-group and between-group diversity seriously (Kim et al., 2020)? Answering such a question is still in limbo.

Recommendations

Although this study results strongly supported the methodological design in quantifying the relationship between FI and depression and the mediating effect of race, income, and marital status, the limitations establish the premise for additional research. To better understand the etiology and outcome of depression, future research should embrace life course principles and methods. The life course refers to the growth and developmental stages of one's life, a period of a person's exposure to the physical, economic, and cultural environment and the changes in those environments (The Public Health Advocate). Adopting this approach could establish a link between early life events and later life realities. This approach could also help researchers and policymakers understand the trajectory of individual and community stressors on older adult health and well-being. Stressors that trigger depression may be recent or from past events, and individuals can intensely remember these events for some reason or another. For example, thinking deeply about stressful past experiences such as emotional or physical situations can be sufficient to trigger an onset of depression.

Given this study's observations, findings, and limitations, the prospect of future research points to the necessity of capturing the psychosocial stressors of FI more precisely over a more extended period to sustain the study's viability. These precedents expose the potential for prospective cohort studies to capture the social context and a rich

source of data and analytical opportunity for population researchers. However, a point of caution, cohort studies also have limitations that include missing data and missing participants over time that could skew study results.

Adopting the Life Course Approach

Adopting the life course could explore family dynamics and childhood development, work history, financial insecurity of older adults, and other criteria for depressive episodes over a lifetime. This approach is essential: (a) to examine the impact of FI policy change and the degree of success or failure on how individuals adapt to new circumstances; (b) to the effectiveness of institutions or organizations and community support in implementing those changes. This approach ensures, first, an understanding of the gaps in data, and the cultural differences, in the presentation of symptoms. Second, it will explore the lack of knowledge of depression and health disparities among marginalized groups undergoing financial hardship, gaps in income and wealth, or lack of resources.

Adopting a Multivariate Framework

One viable approach is to adopt a multivariate framework like the SEM to guide the study parameters. This framework includes, among others, using focus groups to capture individuals' data on knowledge, attitudes, and belief to reflect cultural pride and heritage of racial/ethnic groups related to life-long stressors. This qualitative data could establish time-sensitive datasets for researchers to examine upstream social determinants of health such as racial and health disparities, discrimination, and access to wealth over a period and related downstream effects, FI, depression, obesity, and diabetes. Such

qualitative methodologies will provide a different approach to exploring individual experiences as participants describe their experiences in their own words. This approach is beneficial for providing a nuanced understanding and additional insight into a problem as more general and open-ended. Future research may also explore how the current findings can be used to reduce the burden of FI and depression across racial/ethnic U.S. populations.

Implications for Professional Practice and Social Change

Professional Practice

One esteem priority for this study is creating trusted messengers to lead and reinforce the priorities of threats to older adults' social and economic needs in the transitional years from work to retirement. This priority could be achieved by establishing and prioritizing connection and support from public health leadership at state and city levels and establishing a multivariable framework that incorporates the priorities of a social change model seen in Figure 11.

Public Health Leadership Support

The second priority is establishing a connection with public health leadership at the city and state levels. Public health leaders' support will help reinforce access to scarce resources and strengthen the relationship with targeted communities. This connection will help social change advocates reinforce what they have discovered in their work or in the field. This approach will likely give access to different communication media to track FI policy, discrimination and discriminatory practices, and other means to increase data and

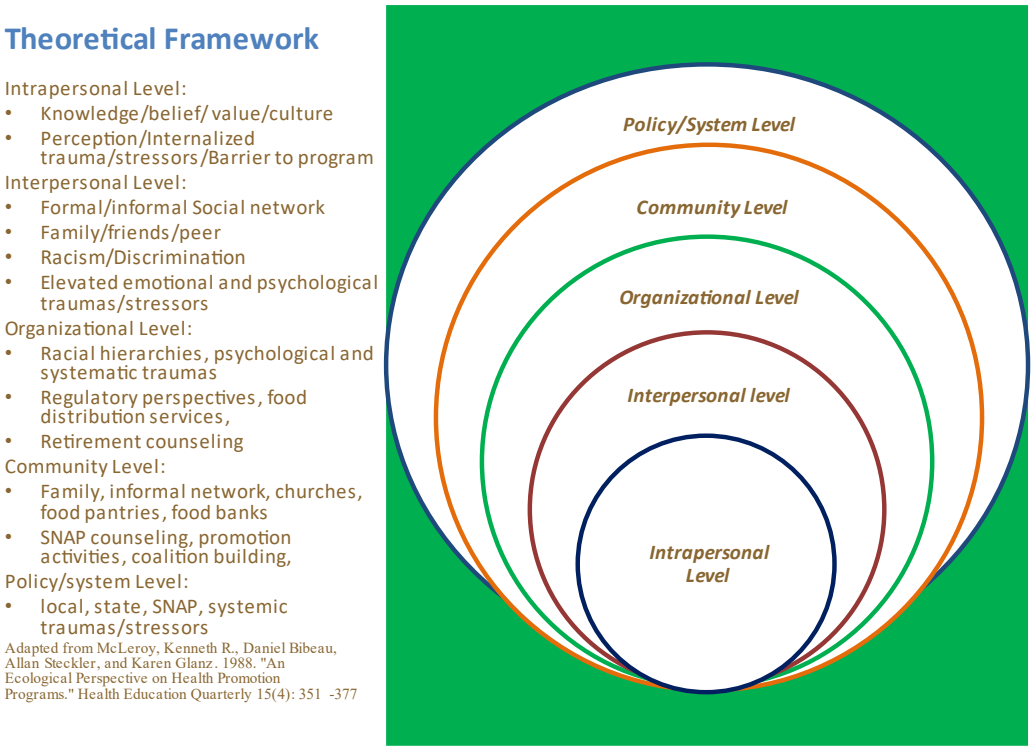
resources to satisfy the needs and well-being of older adults. This priority could be accomplished by adopting *the model for social change* (Figure 11).

Social Change Model

When considered at the individual and environmental levels, the SEM in Figure 10 can help guide social change efforts in planning, prevention, and intervention activities among older adults. On the other hand, the model for social change signifies incorporating the universal perspectives of the SEM and the behavioral and social change communication tools, channels, and approaches. Specifically, the focus is on encouraging dialogues, group participation, and engagement and providing tailored messages to groups. This model's approach could target and motivate a community of sustainable individuals in knowledge, attitudes, and behaviors to change the trajectory of health outcomes. The targeted outcomes include positive health, self-care, education, and well-being. These relationships could be hypothesized as operating at different social-ecological levels and provide the theoretical framework to help us identify the key pathways to health. These pathways may influence, for example, life course trajectories that could prevent or exacerbate symptoms of depression.

Figure 10

Social-Ecological Model Conceptual Framework



Individual Level Impact

At the individual level, an individual brings personal knowledge, beliefs, values, and behaviors influenced by their family, friends, and proximal community (McLeroy et al., 1988). These behavioral characteristics can influence or impact a range of pathways and trajectories in the general health and well-being of older adults (Figure 10). According to one study, the prevalence of depression varies substantially across the life course with differing trajectories of symptoms over long periods of time and differing outcomes (see George, 2018; Von Cheong et al., 2017).

Appendix G of this study gives a conceptual overview of the individual level of the SEM and the distribution of applicable risk factors at the intrapersonal and interpersonal levels. This diagram emphasizes generational stress vs generational wealth and low-income vs higher income individuals, and life expectancy. In agreement with the findings, Race/FI combination negatively disrupts social circles, family, and networks creating tension, lack of trust and shorter life expectancy for older adults when these parameters are activated. On the other hand, Race/FS relates positively to stronger social circles, generational wealth, higher income, and ability to activate positive coping skills and resiliency. When activated, the outcome is reflective of an extended life expectancy for the older populations, which could be achieved through life course events.

Life Course Approach

The science is clear that early life events can affect later life outcomes (George, 2018; Von Cheong et al., 2017). In a study conducted by researchers from the CDC and Kaiser Permanente, the researchers found that childhood adverse events (ACE) were associated with many social and economic outcomes in later life (Merrick et al., 2019). The dose response relationship between ACE and health outcomes stated that the higher the ACE scores, the worse health outcomes. A person with an ACE score of 0, is 4.5 times likely to have depression in the later years. This study herein found that food insecure non-Hispanic White is 3.16 times likely to become depressed. Merrick et al. reported that1 in 6 adults experience four or more types of ACEs. What are the chances that ACE had influenced this outcome? According to the SEM, internalized trauma or stressors in early life are linked to individuals who were exposed to food-insecurity

psychosocial stressors, low family or household income, discrimination, and disparity in health. To better understand the etiology and outcome of depression, future research must embrace life course principles and methods, a link between early life events and later life realities.

Exposure to Early Life Adversity

Exposures to early-life stressors have a ripple effect on health outcomes in later life. For instance, ACEs are a serious public health problem with far-reaching, preventable consequences across the lifespan (Merrick et al., 2019). Exposure to early life adversities, which include traumatic events (such as being from a specific race/ethnicity low-income household) that occur during childhood, can affect how the body responds to stress. These events are also linked to chronic health problems and mental illness in later life (Merrick et al., 2019). Growing up in a household where the symptoms of ACEs are common and constantly repeated affects childhood development (Merrick et al., 2019). Individuals may internalize these traumatic events throughout childhood, which can materialize later in older age.

Moreover, through this research and other observations, the research community may now understand the exposure mechanisms to early life adversities and associated traumatic events. These events include FI and racial identity stressors (social stressors). For example, if faced with life-threatening situations pertaining to food security for self and family, these behavioral factors may resurface in cases related to retirement insecurity, insufficiently fixed income after retirement/poverty, other stressful life events, and medical problems. At this level, individuals are more susceptible to disease, illness,

and mental health challenges over their lifetime. Children growing up with toxic stress may have difficulty forming healthy and stable relationships later in life. They may also have unstable work histories as adults and struggle with finances, family, jobs, and depression throughout life, the effects of which can be passed on to their children (Merrick et al.,2019).

Addressing Social and Economic Realities

Depression varies widely, indicating differing trajectories of symptoms over long periods of time, with possible differing causes and differing outcomes (Musliner et al., 2016). Depression among racial groups decreases overall self-worth or personal value and has been linked to interpersonal disparities in wealth and income in many marginalized groups (Williams & Purdie-Vaughns, 2016; Williams & Cooper, 2019). Research shows that parents facing financial hardship are more likely to experience stress, depression, and conflict in their relationship and family, compromising parenting and increasing the risk of ACEs. Parents facing financial hardship have fewer resources to invest in their family or children and face difficult choices when trying to balance work and family responsibilities. About 4 in 10 children in the United States live in low-income households, including more than half African American and Hispanic children, and 1 in 10 live in poverty (Merrick et al., 2019). Strong evidence consistently links low income to ACE exposure and children's long-term health, educational, and social outcomes (Merrick et al., 2019).

Health Promotion Strategies

The health promotion strategies that should help at this innermost level of the SEM include educational programs, support groups, and senior peer counseling (McLeroy et al., 1988). The pathways leading to income inequality at this level could be linked to life course trajectories, including culture perspectives, and the ensuing wealth gap in the United States.

Environmental Level Impact

Organizational Level and Social Trust. The organizational level of the SEM involves the health care system, policies, and structures working together to assist or support older adults' FI needs and well-being. At this level, psychological and systemic traumas are common due to racism and discriminatory practices in some organizational policies and practices, which can erode social trust and well-being and reduce social capital for some vulnerable communities. Social capital refers to features of social organization, such as networks, norms, and social trust, that facilitate coordination and cooperation for mutual benefits (Serageldin & Grootaert, 2017).

Researchers indicated that institutional racism and discrimination contribute to poorer health outcomes for racial/ethnic minorities. Institutions or organizations that practice and include racial bias and structural racism in their policies and practices limit opportunities, resources, wealth, and well-being of individuals and populations based on race/ethnicity and socioeconomic and sociodemographic statuses. From a life-course perspective, researchers found that adverse life-course events like inadequate income, unemployment, job loss, and worsening health conditions create a lack of trust among

individuals in response to these critical life-course events. This lack of social trust occurs when governmental organizations or institutions provide little or no funding or resources to vulnerable individuals or communities to buffer the lack of social capital. However, these programs can provide information on health insurance plans and fund programs for making older adults aware of federal, state, and local benefits and how to access them. Organization programs can offer workplace retirement counseling and workshops for older adults planning retirement.

Community Level and Mediating Structures. Access to healthy food is important to the quality of life and well-being of aging communities comprising socio-economically disadvantaged individuals. According to McLeroy et al., the most severe health problems will occur in communities with the least power and access to resources. They are the poor, minorities, the rural, and those with serious health complications (McLeroy et al., 1988). Community-level factors could limit access to affordable, adequate, and healthy nutritious foods for older adults. These factors can have political, social, and economic ramifications for aging communities. These factors often include convenience stores and small independent stores that are more common in food deserts than full-service supermarkets or grocery stores in terms of FI. Food deserts have higher food prices, lower quality foods, and less variety than supermarkets and grocery stores.

On the other hand, communities can pool resources and ideas together to improve community health. These organizations can negotiate and lobby for food resources and programs in vulnerable neighborhoods and communities. Mediating structures connect individuals and the larger social environment and help deliver service to the community

(McLeroy et al., 1988). Changes in individuals without the support of these mediating structures are difficult to achieve. However, a community can help coordinate health events designated to educate and equip older adults with knowledge and materials to help prevent food insecurity and provide health awareness about the seriousness of depression.

Health Promotion Activities

Health promotion activities should include increasing coordination among community agencies and coalition building to influence community awareness, advocating for local health policies, and lobbying for resource expenditures (McLeroy et al., 1988). Communities often play a critical role in defining community initiatives, such as allocating resources and funding for program amelioration (McLeroy et al., 1988). For instance, communities can use their power to determine what issues can be placed on the public agenda. These issues include setting up food pantries and food banks, providing information on accessing SNAP benefits, and providing home delivery services through food on wheels programs.

At the policy levels, the proposed hypothesis is that income inequality varies across many characteristics of material deprivations that are relevant to health and well-being. These include a lack of investment in housing, education, and public transport, as well as healthy food availability and accessibility of health care. Thus, greater inequality leads to worse physical health due to less public spending on health care in more unequal societies, leading to an increased rate of depression. This level consists of the governing bodies responsible for establishing laws at the local, state, and federal levels of government (Bronfenbrenner, 1979; McLeroy et al., 1988). These agencies can plan

initiatives, research, and access funding for FI and depression research related to aging and health disparities.

Macro-Level Context

FI-depression associations are moderated by macro-level context, including large-scale economic, cultural, and social contexts where people live and age. FI is a psychosocial stressor repeatedly associated with depression among older adults. FI influences on depression in older adults may be affected by the broader, macro-level context, which can be examined policy level. Considering FI to be a source of psychosocial stressor among older adults at the macro-level in terms of the food systems, funding the Supplemental Nutrition Assistance Program (SNAP) could help address some barriers to accessing healthy, affordable foods for older people. Researchers found that older adults are less likely to participate in food assistance programs even when accounting for socioeconomic differences (Bergmans & Wegryn-Jones, 2020).

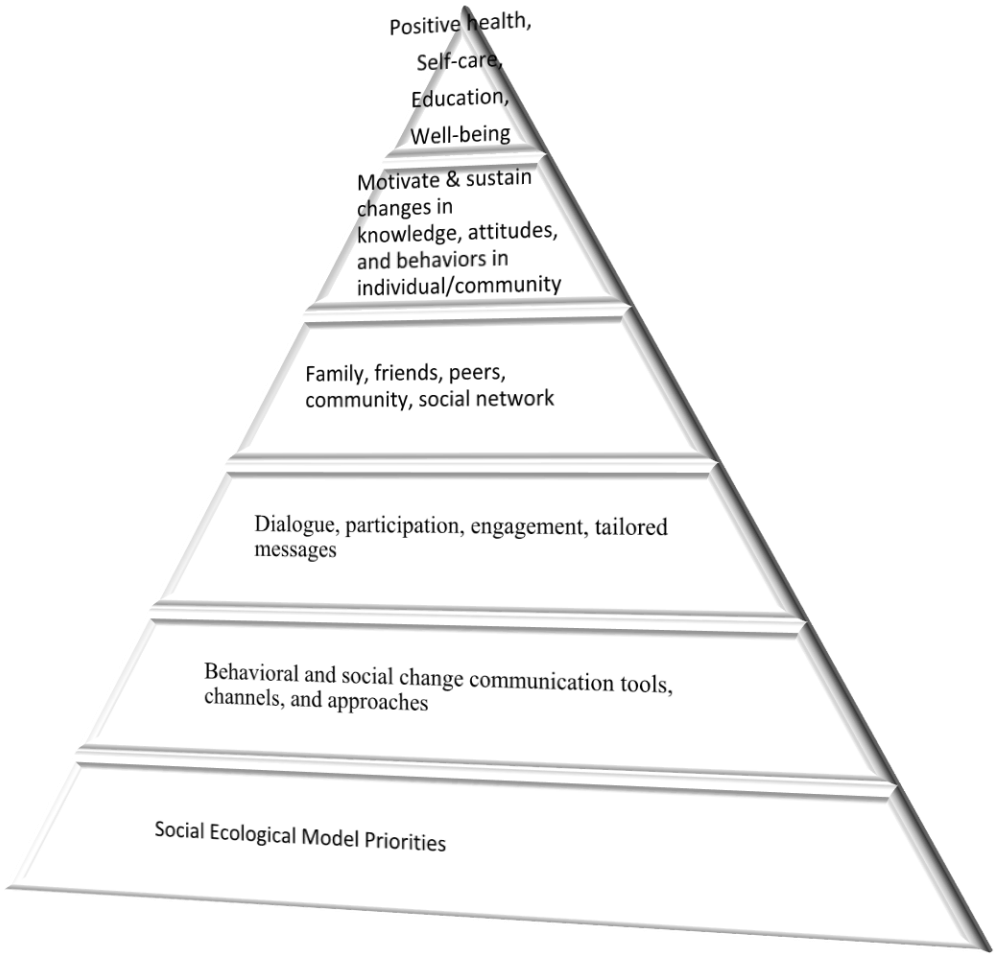
Developing strong and sustainable food policies targeting low-income and vulnerable populations could help mitigate the symptomology of traumatic events exacerbating long-standing disparities among disproportionately marginalized populations. Policymakers should expand legislation to address projected FI issues in the United States. Expansion of these programs would address the increases in the socioeconomic and health inequities of FI and depression. Also, racism and ageism continue to shape attitudes, practices, and policies concerning older adults and racial and ethnic minority groups.

Positive Social Change

Within the preview of the model for social change and issues emanating from this study, there is a need for a multifaceted framework to examine the FI-depression trajectories and pathways. These trajectories and pathways can be complex due to the bidirectional effects of the FI-depression relationship that has far reaching consequences for the individuals as well as communities. As a first step, this study findings confirmed the FI-depression association and the influence of race as a moderator in this determination. However, low-income as well as isolation from close relatives also impacted this study results, which is cautionary. This caution lies within the parameters of the study and generalizing the results to a larger population because of cross-sectional study limitations. To move beyond this limitation, it is important to conclude this study on its impact on social change priorities, implications, and strategies to focus on exposing the needs and priorities of a vulnerable community. Figure 11 shows the model for social change adopted from a public health perspective.

Figure 11

Model for Social Change



Note. Universal: SEM perspectives, Behavioral and social change communication tools, channels, and approaches. Specific: Dialogues, participation, engagement, tailored messages. Target: Motivation, sustainability, individual and community level changes in knowledge, attitudes, and behaviors. Targeted outcome: Positive health, self-care, education, well-being.

The social change implication will increase communication and collaboration skills and strategies among diverse groups, including providers and advocates, on the tailored health needs of older adults. Adopting this approach from a universal perspective (SEM) could increase knowledge and understanding of the interactions of stressful life events throughout the life course. FI, race, and depression are complex issues on the socioeconomic gradient, meaning there are many variations among the issues that can affect older adults' social, economic, and mental health. Therefore, exploring the relationship between FI and depression among adults aged 60–69, in the United States, by race/ethnicity could influence social change (Ziliak & Gundersen, 2019). The implications include informing and targeting action at the local, community, and policy levels:

1. To improve mental health leadership and advocacy in communities or groups affected by FI issues.
2. To improve the quality of life for older adults in targeted communities affected by the dual challenges of FI and depression.
3. To help reduce medical and healthcare spending attributed to FI and depression in the future.
4. To open opportunities for improved outreach and foster an understanding of older individuals and community needs.
5. To align public health actions to the older adult needs by increasing depression screenings for elderly care visits.

6. Improve access to food benefits and tailor public health messaging to target FI and depression issues affecting older adults in minority communities.

Overall, these social change actions could help to illuminate and address how the health of the socially and economically disadvantaged older adult populations is determined and protected in the United States. The implication could increase knowledge about the exposure to risks and lack of resources linked to living conditions influenced by race and controlled by SES. The social change implications may also inform the levels of interpersonal and community influences of FI on racial/ethnic minority groups and the effects of depression through community messaging and advocating techniques. These measures should help inform geriatric practitioners, advocacy groups, families, and policymakers on the possible effects of FI and depression as measured by race among various age groups. These measures could help target racial and health disparities among vulnerable communities and possibly further the mission to eliminate racism and ageism in health and health care.

Figure 11 shows a mechanism adopted from the public health perspective and United Nations Children's Fund (UNICEF) "Communication for Development Strategic Framework 2018–2021" (UNICEF.ORG, 2018). Universally, this diagram may act as a reference point for public health and geriatric practitioners to utilize a mix of behavioral and social change communication tools, channels, and approaches (UNICEF.ORG, 2018). The SEM framework guides these behavioral and communication utilities over time: (a) To build a positive social change agenda that encourage dialogue, group participation, and community engagement in civic and social activities targeting older

adults, families, and social networks. (b) To understand the multifaceted and interactive effects of individual and environmental factors determining FI behaviors and depression among racial/ethnic groups. (c) To evaluate communication initiatives and strategies for identifying and negotiating leadership roles to plan, implement, and monitor targeted outcomes. These communication initiatives and strategies can help increase individual and group understanding and shift attitudes and norms around issues that affect older adults' social, civic, and economic well-being. (d) To develop and use tailored messages and approaches in a variety of ways through communication channels appropriate for addressing older populations needs and aspirations. (e) To utilize research-based outcomes, interactive activities, outreach, and processes to promote health, self-care, education, and other outcomes and (f) to motivate older individual and community members to value knowledge, understand individual attitudes, and the stereotypical behaviors about the aging culture.

These impacted measures could build a transformative culture encouraging private and public collaboration through individual sharing, listening, open dialogue, debate, and negotiation. This collaborative process allows groups of older individuals or communities to express, define, and identify their collective needs, values, and contributions to society's political, civic, and social life. These measures also shape what can influence the social and political landscape for older adults as active change agents in their community; this emphasizes community empowerment and creates an enabling environment for change (UNICEF.ORG, 2018). Community engagement is usually through interpersonal communication and may change social norms and accountability

structures, provide sustainable, multifaceted solutions to broader social problems, and create demand and utilization of quality services for older adults (UNICEF.ORG, 2018). Overall, these measures could model new norms and behaviors desired to understand the impact of FI stressors on depression among various groups of racial/ethnic minorities and the nutritional habits of older adults and their families; and to translate this understanding into interactive communication with the target population (UNICEF.ORG, 2018).

Focus

On personal reflection about values and culture older adults desired to create and change in empowering their communities and families. This framework provides older adults a guide towards increasing their knowledge and skill sets about nutritional health, depression, and other factors, including reducing health disparities in vulnerable communities.

Action

Through advocacy for engaging leaders, building community health workers' capacity, implementing interpersonal communication activities such as home visits, group discussions, and educational talks, and partnering with local and governmental organizations to implement and monitor food insecurity-depression prevention activities. It is also important for public health and geriatric practitioners to have versatile knowledge of life course events among older individuals.

Recommendation

These events should be documented in future studies due to the lack of life course age-related study peer reviews to stress the uniqueness and personal meaning of life course (Hareven, 2019).

Conclusion

The compounded effects of FI, race, and depression represent public health concerns with multiple dimensions and far-reaching consequences for older adults in the United States. The aging population represents the most significant demographic shift in the history of the United States. As more Americans live longer and healthier lives, health, and healthcare systems need to adjust their priorities. These priorities include ensuring access to social and economic resources for older people to prevent FI and depression; making more resources accessible in a social and environmental context to save, invest and secure a stress-free and supportive retirement. From the FI perspective of older adults 60–69 years of age, readers may understand that FI involves older adults' social, economic, and physiological well-being in the aging process. In this process, some older adults could have comorbidity conditions in addition to FI, which puts them at greater risk of depression.

The timely analysis of these risk factors and the observation of other social and economic disadvantages have fallen disproportionately on vulnerable minority groups. Multivariate logistic regressions found evidence that FI and Race were significant predictors of depression, such that individuals identified as food insecure had a higher likelihood of depression. Race was a significant predictor, such that non-Hispanic Blacks

and Hispanics had a lower likelihood of depression than non-Hispanic Whites. This significance also establishes race/ethnicity as a moderating variable and a possible candidate for future studies. The interaction category, non-Hispanic White and food insecure, was statistically significant. This finding indicates that individuals identified as non-Hispanic White and food insecure were more likely to be identified as depressed than those identified as non-Hispanic White and food secure. Non-Hispanic Blacks and non-Hispanic Asian individuals identified as food secure were also less likely to be depressed than White and food-secure individuals. The interpretations of the findings may form grounds for future studies that include race/ethnicity stressors, discrimination, and health disparities.

The social change significance of these data and the outcome of this study is staggering. There is no shortage of food in the United States, yet the number of food-depressed persons in this nation is a public health concern. The unequal distribution of FI highlighted throughout this study is attributed to many risk factors linked to depression. Addressing these risk factors was a priority in assessing an aging population, but not the most parsimonious. There still needs to be more research, as proven through this study and many years of research done by prominent researchers. For instance, even though rates of FI trend downward, the number of people with food issues is growing, meaning more people are experiencing stressors. The COVID-19 pandemic exacerbates the situation; how it affects some older adults is even more complicated for researchers and requires timely and targeted actions addressing FI and its consequences.

Future research should focus more on a multivariable framework and from an interdisciplinary point of view. This approach will help capture the historical and socioeconomic context of lifelong events influencing comorbid health outcomes of older populations. For instance, this study focuses more on racial and ethnic disparities in health, financial insecurity, and the wealth gap among the older adult subgroups that are problematic. Understanding these social and economic consequences of FI leading to depression will further open the historical discourse on how structural racism and inequality in health and wealth and the long-term effects can be instrumental in the prevalence of FI and the deleterious consequences of depression on older adults. New studies could build on this legacy to strengthen the current findings, especially by including more diverse populations and vulnerable subgroups.

Regarding these social change gaps in research, more updated communication channels need to address older adults' health in the social and historical context of life course events. Advocates for older adults should use communication messaging cues to address and evaluate ageism and other forms of discrimination, including racism, to ensure the participation of older adults in the social, economic, and civic life in the United States. The appropriate political and public conversation on the aging and disease process could contribute to an extra 20 years of productive life events in American society. The contrary could translate into unhealthy productive time and increased social problems more visible in traumatized and vulnerable communities where older adults live.

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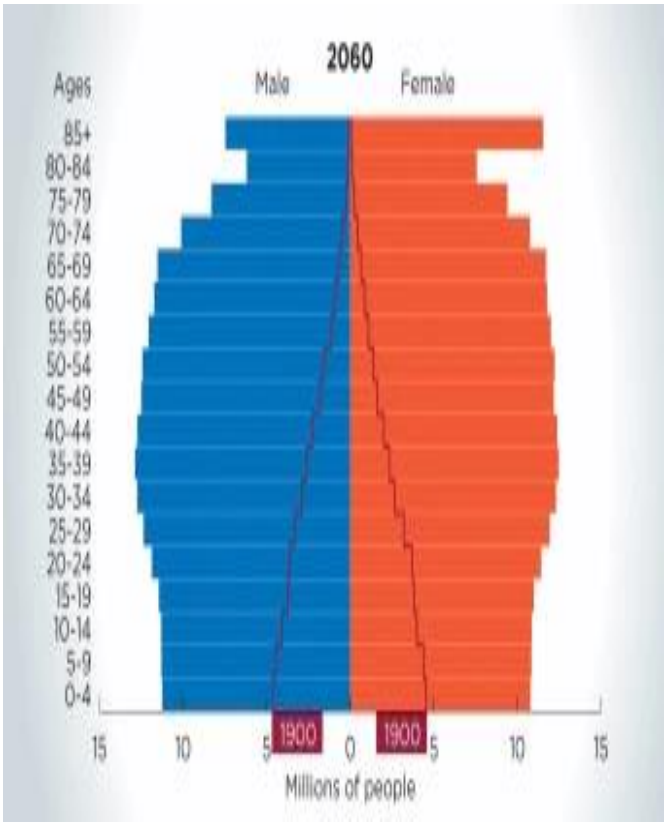
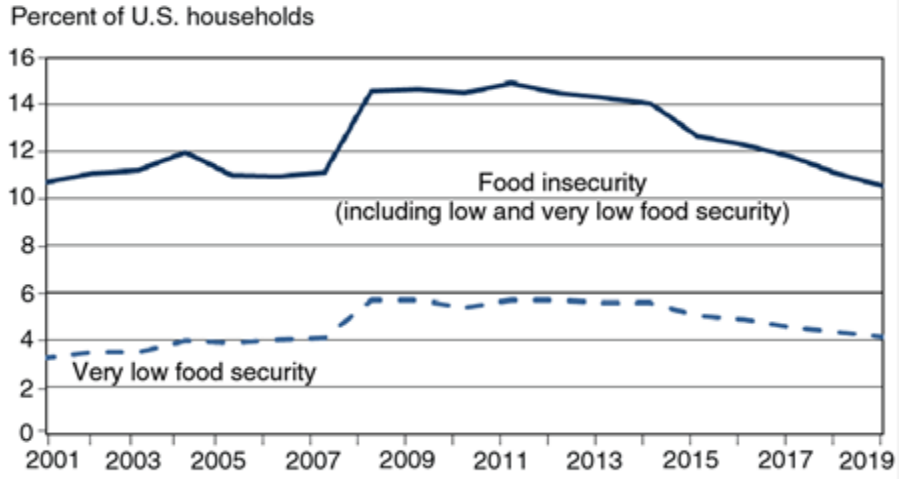
Appendix A: Rectangularization of the U.S. Population 1900–2060



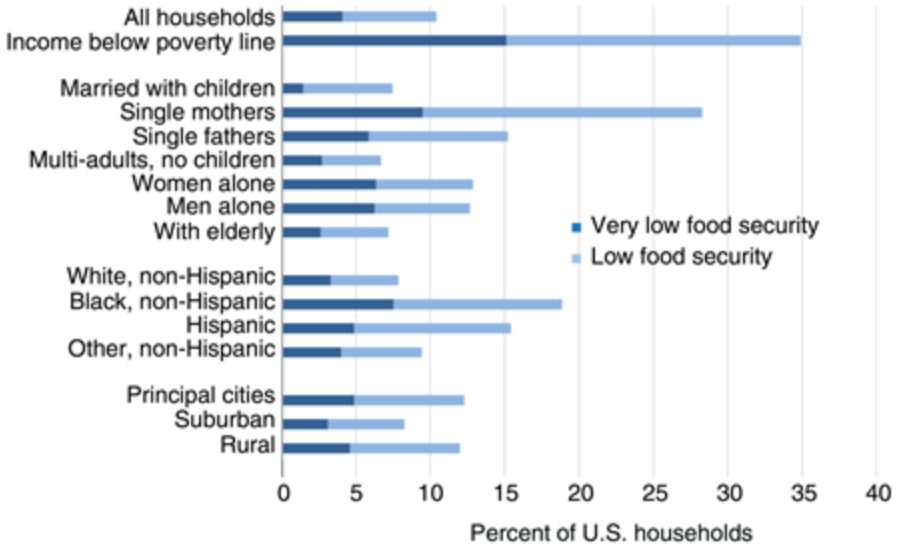
Appendix B: Prevalence of Food Insecurity

Prevalence of food insecurity and very low food security, 2001–2019



Source: USDA, Economic Research Service using data from Current Population Survey Food Security Supplements, U.S. Census Bureau.

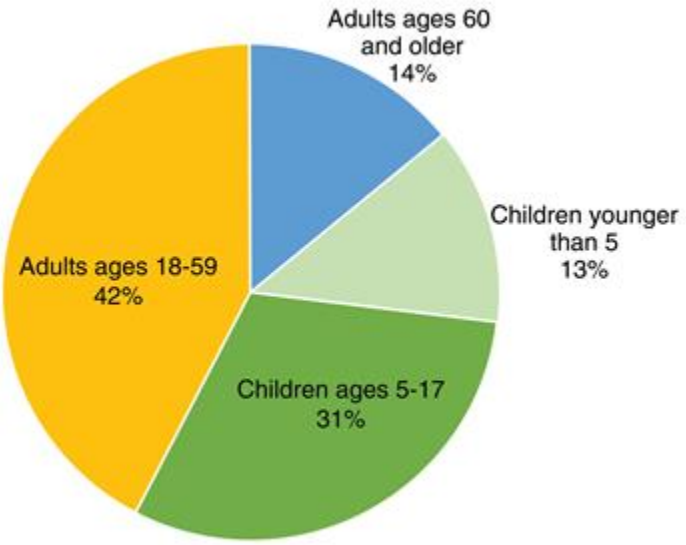
Prevalence of food insecurity by selected household characteristics, 2019



Note: Food-insecure households include those with low food security and very low food security.
Source: USDA, Economic Research Service using data from the 2019 Current Population Survey Food Security Supplement, U.S. Census Bureau.

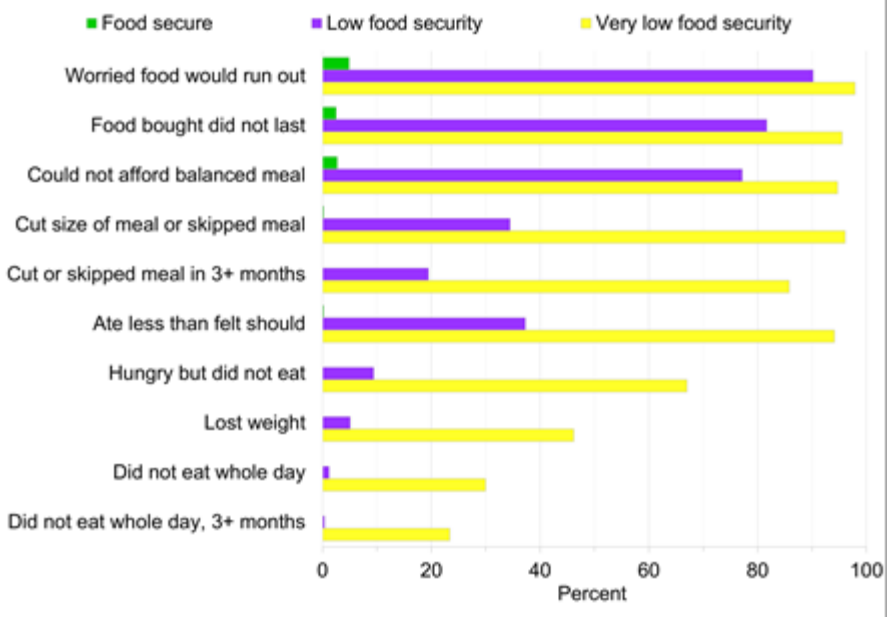
Appendix C: Distribution of SNAP Participants

Distribution of SNAP participants by age, fiscal 2018



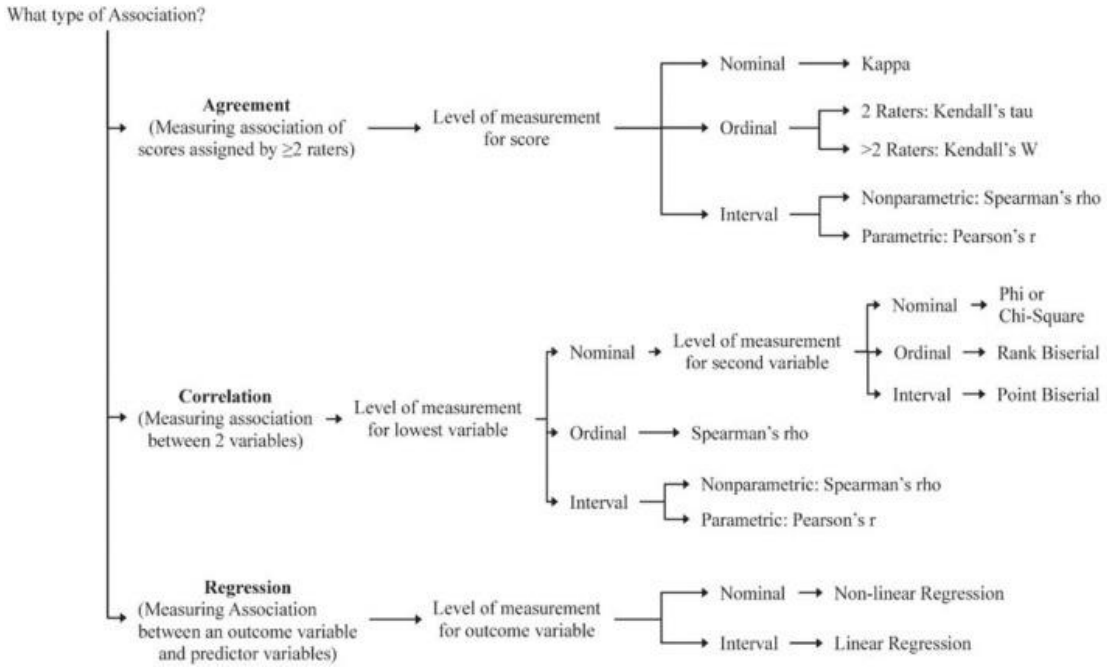
Source: USDA, Economic Research Service using data from USDA, Food and Nutrition Service.

Percentage of households reporting indicators of adult food insecurity, by food security status, 2020



Source: USDA, Economic Research Service, using data from the December 2020 Current Population Survey Food Security Supplement, U.S. Census Bureau.

Appendix D: Decision Tree to Identify Inferential Statistics for an Association



Simpson (2015). https://doi.org/10.4212/cjhp.v68i4.1

Appendix E: Adult-Level Food Security in the Current Population Survey Food Security Supplement

Criteria	Questions	Responses	Scale
1	We worried whether our food would run out before we got money to buy more.	Often, sometimes, or never true	1 2 3
2	The food that we bought just didn't last and we didn't have money to get more.	Often, sometimes, or never true	1 2 3
3	We couldn't afford to eat balanced meals.	Often, sometimes, or never true	1 2 3
4	In the last 12 months, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food?	(Yes=1/No=0)	1 2
5	In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? 5a. (If yes to Question 5) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?	(Yes=1/No=0)	1 2
6	In the last 12 months, were you ever hungry, but didn't eat, because you couldn't afford enough food? (Yes/No) 6a. (If yes to Question 6) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?	(Yes=1/No=0)	1 2
7	In the last 12 months, did you lose weight because you didn't have enough money for food?	(Yes=1/No=0)	1 2
8	In the last 12 months did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food? (Yes/No) 8a. (If yes to Question 8) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months	(Yes=1/No=0)	1 2

Appendix F: SPSS code for MLR(1) RQ1 and RQ2 and MLR (2) RQ3

MLR(1)

```
LOGISTIC REGRESSION VARIABLES Depression_category
 /METHOD=ENTER Food Insecurity category Race ethnicity Income_group
MaritalStatus_recode
 /CONTRAST (FoodInsecurity_category)=Indicator(1)
 /CONTRAST (Race_ethnicity)=Indicator(2)
 /CONTRAST (Income_group)=Indicator(1)
 /CONTRAST (MaritalStatus_recode)=Indicator(1)
 /PRINT=GOODFIT CI(95)
 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

MLR (2)

```
LOGISTIC REGRESSION VARIABLES Depression_category
 /METHOD=ENTER FI_Food_insecurity*Race_White FI_Food_insecurity*Race_Hispanic
 FI_Food_insecurity*Race_Black FI_Food_insecurity*Race_Asian
FI_Food_insecurity*Race_Others
 FS_Foodsecure*Race_Hispanic FS_Foodsecure*Race_Black FS_Foodsecure*Race_Asian
 FS_Foodsecure*Race_Others FI_Food_insecurity*FS_Foodsecure Income_group Race_ethnicity
 FoodInsecurity_category MaritalStatus_recode
 /CONTRAST (Race_White)=Indicator(1)
 /CONTRAST (FI_Food_insecurity)=Indicator(1)
 /CONTRAST (Race_Hispanic)=Indicator(1)
 /CONTRAST (Race_Black)=Indicator(1)
 /CONTRAST (Race_Asian)=Indicator(1)
 /CONTRAST (Race_Others)=Indicator(1)
 /CONTRAST (FS_Foodsecure)=Indicator(1)
 /CONTRAST (Income_group)=Indicator(1)
 /CONTRAST (Race_ethnicity)=Indicator(1)
 /CONTRAST (FoodInsecurity_category)=Indicator(1)
 /CONTRAST (MaritalStatus_recode)=Indicator(1)
 /PRINT=GOODFIT CI(95)
 /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Appendix G: Individual Levels of the SEM framework