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MEASURING THE IMPACT OF REGIONAL PRICE DISPARITIES ON FOOD INSECURITY RISK

by

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March 2023

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This thesis analyzes the risk of food insecurity among active-duty servicemembers and evaluates current policies intended to reduce the high rate of food insecurity reported among servicemembers and their families. The newly implemented Basic Needs Allowance (BNA) provides economic assistance to active-duty families with household income below 150 percent of the Federal Poverty Level (FPL), but I find that less than one percent of the Department of Defense population is eligible for assistance rendering the allowance ineffective in reducing the rate of food insecurity among servicemembers. Among comparable civilian households, there is no abrupt decline in food insecurity rates at 150 percent of the FPL. Furthermore, the likelihood of experiencing food insecurity is 16 percentage points higher in high-cost areas compared to low-cost areas, indicating a relationship between purchasing power and the rate of food insecurity. Based on this analysis, servicemembers with income below 200 percent of the FPL are sensitive to regional price differences, putting junior servicemembers in high-cost areas at an increased risk for food insecurity.

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MEASURING THE IMPACT OF REGIONAL PRICE DISPARITIES ON FOOD INSECURITY RISK

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Submitted in partial fulfillment of the
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ABSTRACT

This thesis analyzes the risk of food insecurity among active-duty servicemembers and evaluates current policies intended to reduce the high rate of food insecurity reported among servicemembers and their families. The newly implemented Basic Needs Allowance (BNA) provides economic assistance to active-duty families with household income below 150 percent of the Federal Poverty Level (FPL), but I find that less than one percent of the Department of Defense population is eligible for assistance rendering the allowance ineffective in reducing the rate of food insecurity among servicemembers. Among comparable civilian households, there is no abrupt decline in food insecurity rates at 150 percent of the FPL. Furthermore, the likelihood of experiencing food insecurity is 16 percentage points higher in high-cost areas compared to low-cost areas, indicating a relationship between purchasing power and the rate of food insecurity. Based on this analysis, servicemembers with income below 200 percent of the FPL are sensitive to regional price differences, putting junior servicemembers in high-cost areas at an increased risk for food insecurity.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADSS	Active-Duty Spouse Survey
BEA	Bureau of Economic Analysis
BAH	Basic Allowance for Housing
BAS	Basic Allowance for Subsistence
BNA	Basic Needs Allowance
COLA	Cost of Living Allowance
CPS-FSS	Current Population Survey–Food Security Supplement
DMDC	Defense Manpower Data Center
DOD	Department of Defense
ERS	Economic Research Service
FIPS	Federal Information Processing Standard
FPL	Federal Poverty Level
MSA	Metropolitan Statistical Area
NDAA	National Defense Authorization Act
RMC	Regular Military Compensation
RPP	Regional Price Parity
SNAP	Supplemental Nutrition Assistance Program
SOFS-A	Status of Forces Survey, Active-Duty
TFP	Thrifty Food Plan
USDA	United States Department of Agriculture

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I. INTRODUCTION

A. OVERVIEW

In March 2021, Secretary of Defense Lloyd Austin released his top priorities for the Department of Defense, with "taking care of our people" listed as the second item on his three-part agenda (Austin, 2021). In his message to the force, Secretary Austin emphasizes that support will always be provided to ensure the safety, health, and welfare of servicemembers and their families. As part of this line of effort, the Department of Defense is battling to decrease food insecurity among active-duty service members as it poses a risk to the readiness and well-being of military personnel. Both the Status of Forces Survey for Active Duty (SOFS-A) and Active-Duty Spouse Survey (ADSS) highlight higher than average rates of food insecurity, particularly among junior service members. This issue is exacerbated by the economic effects of the COVID-19 pandemic and recent inflation driving up cost-of-living across the country. In a memorandum released by Gilbert Cisneros Jr., the Under Secretary of Defense for Personnel and Readiness (OUSD P&R), the Department of Defense is focusing on six lines of effort to reduce food insecurity among active-duty troops: increase access to healthy food, enhance spouse economic opportunities, review service member pay and benefits, reinforce financial resources and awareness, encourage service members and families to seek available resources, and expand data collections and reporting (OUSD P&R, 2022).

Individuals and families across the country are struggling to keep pace with the rising cost of living. The Bureau of Labor Statistics reports that prices for food at home increased almost 14 percent in 2022, the largest yearly increase since 1979 (United States Department of Labor, 2022). Similarly, the United States Department of Agriculture (USDA) predicts that the rise in food prices at home will continue in 2023 with an expected increase between three and four percent (Economic Research Service, 2022). These increases are not the same across the country, with some regions experiencing higher price increases and general inflation than others. Furthermore, geographic differences in inflation and cost of living are not limited to just food. Prices for childcare, transportation, utilities, and housing have all increased dramatically and vary widely across and within

states. This variation in the cost of living impacts the real value of service member compensation and creates inequalities dependent on where a service member is assigned. Although civilian incomes vary based on geography and local economic factors, a servicemember's base salary and subsistence allowance is fixed with a single regional adjustment for housing allowances if a member lives off post.

B. PURPOSE OF STUDY

The purpose of this thesis is to analyze the correlation between regional price differences and food insecurity among active-duty service members. Furthermore, it seeks to better understand who may be at risk for food insecurity and why the issue persists in the Department of Defense by examining where benefits may fall short of supporting economic security among our service members.

Servicemember pay and benefits were most recently reviewed in the Thirteenth Quadrennial Review of Military Compensation conducted from 2018-2020. In the review, researchers found that regular military compensation still compares favorably to the 70th percentile of civilian wages, which was determined to be the benchmark needed to recruit and retain quality service members (Pentagon, 2020). Despite these findings, a higher rate of reported food insecurity persists among service members compared to the national rate, indicating a perceived lack of economic security. As the Department of Defense struggles with recruiting and retaining qualified members, this issue potentially reduces the ability to retain service members who feel as if their compensation does not allow them to meet their basic needs. My thesis reviews service member pay and benefits, adjusting for regional price disparities to analyze the risk of food insecurity and the effectiveness of allowances such as Basic Allowance for Subsistence and the most recently introduced Basic Needs Allowance.

C. RESEARCH QUESTIONS

My thesis addresses the following research questions related to food insecurity and service member compensation:

- How does the Department of Defense categorize those at risk for food insecurity?
- What is the difference in the prevalence of food insecurity between high and low-cost metropolitan areas, and which servicemembers are impacted by the factors of this difference?
- How do regional price disparities impact real value of servicemember allowances and effectiveness of the Basic Needs Allowance?

D. SCOPE AND METHODOLOGY

This thesis uses panel data on service members that includes demographic and pay information from 2016-2021 to analyze benefits and force composition. The scope of analysis on the active-duty population is limited to the service members income and does not estimate any spousal income. In absence of nationally representative data on food insecurity among servicemembers, I use data on civilians from the Current Population Survey-Food Security Supplement (CPS-FSS) as a proxy for analysis. Using Regional Price Parities (RPPs) for goods calculated annually by the Bureau of Economic Analysis (BEA), I estimate local costs-of-living. I then use reported food insecurity status and household income from the CPS-FSS to measure rates of food insecurity among households at various levels of the Federal Poverty Level (FPL) in high, mid, and low cost-of-living areas. Finally, I observe service members at their first duty station and track the transition to their subsequent duty station or end of active service to analyze the suitability of the Cost of Living Allowance.

E. FINDINGS

By analyzing pay and demographic data, I find only 0.4 percent of servicemembers have household income below 150 percent of the FPL including their basic allowance for housing. Meanwhile, the rate of marginal, low, and very low food insecurity among comparable civilian households at 150 percent of the FPL is approximately 30 percent in low-cost areas. This rate increases by 16 percentage points for households at the same poverty level living in high-cost metropolitan areas. As such, my findings suggest that

servicemembers whose household income is below 200 percent of the FPL and living in metropolitan statistical areas with a BEA regional price index above 108 percent are more likely to report food insecurity than those at similar income levels who are living in lower-priced areas. Servicemembers with the rank E5 or below make up 92 percent of the DOD population with household income below 200 percent of the FPL. Figure 1 depicts the disproportionate rate of reported food insecurity between high and low-cost metropolitan areas among comparable civilian households in 2021.

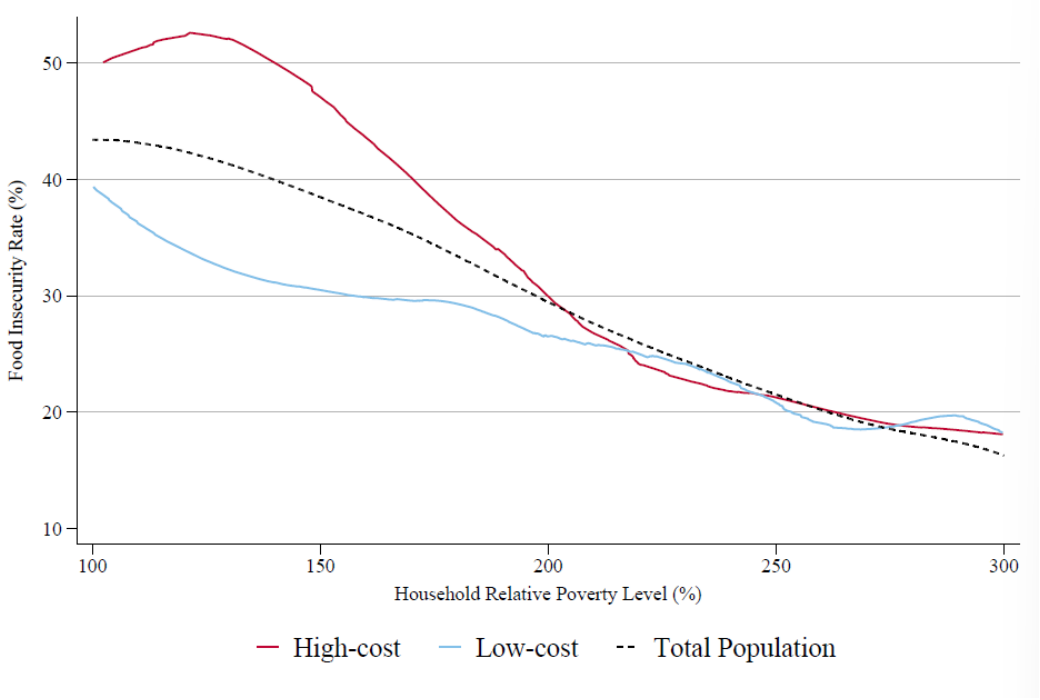

Figure 1. Marginal, Low, and Very Low Rates of Food Insecurity by Household Poverty Level in 2021.

The disparity of food insecurity between high and low-cost areas is correlated with a reduction in purchasing power of their household income captured by analyzing the impact of regional price parities that measure local costs of living. Fixed allowances such as the Basic Allowance for Subsistence have a lower value in high-cost areas such as Seattle, Washington when compared to the allowance in Clarksville, Tennessee which is a low-cost area. Furthermore, approximately 15.5 percent of service members living in low

or mid-cost metropolitan areas were subsequently assigned to high-cost metropolitan areas after their first duty station. These individuals and families are likely to report food insecurity as the purchasing power of their base pay and allowances, excluding housing allowance, decreased relative to their last duty station. In summary, my thesis indicates that current allowance policies are ineffective at supporting economic security or reducing the rate of food insecurity among our service members and their families.

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II. BACKGROUND AND LITERATURE REVIEW

A. BACKGROUND

In this chapter, I review existing research on food insecurity, including studies that assess its prevalence and identify contributing factors. I examine individual effects of food insecurity and the effectiveness of food assistance programs and Department of Defense policies on improving outcomes and reducing frequency. This chapter also examines three key studies focusing exclusively on measuring food insecurity among active-duty service members.

The United States Department of Agriculture is the leading federal agency responsible for overseeing the Food and Nutrition Service program. It monitors food security through annual surveys conducted by the department's Economic Research Service. The 2021 United States Household Food Security report identified 10.2 percent of households, or approximately 13.5 million households, as food insecure and struggling to obtain enough high-quality food to support a healthy and active lifestyle (Coleman-Jensen et al, 2021). The USDA defines food insecurity on a scale from high to very low food security. These definitions are used throughout the analysis and are identified in Table 1.

Table 1. Characterization of Food Security Status. Source: United States Department of Agriculture, Economic Research Service (2022).

Category	Characterization	Definition
Food Secure	High Food Security	Households had no problems, or anxiety about, consistently accessing adequate food.
	Marginal Food Security	Households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced.
Food Insecure	Low Food Security	Households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted.
	Very Low Food Security	At times during the year, eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food.

B. STUDIES ON FOOD INSECURITY

A large amount of literature has studied the measurement of food insecurity and its key determinants. The most widely referenced study is the annual Household Food Security report which uses the 18 item Household Food Security Survey Module to measure and assess food insecurity. This module was added to the Current Population Survey in 1995, making it the most comprehensive and nationally representative data set on the topic (Committee on National Statistics, 2006). Figure 2 depicts food insecurity rates calculated by the Household Food Security report over the last 20 years. In 2001, just over 10 percent of households reported food insecurity. Food insecurity peaked at roughly 14.9 percent in 2011 and has steadily declined since, with an estimated prevalence of 10.2 percent in 2021.

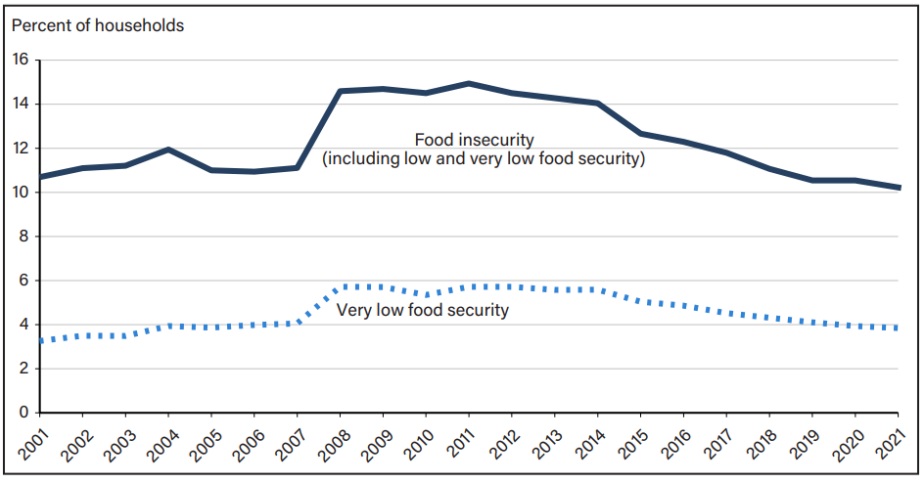

Figure 2. Trends in the Prevalence of Food Insecurity and Very Low Food Security in U.S. households, 2001-21. Source: USDA, Economic Research Service (2021).

While food insecurity rates have generally been decreasing, the recent inflation crisis and the economic impact of the COVID-19 pandemic have made it difficult to produce and transport goods, putting further strain on the economy (Global Food Banking Network, 2022). This summary of current research on food insecurity measures and prevalence suggests that as unemployment and inflation rise, we can expect to see higher rates of food insecurity suggesting a strong correlation between the country's economic health and food security status.

In addition to studies measuring prevalence, there is a large body of research that analyzes the determinants of food insecurity. Specifically, households with children, particularly those with children under the age of 6, as well as single parents, single women, minority households, and households with income below 185 percent of the poverty line are more likely to experience food insecurity than the national average (Coleman-Jensen et al. 2021; Balistreri, 2016). Geography also plays a large role in determining a household's risk for food insecurity (Coleman-Jensen et al. 2021; Bonanno and Li 2015; Gundersen and Ziliak 2017; Gundersen 2021). As depicted in Figure 3, food insecurity rates differ significantly across counties with a high prevalence of food insecurity in the south and southwest regions where the median income is lower than the national average.

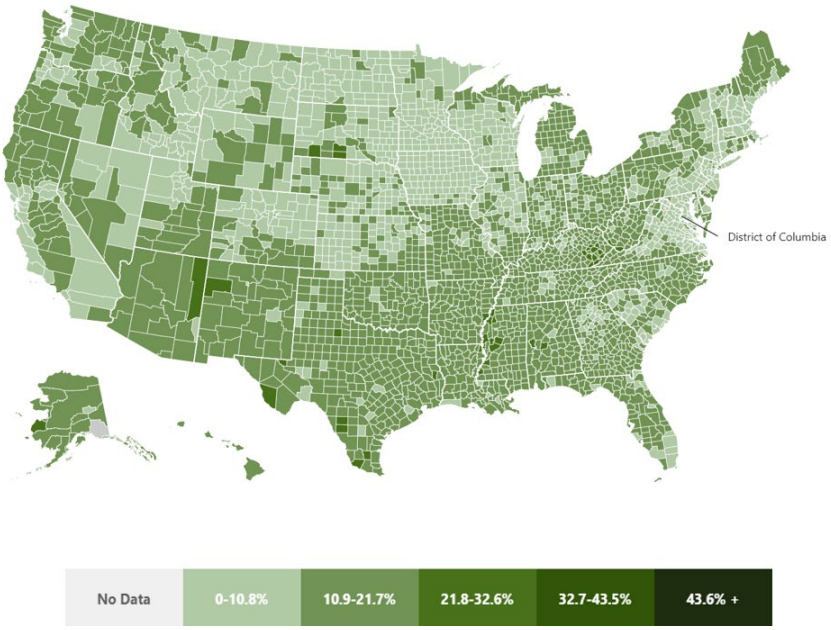

Figure 3. Food Insecurity Rates by County. Source: Map the Meal Gap (2020).

The 2021 Household Food Security report and a 2015 study assessing food insecurity and access in metropolitan areas both found that households in principle cities, which is the largest city in a metropolitan area, and households in rural areas report food insecurity at higher rates than the national average (Coleman-Jensen et al. 2021; Bonanno and Li 2015). As expected, high cost of living areas such as principal cities have higher food prices which drive up rates of food insecurity. In one USDA study examining the effect of local food prices on food insecurity among SNAP participating households, researchers found that a $10 increase in the food basket cost resulted in a significantly higher prevalence of food insecurity (Gregory and Coleman-Jensen 2014). The food basket costs represent the dollar value of a nutritionally balanced diet purchased at local grocery stores and areas with higher food prices for these baskets have significantly higher rates of food insecurity among households at 200 percent or less than the poverty line.

Similarly, in rural or non-Metropolitan areas where food insecurity is more prevalent, lower income and limited access to food are the main contributors to the higher rates of food insecurity. In a 2009 report to Congress, the Department of Agriculture reported that 6 percent of households were located in food deserts and did not have

sufficient quantity or quality of food due to access-related problems (Ver Poeg et. al, 2009). Food deserts are defined as low-income areas with minimal access to healthy or affordable due to a lack of supermarkets or grocery stores in the area, as well as a lack of transportation options that make it difficult for people to access stores that sell healthy food (Dutko et. al, 2012). While many studies recommend increasing the number of grocery stores in food deserts as a solution for reducing food insecurity, a 2019 study on food deserts and nutritional inequality used counterfactual simulations to counter this argument. The researchers found that providing low-income households with access to the same products and prices as high-income households has only a minor impact on reducing nutritional inequality and the primary driver is due to variations in demand, challenging the notion that increasing the supply of healthy groceries would significantly contribute to reducing nutritional inequality (Alcott et. al, pg. 1798, 2019). The authors point out that their results indicate that conventional supply-focused measures aimed at getting rid of food deserts are likely to have limited impact on promoting healthy eating in disadvantaged communities. In a similar report by the Brookings Institute in 2021, the authors suggest that instead of strategies and programs intended to increase access, policymakers should focus on increasing equality of assistance benefits across geographic regions in order to reduce food insecurity (George and Tomer, 2021). As we consider policies for decreasing food insecurity among active-duty servicemembers, solely focusing on expanding funding and supply at commissaries on base may not be the right approach in reducing food insecurity for those who are economically disadvantaged. Instead, DOD policymakers should consider a comprehensive examination of current compensation policies to ensure equality of benefits and allowances that are impacted by geographic price variations.

C. POTENTIAL EFFECTS OF FOOD INSECURITY

Given the considerable number of individuals and families reporting food insecurity, it is important to examine the potential effects of food insecurity on the physical and mental health of those individuals. Many studies find a significant correlation between food insecurity and various negative health effects (Seligman et al 2010; Vozoris and Tarasuk 2003; Lee and Frongillio 2001). One of the main conclusions of Gunderson and Ziliak's 2015 comprehensive review of these studies is the need to control for confounding

factors, such as income and access to medical care. This is crucial in studies that analyze the health effects of food insecurity because many of the factors that determine food insecurity, such as poverty and lack of access to healthy food, also affect health. In a 2009 study examining the association between chronic disease and food insecurity, researchers used a Poisson regression to analyze self-reported food security status using the Adult Food Security Survey Module and self-reported or clinical diagnosis of hypertension, high cholesterol, or diabetes. Their analysis found a strong association between food insecurity and chronic diseases such as hypertension and diabetes among adults under the age of 65 with household incomes below 200 percent of the federal poverty level (Seligman et. al, 2010).

Among the more recent studies specifically examining relationships between food insecurity and mental health outcomes, the primary associations found were depression, anxiety, and sleep disorders (Reeder et al. 2022; Beymer et.al 2021; Arenas et. al 2020). Reeder's study on the association between food insecurity and depression uses self-reported mental health responses from the National Health and Nutrition Examination Survey and found a strong statistical difference in the prevalence of depression across different levels of food security. Only five percent of adults who were food secure experienced depression, compared to 15 percent and 26 percent of adults in the low and very low food security categories, respectively (Reeder et. al 2022). The study finding of a statistically significant correlation between food insecurity and depression asserts that individuals or families who are struggling to afford basic necessities such as food, shelter, and transportation may experience negative mental health effects. A shortcoming of this conclusion is that there are many omitted factors correlated with mental and physical health which are positively correlated with food insecurity, resulting in positively biased findings.

With a growing number of individuals and families experiencing food insecurity, individual and tax-funded healthcare costs associated with the condition grow as well. An examination of healthcare costs associated with food insecurity using the National Health Interview Survey and Medical Expenditure Panel Survey data from 2011-2013 estimated $52.9 billion dollars spent on healthcare expenditures related to food insecurity (Berkowitz et. al, 2019). Figure 4 shows the disparities in healthcare expenditures associated with food

insecurity from this study. As expected, the areas with high rates of food insecurity are spending the most money to combat health issues.

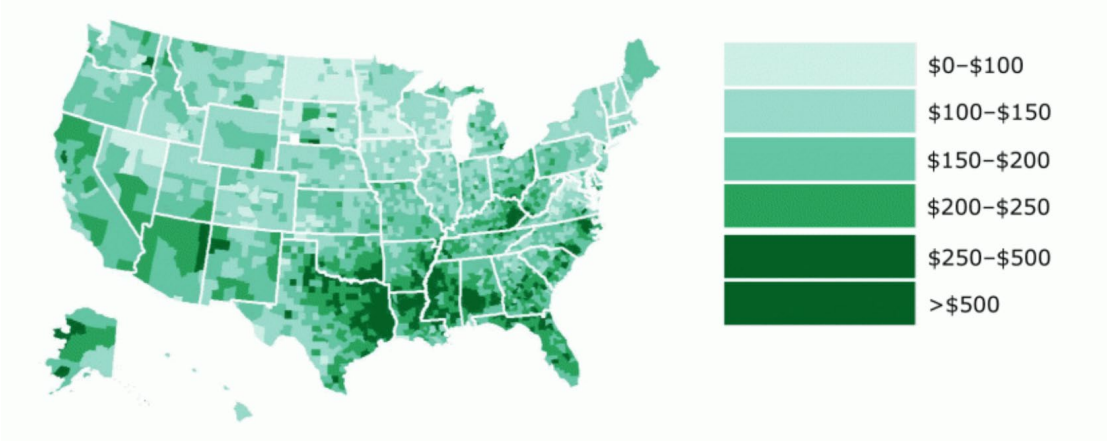

Figure 4. Per Capita Health Care Costs Associated with Food Insecurity by County, 2012–2013. Source: Berkowitz et. al. (2019).

The current body of research signifies that food insecurity can be linked to far-reaching and long-term negative effects on physical and mental health and result in excess personal and federal spending on healthcare. Moreover, addressing food insecurity among active-duty military members can result in cost savings for the military and taxpayers. When service members and their families have access to nutritious food, they are less likely to experience health problems that require medical treatment or result in lost productivity. This can result in cost savings for the military and reduce the burden on the healthcare system.

D. FEDERAL ASSISTANCE PROGRAMS AND POLICIES

There are a number of federal and state level assistance programs designed to provide support to families and individuals experiencing economic hardship. SNAP and SNAP for Women Infants and Children (WIC) are the two largest programs with a federal budget of $111 billion in 2021 (Center on Budget and Policy Priorities, 2022). According to the USDA, families qualify for SNAP if their total income before taxes is below 130 percent of the FPL. However, some states have adopted a broad-based categorical

eligibility policy in which a household can qualify for SNAP if they are eligible for their state's Temporary Assistance for Needy Families program (USDA, 2023). The program income limits are set by individual states and fall between 130 and 200 percent of the FPL. The Federal Poverty Level is the same in every state in the United States, except Alaska and Hawaii, and varies only by number of family members despite significant differences in costs of living. It represents an absolute standard measure of income needed to meet basic needs such as food, shelter, and clothing. Originally set at three times the cost of an economic food plan in 1963, the FPL is adjusted annually by the Census Bureau for inflation. Several studies on the measurement of poverty agree that the official poverty measure is outdated and does not accurately capture households that are unable to afford basic necessities yet do not qualify for assistance programs (Haider 2020; A.L.I.C.E 2018; Kaverman 2020; Brady 2003). These studies argue that the measurement should be relative rather than absolute. A relative poverty line would be more appropriate for calculating assistance benefits considering the variation in regional costs of living, inflation, and other factors that affect family expenses. This would ensure that the poverty line accurately reflects the economic situation of families and that assistance programs are effectively targeted to those in need.

The maximum SNAP benefit is indexed off the USDA's Thrifty Food Plan which uses a mathematical model based on the national average cost of food and other factors to determine the expenses of purchasing nutritious food items which are budget-friendly and support healthy eating habits for a given family size (USDA Food and Nutrition Service, 2022). A recent increase in SNAP has helped close the gap between SNAP benefits and meal costs, however, in 21 percent of counties, the maximum benefit still does not cover the cost of meals (Urban Institute, 2021). Figure 5 shows the gap between maximum meal benefit and meal costs from Map the Gap data after the 2021 program benefits increase. Despite the availability of federal assistance programs such as SNAP and WIC designed to help decrease rates of food insecurity, the Center for Naval Analysis estimates only between 0.08-0.1 percent of service members were enrolled between May and August of 2019 (Golfin et. al, 2020).

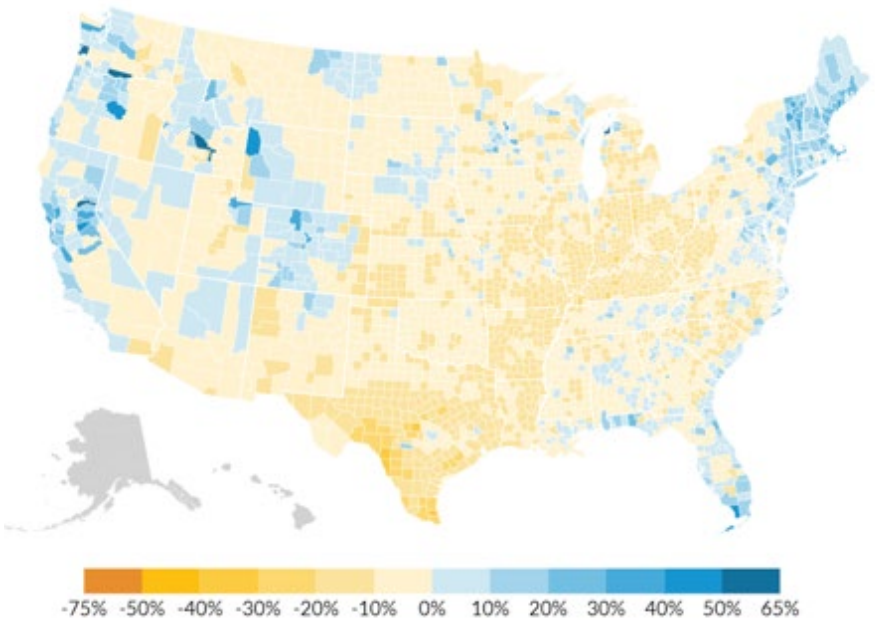

Figure 5. Gap between Maximum SNAP Benefit and Meal. Source: Urban Institute (2021).

The 2022 National Defense Authorization Act (NDAA) established the Basic Needs Allowance (BNA) for eligible members whose gross household income is less than 130 percent of the FPL (S.1605, 2021). This allowance allocates additional pay to servicemembers on a monthly basis in order to raise their household income equal to 130 percent of the poverty level. Upon approval of the 2023 NDAA, policymakers increased the maximum allowable income for BNA to 150 percent of the FPL to be enacted no later than January 2024 (H.R.7776, 2022). The first payments of BNA are expected to be disbursed in fiscal year 2023 so analysis on utilization and impact of the allowance has not occurred. While the BNA has fewer qualification restrictions than the SNAP program, it restricts financial benefits to families with gross income below 150 percent of the FPL.

The corresponding Title 37 of U.S Code stipulates that the Secretary can make a determination to exclude any portion of the basic allowance for housing (BAH) from household income for servicemembers who reside in areas with high cost-of-living (37 USC § 402b, 2022). No further detail is provided to specify which areas are considered high-cost of living. As of 2023, only seven military housing areas receive a cost-of-living

allowance (COLA) to help offset expenses for those servicemembers stationed in high cost-of-living areas as determined by the Department of Defense. The objective of the COLA policy for servicemembers residing in the United States is not to maintain purchasing power at any given duty station but instead to distribute equal purchasing power over their career (Directorate of Military Compensation Policy, Allowances Branch; n.d.) It was designed to offset higher prices in areas 8 percent more expensive than the average U.S. city. Policymakers set the threshold for COLA allowance no lower than 108 percent in Title 37 of the United States Code, despite a recommendation by the 7th Quadrennial Review of Military Compensation suggesting a threshold of 105 percent (Pentagon, 1993). A significant assumption of this policy is that over a servicemember's career, they are stationed in a variety of high, mid, and low-cost areas. However, this is not guaranteed and while servicemembers can voice their preferences, ultimately the needs of the service outweigh personal preferences. Furthermore, a large proportion of service members only execute one enlistment term between four and five years of service. Many of these servicemembers never execute a permanent change of station and remain at their duty station until the end of active service. A servicemember living in a high-cost area serving only one enlistment term would not have their purchasing power distributed equally.

In summary, individuals and households that rely on assistance are not receiving equal benefits due to regional price disparities. A report by the Congressional Research Service highlights the flaws of assistance programs noting that the thresholds used for program qualification are indexed and updated based on national inflation, not on geographic indices despite differences in costs of living across states and metropolitan areas (Weinstock 2022). This thesis will contribute to the existing literature on this topic by analyzing the impact of regional price disparities on current DOD program benefits to examine if they are effectively providing equal assistance to those in need.

E. FOOD INSECURITY AMONG ACTIVE-DUTY SERVICE MEMBERS

Limited research examines the prevalence of food insecurity among service members. One reason is that the Department of Defense has not made comprehensive data available for study which makes it difficult to analyze the prevalence of food insecurity in

the military population. A 2022 Center for Strategic and International Studies brief identified the extent of food insecurity, current assistance programs utilized by service members and their limitations, and challenges specific to military life. The main determinants found to put military families at higher risk than civilian counterparts are frequent moves resulting in higher rates of spousal unemployment, lack of access to childcare, and ineligibility for federal assistance programs because Basic Allowance for Housing is calculated as earned income. Moreover, the report maintains that food insecurity not only has a negative effect on individual service members and their families, but also negatively affects defense readiness, recruitment, and retention.

The 2020 SOFS-A and the 2021 ADSS estimate that 25 percent of service members experienced food insecurity. The rate of food insecurity is higher among military personnel who have certain characteristics, such as being junior enlisted (E1-E4), enlisted in the Army or Navy, part of a minority group, living in households with children, having an unemployed spouse, being unmarried, or living on base (ADSS, 2021; SOFS-A, 2020). Service members who are financially unstable were more likely to report food insecurity, further confirming the strong connection between economic stability and food insecurity. The Active-Duty Spouse Survey found slightly higher rates of food insecurity in the Pacific West and South-West, and South-Central areas but did not investigate food insecurity at the county level or trends among specific military bases.

Similar results were found among independent studies with marginal food insecurity estimates between 17 and 33 percent (Rabbitt et. al, 2022; Wax and Stankorb, 2016; Beymer et. al 2021). Two of these studies, Rabbitt et. al 2022 and Beymer et. al 2021, say that the projections should be viewed as the highest potential likelihood of marginal food insecurity among active-duty servicemembers considering the demographic characteristics of the participants who were mainly junior enlisted. Furthermore, these studies used the two-item screener from the Household Food Security Survey Model also known as The Hunger Vital Sign, which is an efficient and valid way of identifying those who are food insecure but omits questions about child food security and limits the researcher's ability to examine differences among marginal, low, and very low food insecurity (Rabbitt et. al, 2022).

While the current economic crisis affects all Americans, service members have the option to shop at the commissary and exchanges on military installations that offer savings exclusively to members of the military community. Yet these savings may not be enough to help increase economic stability as many service members choose not to utilize this resource due to the quality or availability of certain goods. In a recent study by the Government Accountability Office (GAO), annual commissary sales have steadily fallen from around $6 billion in 2015 to $4.4 billion in 2021 with just under two million out of the eight million eligible patrons utilizing the commissary annually (GAO, 2022). This indicates that the military communities' preferences are changing and may be just as sensitive to local price variations and inflation as their civilian counterparts. The study also notes that the Defense Commissary Agency's global customer savings target is 23.7, yet the savings rate in the continental United States is just 17.1 across the six regions, excluding Hawaii and Alaska.

As noted by the CSIS report on solving food insecurity among military families, surveys suggest that individuals in certain locations report higher rates of food insecurity, but more evidence is needed to determine how regional differences may impact food insecurity (Lutz and Welsh, 2022). This thesis contributes to the existing body of literature on military food insecurity by examining regional price disparities and their impact on real income and military allowances. It also measures rates of food insecurity by cost-of-living metropolitan areas, evaluating service members who may be at an increased risk of food security. Finally, it will illustrate the impact of regional adjustment to servicemember's Basic Allowance for Subsistence and propose improvements to the Basic Needs Allowance and Cost-of-Living Allowance policy.

III. DATA AND METHODOLOGY

A. DATA

Data on servicemembers is from the Defense Manpower Data Center (DMDC) and includes demographic and pay information from 2016 to 2021. I merge the DMDC data with Defense Enrollment Eligibility Reporting System data which provides additional information on service member's family status including age and number of dependents. Servicemembers gross monthly income is calculated by aggregating basic pay, BAS, Basic Allowance for Housing (BAH), and special pay before taxes. After calculating income and family size, I create three binary variables to categorize each servicemember relative to the federal poverty line: 1) at or below 130 percent of the federal poverty line 2) at or below 150 percent of the federal poverty line and 3) at or below 185 percent of the FPL. Federal poverty guidelines are issued annually by the Department of Health and Human Services. A limitation of this data is that spousal employment is unreported. This analysis does not forecast any spousal income and instead focuses on known income of the servicemember.

Data on civilian household food security is from the Current Population Survey-Food Security Supplement (CPS-FSS) from 2016-2021. As noted earlier, this is the most comprehensive source of national and state-level data on food insecurity. To estimate reasonable comparisons between service members and civilians, I limit observations in the CPS-FSS data to employed individuals above 100 percent of the FPL who have attained at least a high-school degree or more between the age of 17 and 55. Key variables used from this data set are age, education, employment status, relative poverty level, food security status, and total household income. Relative poverty levels are calculated in a similar fashion to servicemembers, however, reported total family income is used. A limitation of this data set is that food security status and household income are self-reported which may result in lower estimates of food security and higher estimates of household income. This is because of the stigma surrounding financial hardship, individuals may be less inclined to report financial and economic struggles. A summary table of both populations in 2021 is shown in Table 2.

Table 2. Summary of Data Descriptive Statistics. Adapted from U.S. Census Bureau (2021).

Summary Statistics

	Civilian		DOD	
Male	6,309	52.79%	795,340	82.82%
Female	5,643	47.21%	165,000	17.18%
Married	6,012	50.30%	513,407	53.46%
High School Degree	4,006	33.52%	623,757	64.95%
Some college	1,938	16.21%	119,453	12.44%
Bachelor's+	6,008	50.27%	217,130	22.61%
White	9,501	79.49%	540,910	56.32%
Black	1,236	10.34%	162,827	16.96%
Other	1,215	10.17%	256,603	26.72%
Mean Age	38.32	(9.16)	28.79	(7.48)
Mean Household Size	2.70	(1.47)	2.26	(1.50)
Mean # of Children	0.96	(1.18)	0.78	(1.18)
Mean Poverty Level	4.69	(2.88)	3.76	(1.70)
Observations	11,952		960,340	

To determine the location of both service members and civilians to make a proper comparison, I utilize the metropolitan area Federal Information Processing Standard (FIPS) code, called METFIPS which represents individual Metropolitan Statistical Areas (MSA) delineated by the Office of Management and Budget. An MSA consists of a central region with a significant population center and neighboring communities that have strong economic and social connections to the core area (Office of Manpower and Budget, 2021). While the DMDC data provides county FIPS codes for 97 percent of service members, the CPS-FSS excludes 55 percent of county FIPS codes to prevent the identification of respondents in smaller counties. The DMDC data does not include METFIPS identifier so I utilized the servicemember's assigned duty zip code to assign the appropriate METFIPS code.

I define high cost of living states and metropolitan areas using the Bureau of Economic Analysis (BEA) regional price parities for goods. Regional price parities gauge the variances in cost of living among all states relative to the national average. The BEA defines the goods category to include "apparel, education, food, medical, recreation, transportation, and other goods" (Bureau of Economic Analysis, 2022). I define the high cost-of-living metropolitan areas as those with a regional price parity greater than or equal to 108. This encompasses the top ten percent of high cost-of-living metropolitan areas. The distribution of observations by regional price parity in both the DOD and CPS-FSS datasets are shown in Figure 6. I find a similar distribution of households between high and low-cost areas between the two populations.

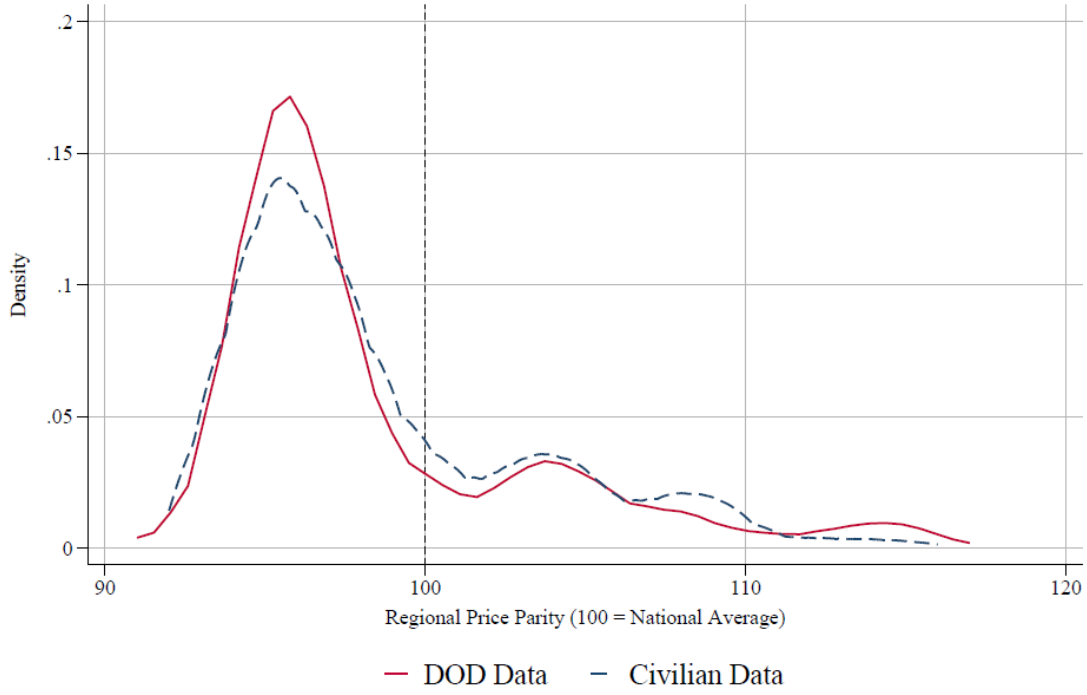

Figure 6. Distribution of Observations by Regional Price Parity Index

Finally, to measure food insecurity in the CPS-FSS dataset, I create a binary variable for food insecurity equal to one if the respondent is categorized as low or very low food secure. For a detailed examination of food insecurity rates, I also create a binary food

security variable to assess marginal food insecurity equal to one if the respondent is categorized as marginal, low, or very low food insecure in the CPS variable for detailed food security status.

B. METHODOLOGY

To address how the Department of Defense currently identifies those at risk for food insecurity, I analyze recent policy decisions to include the Strategy and Roadmap for Strengthening Food Security in the Force and the 2023 National Defense Authorization Act. Using DMDC data, I estimate the number of service members who would be at risk for food insecurity under the Department of Defense's definition over the last five years across the various ranks and services. As this analysis does not include spousal income, it should be treated as the upper bound of the estimate of food insecurity.

Next, I measure the rate of food insecurity among civilians by relative poverty level to study the impact and effectiveness of Department of Defense policies in reducing food insecurity among those at risk. To analyze if a higher cost-of-living increases the risk of food insecurity for those at a fixed income level, I use reported food insecurity status and household income from the CPS-FSS data and evaluate rates of food insecurity among civilian households in high and low-cost areas. A more detailed analysis is conducted by calculating food insecurity rates of individual regional price parities values to observe food insecurity trends as the cost-of-living increases.

The effects of regional price parities on the value of servicemember compensation are examined by adjusting basic pay and allowances (excluding BAH) according to regional price parities to visualize the impact of price variation on goods in different MSAs. I analyze DMDC data to estimate the number of service members living in high, mid, and low-cost areas by service and rank. Then, I conduct an analysis of poverty levels among servicemembers by rank alongside an analysis of the current COLA policy to identify the population at risk for food insecurity. I analyze the validity of assumptions and provisions of the policy and how it can be improved to better support the economic well-being of servicemembers who have limited say in their choice of assigned duty station.

Finally, I observe service members at their first duty station and track their transition to their subsequent duty stations or end of active service to estimate the retention effects of higher price parities. Servicemember duty locations are identified after one year of service to observe their first duty station and not location of boot camp or entry-level training schoolhouse locations. I then observe these personnel four years later as a standard contract is four to five years long and the average servicemember's permanent change of station occurs between two and five years. They are categorized by transitioning between cost-of-living areas or exiting active-duty service.

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IV. RESULTS

This chapter reports and interprets the results from my data analysis on food insecurity risk in the DOD. I begin by addressing my first research question regarding the DOD's current classification of servicemembers at risk for food insecurity. This section evaluates the DOD population at risk and predicted effectiveness of the Basic Needs Allowance by analyzing civilian food insecurity by poverty level. Secondly, I present the results of my food insecurity analysis between high and low-cost metropolitan areas to examine the correlation between cost-of-living and the risk of food insecurity. Lastly, I demonstrate how regional variations in prices affect current DOD program benefits to highlight the unequal distribution of benefits and allowances.

A. CURRENT ASSESSMENT OF FOOD INSECURITY RISK IN DOD

The Department of Defense categorizes servicemembers at risk for food insecurity if their annualized gross household income falls below 150 percent of the FPL, the following section analyzes the population at risk under this classification (H.R.7776, 2022; Office of the Under-Secretary of Defense, 2022). This study finds that only 0.4 percent of servicemembers in 2021 have gross income below 150 percent of the FPL when including the member's basic allowance for housing and all of these personnel are enlisted. Excluding the basic allowance for housing, this analysis finds that 1.5 percent of servicemembers fall below 150 percent of the FPL, and 99.7 percent of them are enlisted. This estimate only includes the servicemember's income from basic pay and allowances and is treated as the upper bound of estimation for households at risk for food insecurity. The exact number of households at risk is expected to be lower based on the assumption that households have additional income from spousal employment, additional jobs outside their primary employment with the DOD, and money received from federal assistance programs such as SNAP or WIC not captured in this data. Figures 7 and 8 show the distribution of servicemembers by poverty level in 2021 with and without basic allowance for housing, respectively.

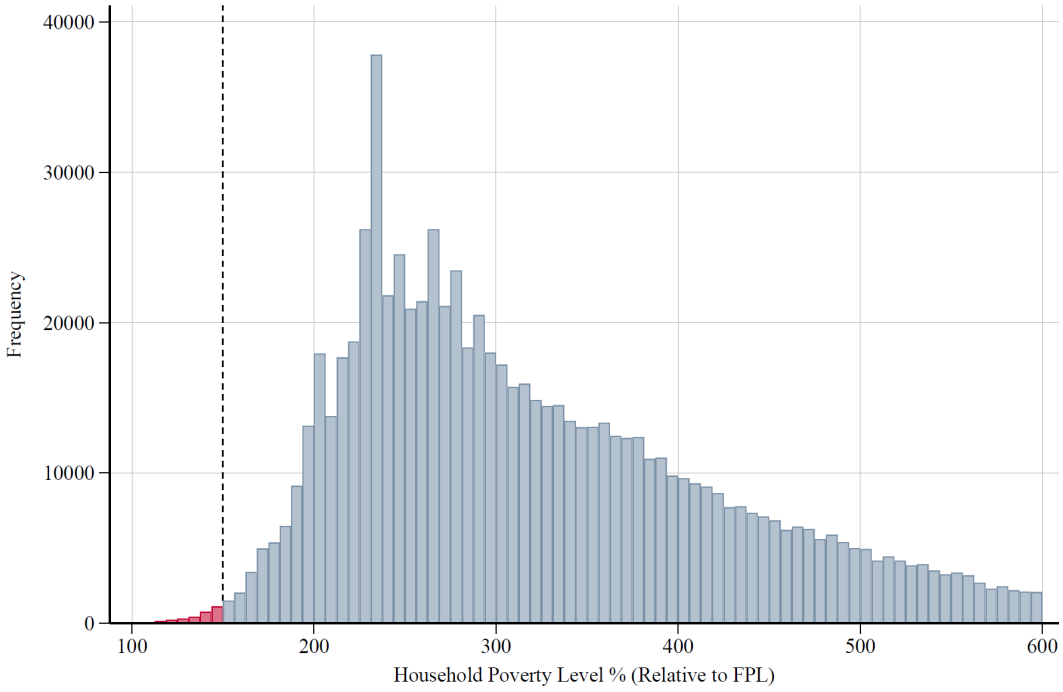

Figure 7. Distribution of Enlisted Servicemember by Poverty Level, Including Housing Allowance

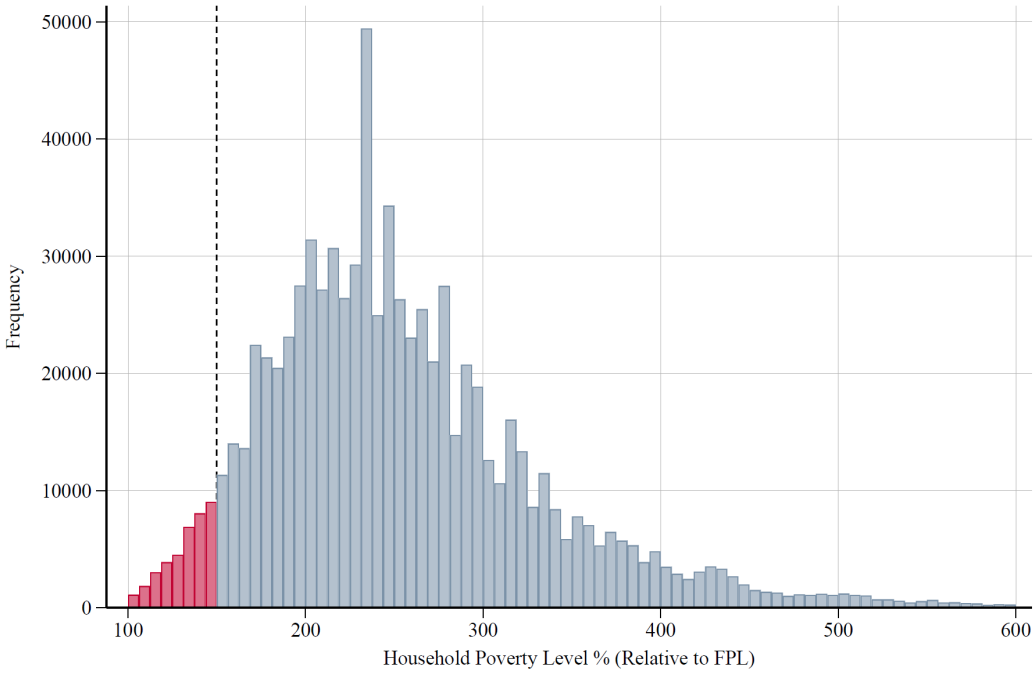

Figure 8. Distribution of Enlisted Servicemember by Poverty Level, Excluding Housing Allowance

My analysis finds that the Army has the largest proportion of servicemembers with income below 150 percent of the FPL. Less than one percent of all Soldiers have gross income below 150 percent of the FPL including basic allowance for housing while approximately 6 percent of Soldiers fall below this threshold when excluding the housing allowance. Conversely, the Navy has the lowest proportion of servicemembers below the 150 percent threshold with and without housing allowances at 0.09 and 2.7, respectively. Figure 9 shows the distribution of servicemembers below 150 percent of the FPL by service in 2021.

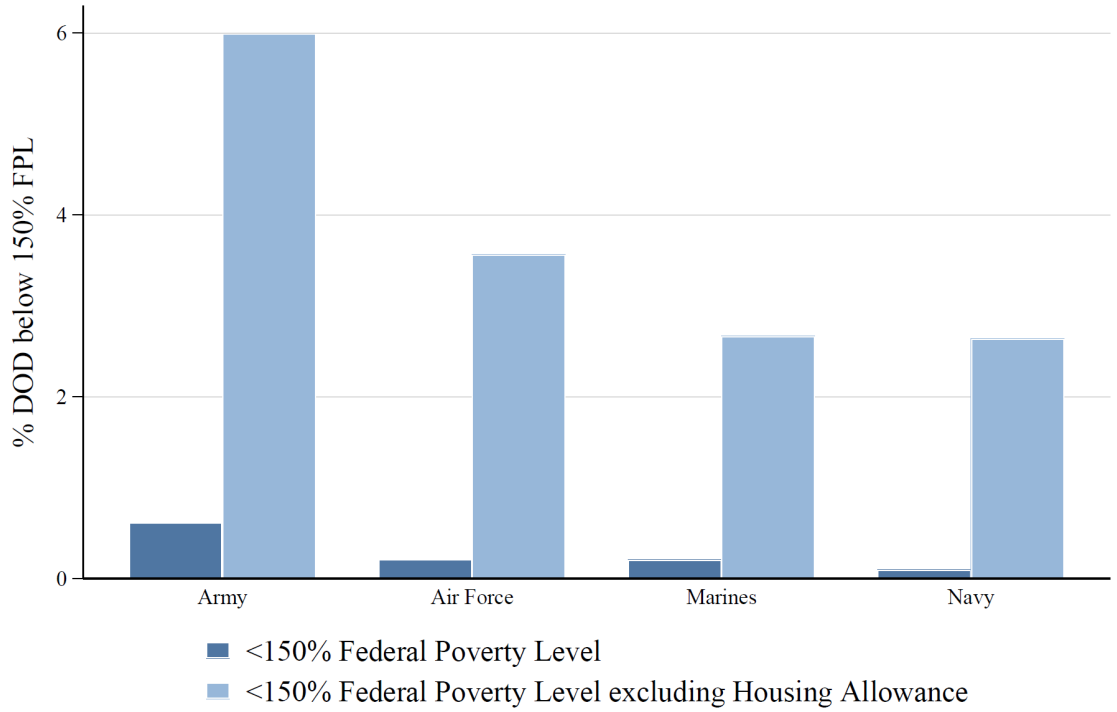

Figure 9. Distribution of Servicemembers Below 150 Percent of FPL by Service

When analyzing this population by rank my findings show the largest concentration of servicemembers are below the rank of E5. An estimated 92 percent of servicemembers with gross income less that 150 percent of the FPL are below the rank of E5 when including housing allowance and 87 percent when excluding it. Junior enlisted servicemembers or

those below the rank of E5, make up 59 percent of the total DOD population in 2021. The Marine Corps and Air Force have the largest proportion of junior enlisted servicemembers at 70 and 60 percent, respectively. The Army's junior enlisted population is approximately 57 percent while the Navy has the smallest proportion of junior enlisted at just 52 percent of its total population. Figure 10 shows the distribution of servicemembers with income below 150 percent of the FPL in 2021 by rank.

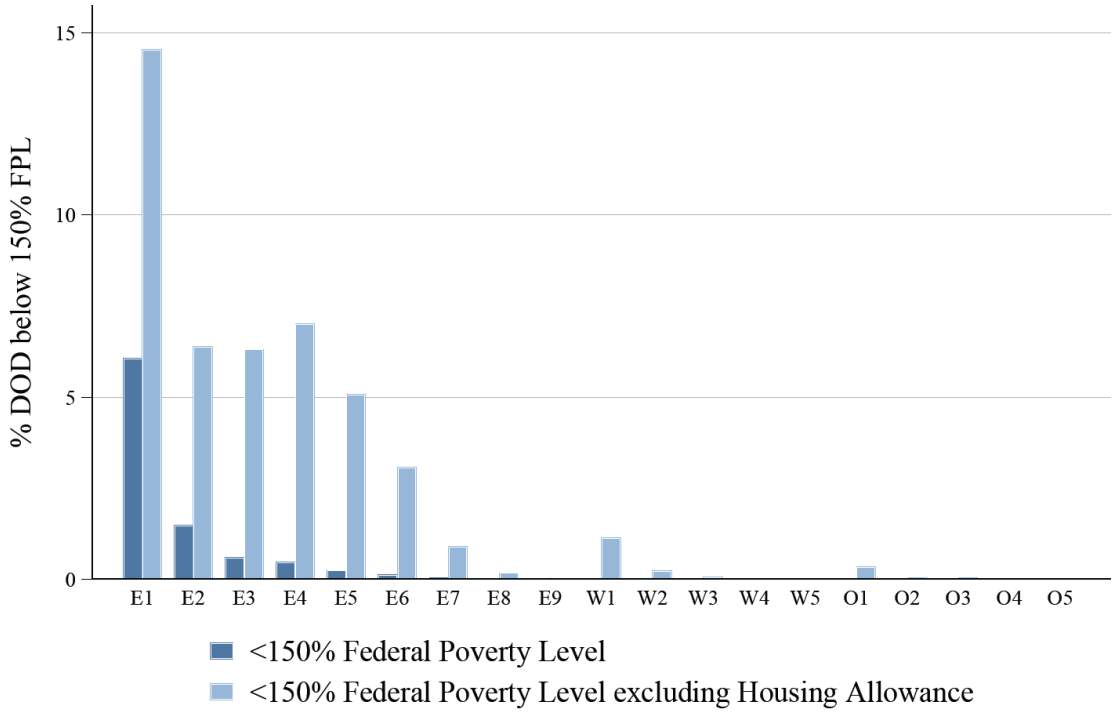

Figure 10. Distribution of Servicemembers Below 150 Percent of FPL by Rank

B. FOOD INSECURITY RATE ANALYSIS AMONG CIVILIAN DATA

Rates of food insecurity among employed civilians between the age of 17 and 55 with a high school degree or more vary by relative poverty level. Food insecurity rates for households at 150 percent are slightly lower than those at 130 percent but remain higher than the national rate of 10.2 percent. Figure 11 depicts the rates of marginal, low, and very low food insecurity by relative poverty level.

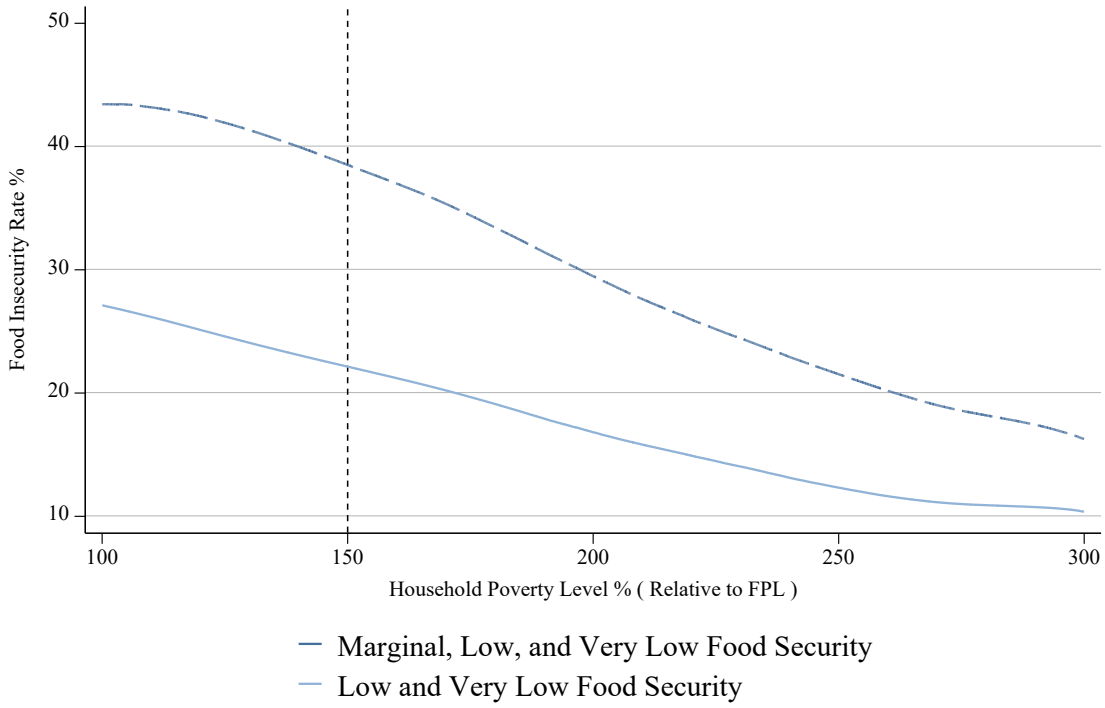

Figure 11. Food Insecurity Rates by Poverty Level

Further analysis reveals that rates of food insecurity are impacted by regional price parities among households below 200 percent of the federal poverty level. At 150 percent of the FPL the rate of marginal, low, and very low food insecurity in high-cost MSAs is approximately 46 percent while the rate in low-cost MSAs is just over 30 percent. Figure 12 shows the trend of marginal, low, and very low food insecurity rates for households at various levels relative to the FPL. The gap between marginal, low, and very low food insecurity rates in high and low-cost areas narrows as the relative poverty level increases until rates converge at the national average for those with a gross household income at or above 200 percent of the federal poverty level. Figure 13 shows the result of a similar analysis but food insecurity rates are limited to low and very low food insecurity. This analysis reveals a five percentage point gap between food insecurity rates in high and low-cost MSAs with a convergence of rates for those households above 185 percent of the federal poverty level. Both graphs reveal that at lower poverty levels, food insecurity rates are substantially above the national average in high-cost metropolitan areas.

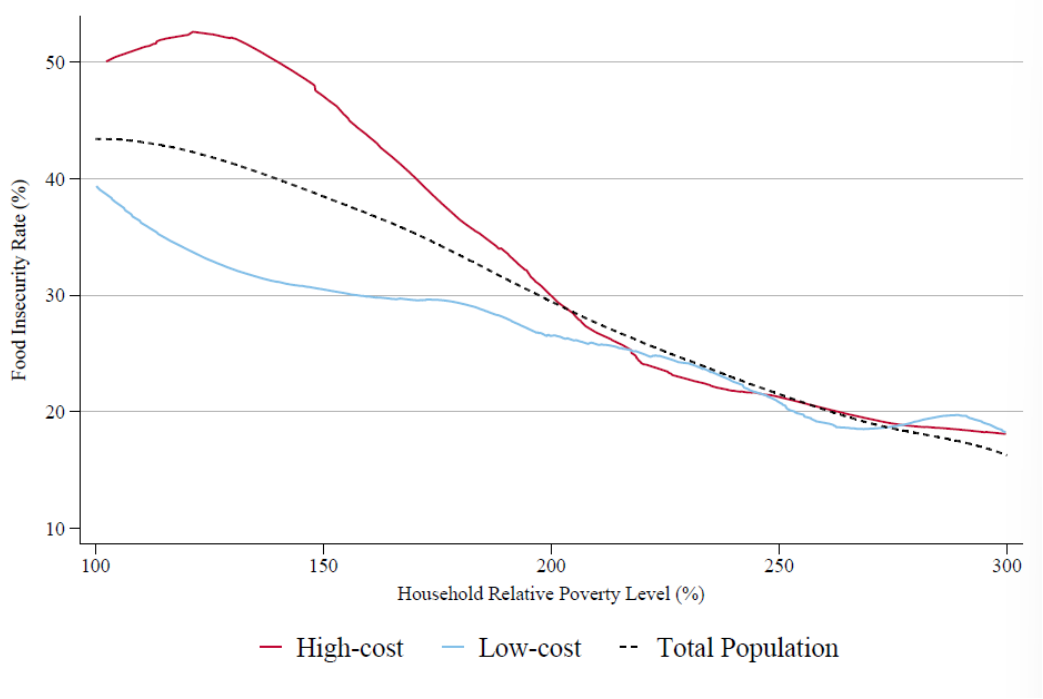

Figure 12. Marginal, Low, and Very Low Food Security Rates by Relative Poverty Level

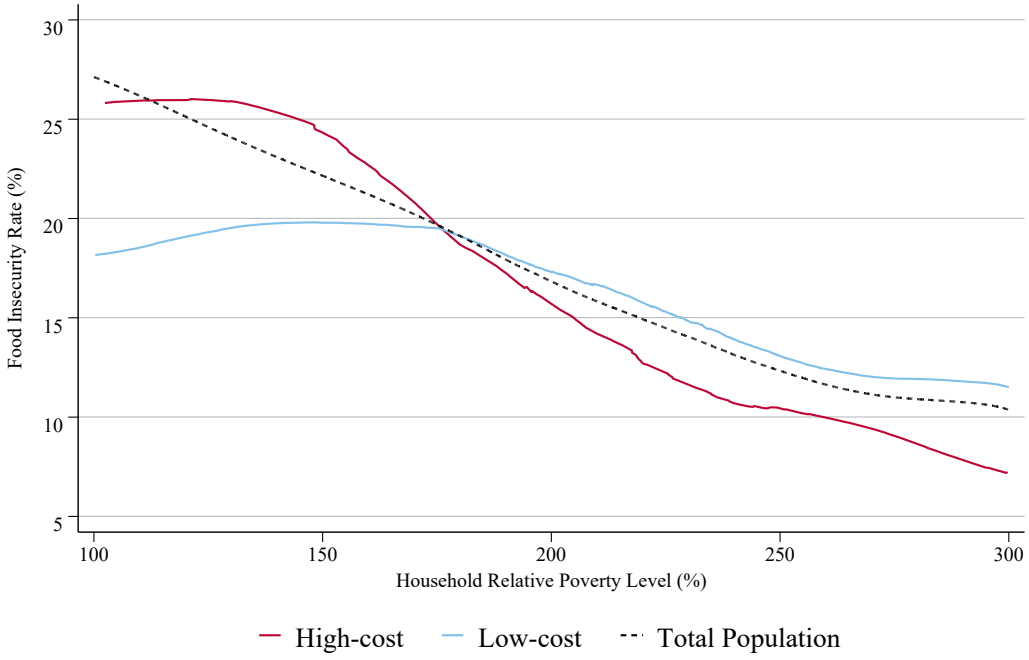

Figure 13. Low and Very Low Food Security Rates by Relative Poverty Level

Figure 14 reveals a more detailed view of how regional price parities relate to food security for households at 150 percent of the FPL. For those households between 150 and 200 percent of the FPL in metropolitan areas with RPPs above the national average, low and very low food insecurity rates range between 23 and 30 percent.

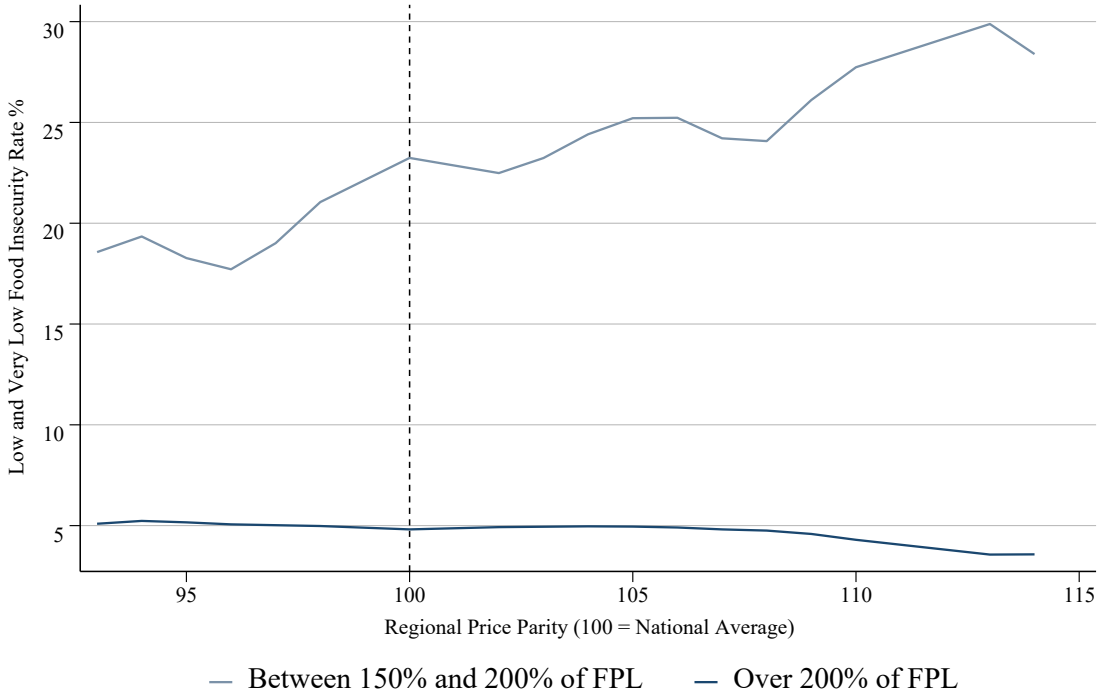

Figure 14. Impact of Regional Price Parities on Food Insecurity Rates

My analysis finds a significant correlation between regional price parities and food insecurity rates at this level of relative poverty. Furthermore, it illustrates the relatively low impact that regional price parities have on food insecurity rates for households with income above 200 percent of the FPL in 2021. The rate of low and very low food insecurity remains relatively equal and 5 percentage points below the national average of 10.2 percent for households with income above 200 percent of the FPL.

C. IMPACT OF REGIONAL PRICE PARITIES ON DOD COMPENSATION AND COST OF LIVING ALLOWANCE ANALYSIS

The following results illustrate the impact of regional price parities on the purchasing power of a household's income. While civilian households are more likely see an increase in salary or hourly wages when moving from low-cost to high-cost metropolitan areas, active-duty servicemembers maintain equal basic pay regardless of whether or not their duty station is high or low-cost. BAH is the only military compensation that is regionally indexed rather than nationally averaged. All other components of regular military compensation are held constant regardless of duty station including basic pay and BAS. Higher costs-of-living are currently absorbed into the servicemember's household budget without a pay adjustment. The value of BAS is far greater in Clarksville, Tennessee than in a high-cost area such as Seattle, Washington giving those in low-cost areas a higher value of regular military compensation. Figure 15 demonstrates the impact of regional price parities on purchasing power of an enlisted servicemember's BAS in 2021.

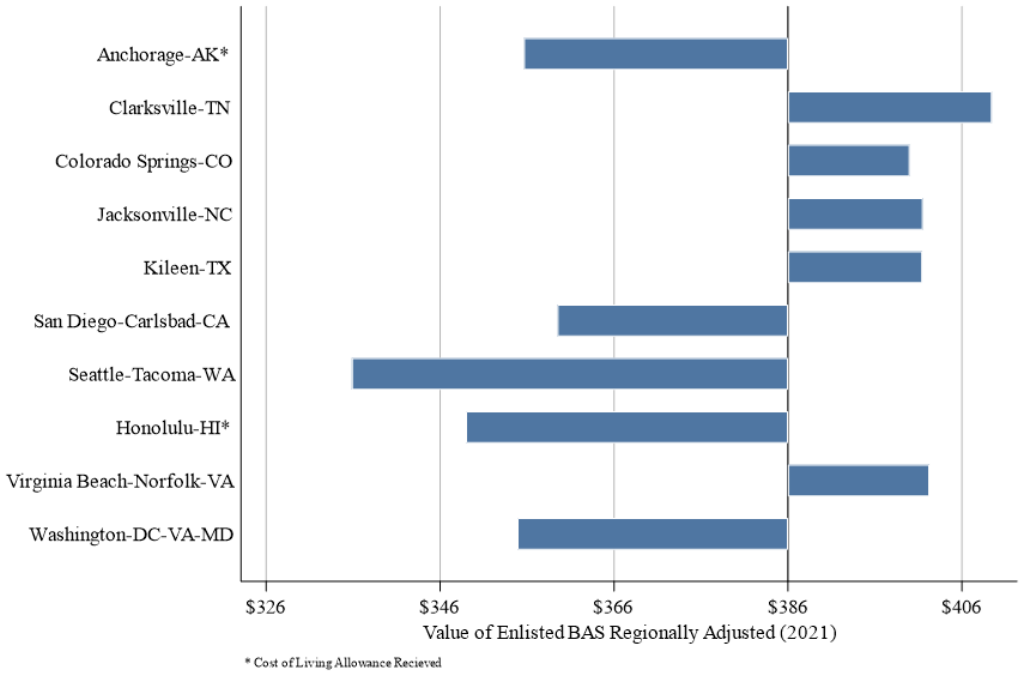

Figure 15. Value of Servicemember's Basic Allowance for Subsistence, Regionally Adjusted by Price Parity

BAS is equal for all enlisted members who are eligible and set at $386.50 in 2021. This amount is derived from the cost of the Liberal Food Plan calculated by the United States Department of Agriculture annually and represents the nationally averaged cost of a nutritionally balanced food basket (Food and Nutrition Service, 2022). By using a nationally averaged cost, those in high-cost areas are receiving a lower amount of subsistence allowance due to decreased purchasing power and may have a harder time staying within budget compared to peers with equal income in low-cost areas. Servicemembers in a select few metropolitan areas receive COLA to offset higher costs based on a mandated threshold percentage of 8 percent. This means that servicemembers assigned to areas with a uniformed services cost-of-living index above 108 percent receive an allowance equal to the difference between their local index and 108 percent (37 USC §403b). All servicemembers are expected to absorb up to 8 percent higher costs-of-living. It is important to note that the uniformed services cost-of-living index used to determine COLA is not equal to the regional price parity index calculated by the BEA. The DOD's index is calculated by a privately contracted firm and assumes servicemember expenditures will be lower than civilian counterparts due to the availability of services on base such as the commissary and exchange which advertise higher saving rates (Defense Travel Management Office, 2022).

As shown in the previous results section, households with income above 200 percent of the FPL are effectively able to absorb higher costs of goods without impacting their ability to obtain the necessary quality and quantity of nutritional food to avoid food insecurity. The median relative poverty level for all servicemembers is approximately 360 percent. In contrast, the median relative poverty level for junior enlisted servicemembers, those below the rank of E5, is approximately 230 percent. My analysis finds that junior enlisted servicemembers make up 92 percent of the DOD population with a relative poverty level below 200 percent. Figure 16 illustrates the distribution of junior enlisted servicemembers by relative poverty level. The junior enlisted population with income below 200 percent of the FPL are most likely unable to absorb the higher cost-of-living which results in higher rates of food insecurity.

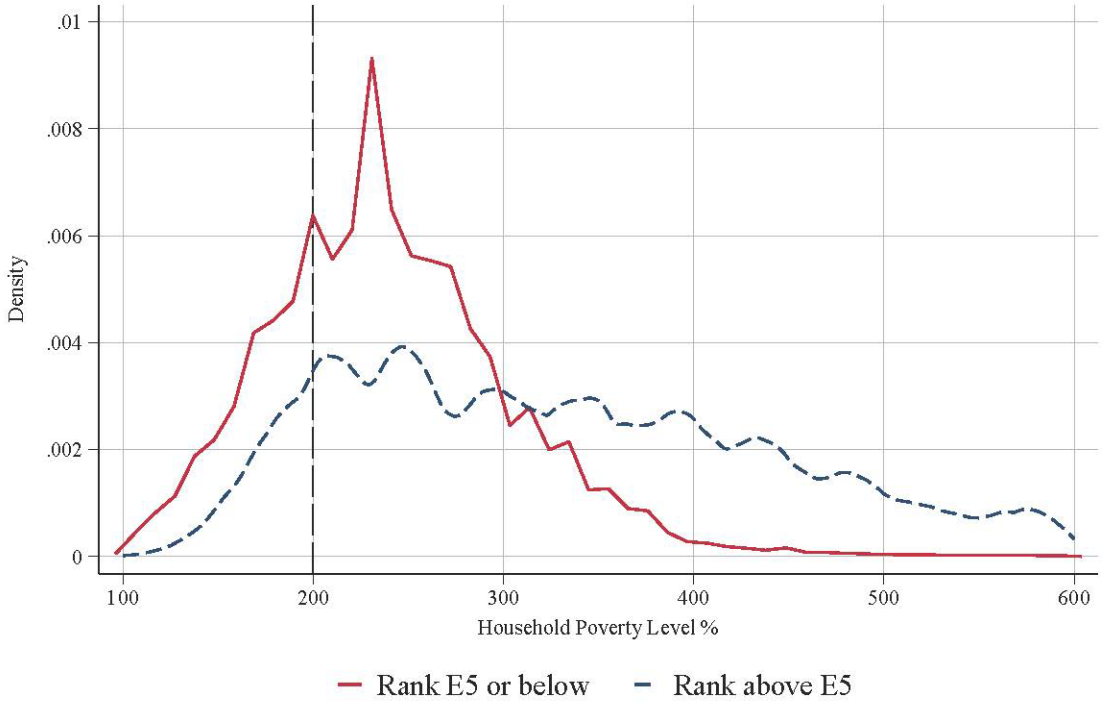

Figure 16. Distribution of Servicemembers by Poverty Level

Lastly, my analysis on cost-of-living transition finds a higher rate of exiting active-duty service among members living in high-cost metropolitan areas at their first duty station. For those servicemembers in low cost-of-living metropolitan areas, the rate of all attrition is approximately 65 percent. The observed rate of attrition for those servicemembers in high cost-of-living areas increases to approximately 70 percent. Figure 17 shows the transition of servicemembers at their first duty station in 2016 to their subsequent duty station or attrition observed in 2021. While this analysis does not seek to make a causal link between service members stationed in high cost-of-living areas and attrition, there is a correlation between the two.

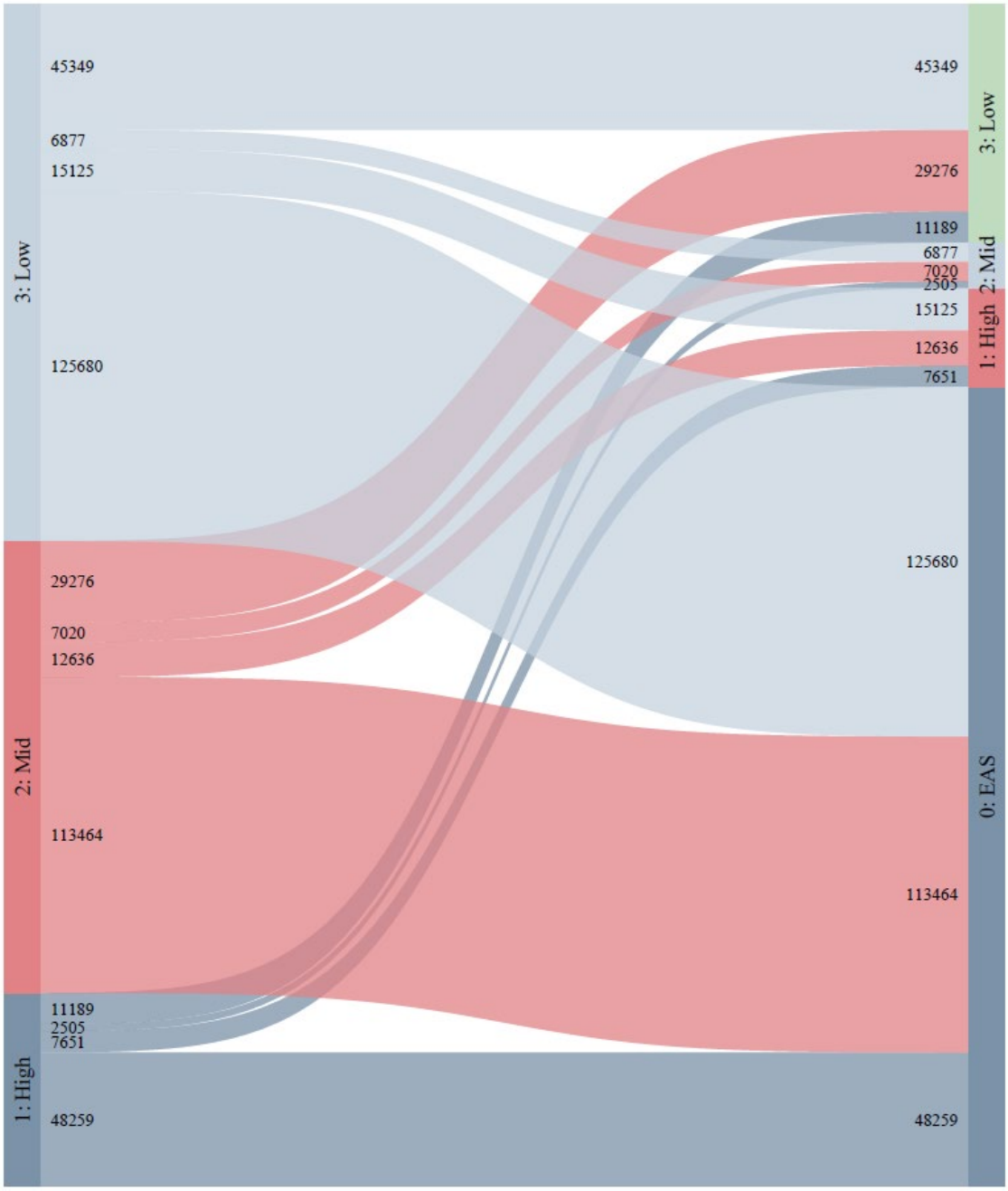

Figure 17. Service Member Transition Between First and Second Duty Station or Observed Attrition

This transition analysis also finds that a total of approximately 15.5 percent of servicemembers execute a permanent change of station from a low or mid-cost duty station to a high-cost duty station after their first tour. Given the impact of regional price parities

covered in my analysis thus far, these servicemembers are more likely to report food insecurity due to the decrease in purchasing power relative to their last duty station.

In summary, I find that less than one percent of the Department of Defense population is eligible for assistance rendering the allowance ineffective in reducing the rate of food insecurity among servicemembers. Among comparable civilian households, there is no abrupt decline in food insecurity rates at 150 percent of the Federal Poverty Level suggesting that 150 percent may not be an appropriate threshold. Furthermore, the likelihood of experiencing food insecurity is 16 percentage points higher in high-cost areas compared to low-cost areas, indicating a relationship between purchasing power and the rate of food insecurity. These findings, combined with the increased attrition rate among members in high-cost areas during their first tour of duty, indicate that current policies may be falling short of supporting the economic security of active-duty servicemembers.

V. CONCLUSION

A. SUMMARY

This thesis assesses the impact of regional price parities on food insecurity among active-duty servicemembers. The primary objectives are to evaluate the effectiveness of DOD policies such as BNA and COLA in the goal of reducing food insecurity and determine if servicemembers in high cost-of-living areas are at an increased risk of food insecurity compared to their counterparts in low cost-of-living areas. Food insecurity is a symptom of larger problems related to economic security, inequality, and lack of access to resources or allowances that are needed. Addressing food insecurity requires addressing these underlying issues and creating a more equitable environment for those serving their country.

The study objective is achieved by examining the impact of regional price parities on food insecurity rates of comparable civilian households. This population encompasses employed adults with a household income above 100 percent of the FPL with a high school degree or more between the age of 17 and 55. I estimate the effect of regional price variation on food insecurity rates for households across various points relative to the federal poverty level. Furthermore, I examine the rates of food insecurity across the spectrum of regional price parities for households with income between 150 and 200 percent of the FPL to examine the effectiveness and equality of the recent Basic Needs Allowance. Finally, I analyze the transition of service members from their first duty station to estimate the rate of attrition from high, mid, and cost areas to identify any trends.

Estimates from my analysis highlight the relatively few servicemembers with income below 150 percent of the FPL with just 0.4 percent of the total population in this category when including housing allowances. Additionally, the rate of low and very low food insecurity among comparable civilian households at 150 percent of the FPL is higher than the national average at approximately 23 percent. Given this estimate, the proposed BNA will not substantially reduce food insecurity as it does not offer additional monetary assistance that will effectively reduce the rate of food insecurity.

My thesis also finds a disparity between food insecurity rates among comparable civilian households below 200 percent of the FPL in high-cost areas. Rates of marginal, low, and very low food security are 16 percentage points higher in metropolitan areas with a BEA regional price index above 108 percent compared to lower cost areas. We can expect higher rates of food insecurity among servicemembers with household income below 200 percent living in a metropolitan area with higher than average costs-of-living.

Lastly, the rate of attrition is greater for servicemembers whose first duty station is in a high-cost metropolitan area. I find that 70 percent of servicemembers exit service after five years when first stationed in a high-cost area compared to 65 percent who exit service if stationed in low-cost area during their first tour. Although these findings do not indicate a strictly causal relationship, there is evidence suggesting that servicemembers who are initially stationed in a high-cost area exit service due to a higher risk of economic insecurity in the early stages of their careers.

B. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

A significant limitation of this thesis is the lack of food security data on servicemembers. The current 6-item short form of the Household Food Security Survey Module used in the ADSS and SOFS-A surveys lacks the ability to differentiate between marginal, low, and very low food insecurity and excludes any questions on child food security. I recommend investigating a more efficient survey to collect comprehensive data on military food security. This analysis is also limited by data on total household income as we only have access to the sponsor's pay and entitlements. Without exact values for spousal income or income from additional sources, the estimate of servicemembers with household income currently below 150 percent of the federal poverty level is overestimated. This limitation does not impact the proxy analysis of food insecurity among civilian households at risk for food insecurity by the Department of Defense standards because the Current Population Survey uses household income rather than person-level data.

The scope of analysis for servicemembers' transition from first to second duty station or end of active-duty service is limited by two factors. First, the transition was

categorized by recording a member's cost-of-living index at one year of service and again after four years. Permanent changes of station are not on an established schedule and typically can occur anywhere between 2 and 5 years. The best estimate of transition was four years to ensure at least one permanent change of station occurred during observation. Secondly, this analysis only observes the first five years of service rather than following a servicemember from entry until retirement. A more thorough analysis of the COLA policy assumption that servicemembers are stationed at both high and low cost-of-living areas across the entirety of their careers to maintain purchasing power would require a more detailed method of capturing the permanent change of station transition and a data set that encompasses more than 20 years of observations to encompass full careers.

C. POLICY RECOMMENDATIONS

To improve the effectiveness of the COLA policy, I recommend a lower threshold percentage for cost-of-living allowance for junior enlisted servicemembers below the rank of E5. For senior servicemembers whose household income is over 200 percent of the FPL, an increase in prices for goods is easier to absorb into their budget without limiting funds necessary for groceries or other basic needs. However, for those at the junior most ranks in high cost-of-living areas, purchasing power is significantly decreased and there is no guarantee for reenlistment or subsequent assignment to a lower cost-of-living area to offset the loss of purchasing power.

Although the Basic Needs Allowance is a step in the right direction toward protecting the economic well-being of active-duty servicemembers, it is not equitable across the force. Servicemembers eligible for the allowance in high cost-of-living areas whose income falls below 150 percent of the FPL may still be at higher risk for food insecurity than their peers in low-cost areas even if their monthly income is supplemented up to 150 percent of the FPL. Instead of using a national average for benchmarking benefits such as the Basic Needs Allowance and Basic Allowance for Subsistence, I recommend the Department of Defense conduct further research on employing regionally adjusted indexes to determine more effective and equitable allowances that meet the intent of these developed policies.

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