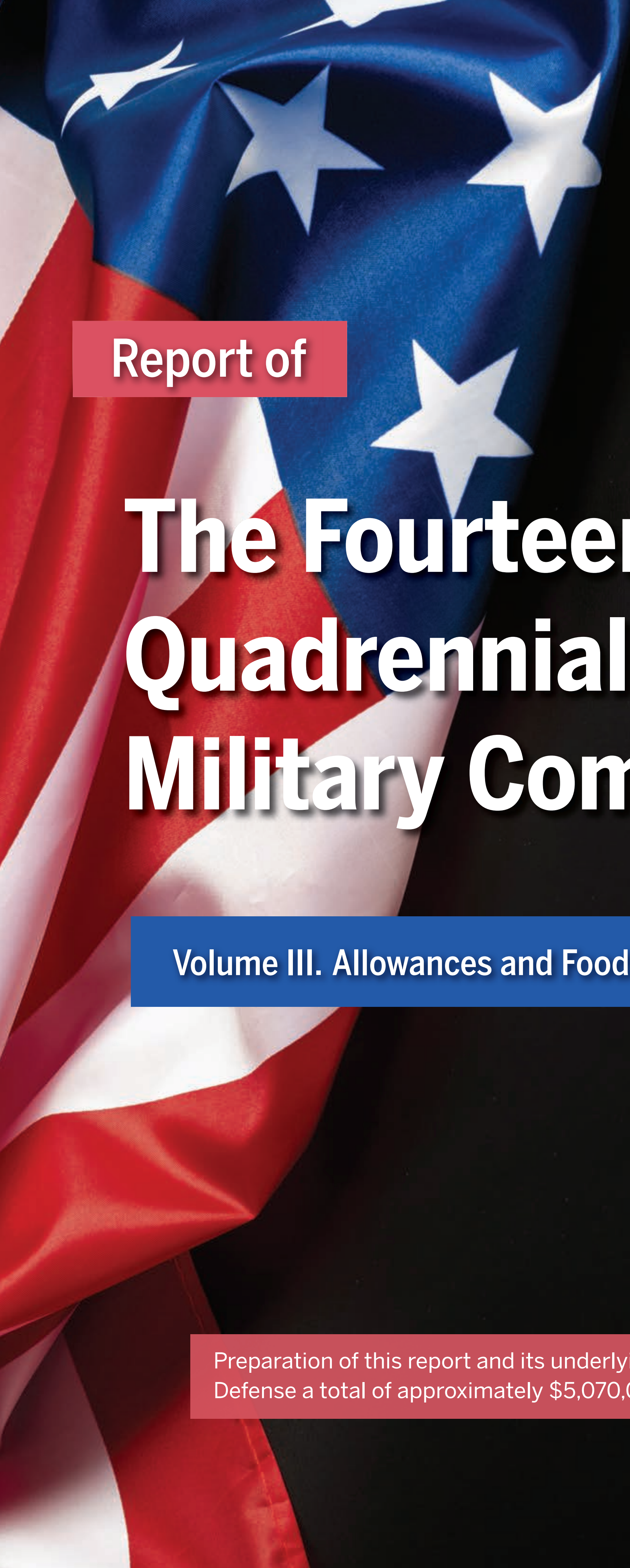


Report of

The Fourteenth Quadrennial Review of Military Compensation

Volume III. Allowances and Food Insecurity • January 2025

Preparation of this report and its underlying studies cost the Department of Defense a total of approximately $5,070,000 in Fiscal Years 2022–2024.

Report of

The Fourteenth Quadrennial Review of Military Compensation

Volume III. Allowances and Food Insecurity

January 2025

Preface

Every four years, the President directs "a complete review of the principles and concepts of the compensation system for members of the uniformed services."[1] When this review is completed, the President must submit a detailed report to Congress summarizing the results of the review along with any recommendations the President may have for changes in the statutory salary system and other elements of the compensation structure for members of the uniformed services.[2]

In January 2023, President Joseph R. Biden instructed the Secretary of Defense to serve as his Executive Agent in conducting the Fourteenth Quadrennial Review of Military Compensation (14th QRMC). In his charge to the Secretary, the President stated:

> Our great Nation has the finest fighting force in the world and it remains our sacred obligation to take care of our men and women in uniform. We owe our service members our support and gratitude, and we recognize the sacrifices they make every day in support of our Nation. Further, our service members deserve a 21st century military compensation system that recognizes and rewards their contributions, reflects the values of our Nation, and incentivizes the next generation of men and women to serve.[3]

In furtherance of this objective, the President directed the 14th QRMC to review and assess five topics: the current military compensation benchmark; the structure of the basic pay table; the requirements and methodologies used to calculate the housing, subsistence, and cost-of-living allowances, including the Basic Needs Allowance; compensation for critical skills; and the implications for compensation of the growing number of dual-income military households.

1 U.S. Code, Title 37, Section 1008(b), Presidential Recommendations Concerning Adjustments and Changes in Pay and Allowances.

2 U.S. Code, Title 37, Section 1008(b).

3 White House, "Fourteenth Quadrennial Review of Military Compensation," memorandum for the Secretary of Defense, January 15, 2023.

At the request of the Commander, United States Special Operations Command, and the Chairman, Joint Chiefs of Staff, the Secretary of Defense added a sixth study—a review of entitlements for deployed members.

This third volume of the 14th QRMC report contains research papers on allowances and food insecurity prepared by federally funded research and development centers in support of the QRMC. They provide more detailed discussion of the topics addressed in the main report, including description of the data sets and methodology used in the various analyses. These reports are presented, with permission, in their entirety. The views expressed in these papers represent those of the authors and are not necessarily those of the Department of Defense.

This volume includes the following:

Evaluation of Basic Allowance for Housing

Adam M. Clemens, Danielle N. Angers, Russell W. Beland, Shing L. Cheng, Daniel M. Leeds, Rikesh A. Nana, Robert W. Shuford, Susan Starcovic, Sarah L. Wilson, with Glenn Ackerman, Peter Bernstein, Louise Collis, Joshua Craig, CNA

Report on the Calculation of the Basic Allowance for Housing, Basic Allowance for Subsistence, and Cost-of-Living Allowances

Adam M. Clemens, Daniel M. Leeds, Jaclyn Rosenquist, Robert P. Trost, Samuel A. Yellin, with Robert W. Shuford, CNA

Military Compensation and Food Insecurity: Analysis in Support of the Fourteenth Quadrennial Review of Military Compensation

Patricia K. Tong, Beth J. Asch, Stephanie Rennane, RAND

January 2025

Evaluation of Basic Allowance for Housing

Adam M. Clemens, Danielle N. Angers, Russell W. Beland, Shing L. Cheng, Daniel M. Leeds, Rikesh A. Nana, Robert W. Shuford, Susan Starcovic, and Sarah L. Wilson

with contributions by Glenn Ackerman, Peter Bernstein, Louise Collis, and Joshua Craig

DRM-2023-U-036969-2Rev

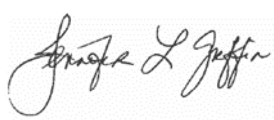
Abstract

This report for the 14th Quadrennial Review of Military Compensation (QRMC) responds to questions related to the Basic Allowance for Housing (BAH) posed by Congress in the 2023 National Defense Authorization Act (NDAA). BAH is a form of compensation designed to help members rent adequate housing near their duty station, and the amount depends upon their rank, their military housing area (MHA), and whether they have dependents. We found that BAH is, on average, higher than what civilians of comparable income spend on rent and utilities. The only exception is the BAH paid to members in the W1 paygrade without dependents. However, BAH is also volatile: in any given year, more than half of MHAs have a greater than 10 percentage point spread across the year-over-year BAH changes for different paygrades in that MHA. This may contribute to some members' dissatisfaction with BAH, as may comparison to on-base privatized housing standards, which are higher than BAH standards for some paygrades. We also found that over the long term, BAH responds to changes in housing markets very well, but its built-in lag of about 6 to 18 months means that it does not keep up with rapid housing cost inflation.

This work was created in the performance of Federal Government Contract Number N00014-22-D-7001.

Cover image: Air Force 1st Lt. Russell Bowman embraces his family at Joint Base Charleston, South Carolina, October 3, 2022, upon returning home from deployment. Photo by Airman 1st Class Christian Silvera.

Approved by: **January 2025**



Jennifer Griffin, Research Program Director

Marine Corps and Defense Workforce Program

Resources and Force Readiness Division

Executive Summary

This is a report for the 14th Quadrennial Review of Military Compensation (QRMC) on the Basic Allowance for Housing (BAH). Specifically, this report responds to BAH-related questions posed by Congress in the 2023 National Defense Authorization Act (NDAA).

The NDAA asks that DOD evaluate the following six issues:

1. The efficiency and accuracy of the current system used to calculate BAH
2. The appropriateness of using mean and median housing costs in such calculations
3. Existing military housing areas (MHAs) in relation to choices in, and the availability of, housing to servicemembers
4. The suitability of the six standard housing profiles in relation to the average family sizes of servicemembers, disaggregated by uniformed service, rank, and MHA
5. The flexibility of BAH to respond to changes in real estate markets
6. Residential real estate processes to determine rental rates

The NDAA also calls for the Department of Defense (DOD) to provide recommendations on the following five topics:

1. The feasibility of including information, furnished by federal entities, regarding school districts in calculating BAH
2. Whether to calculate BAH more frequently, including in response to a sudden change in the housing market
3. Whether to enter into an agreement with a covered entity to compile data and develop an enterprise-grade, objective, and data-driven algorithm to calculate BAH
4. Whether to publish the methods used by the Secretary of Defense to calculate BAH on a publicly accessible website of the DOD
5. Whether BAH calculations appropriately account for increased housing costs associated with Coast Guard facilities

Background about BAH

As explained in the BAH primer published by the Office of the Secretary of Defense (OSD), BAH is a form of compensation designed to help members rent adequate housing near their duty stations when government housing is not available [1]. The BAH rate a member receives depends upon their rank, whether they have dependents, and the MHA of their duty station (with some exceptions if the dependents do not relocate). By law, the rate must be based on the cost of adequate housing for civilians of comparable incomes in the same area [2]. DOD interprets this as the local median rental cost for a given housing unit type, or "housing profile," in a suitable neighborhood, plus the average cost of utilities in that area [1]. Rank and dependent status determine which housing profile is used.

BAH is calculated every year for 24 military paygrades in 300 MHAs in the US. The BAH rates are calculated from an annual BAH survey of available rental units in each MHA. Currently, BAH payments are set slightly below DOD's estimate of total housing costs so that recipients notionally pay an average of 5 percent of their housing costs out of pocket.

Accuracy and efficiency of current BAH rates

To directly assess the accuracy of BAH rates, one would need to conduct more extensive BAH-like surveys in a sample of MHAs and compare the results to the existing BAH surveys, which is beyond the scope of this QRMC study. Instead, we used Census data from the American Community Survey (ACS)—the largest available survey that observes both household income and housing expenditures including utilities—to assess the sufficiency of BAH to match housing expenditures of civilians with comparable income. Because BAH is a key component of military income and varies significantly from one area to another, we defined *comparable civilians* as those with household income minus housing expenses similar to that of servicemembers' regular military compensation minus BAH. BAH should then at least match what civilians with the same income-less-housing spend on rent and utilities.

At a national average level, we found that BAH is significantly higher than civilian housing expenditures, with or without taking into the account the notional 5 percent out-of-pocket that BAH recipients are currently expected to pay. For every rank and dependency status except one—W1 without dependents—average BAH is above average housing expenditures for comparable civilians. The degree to which BAH exceeds civilian expenditures varies from 60 percent for E2 with dependents to 13 percent for CWO4 without dependents. So, rather than paying 5 percent out of pocket on average, they can on average save a portion of their BAH and still rent housing comparable to their civilian peers.

Why, then, do some BAH recipients and their advocates perceive BAH as insufficient? One reason may be that BAH has a high degree of volatility (which reduces efficiency). The relative generosity of BAH varies from one MHA to another, one paygrade to another, and one year to another. It is not uncommon for rates of similar BAH standard units (such as one- and two-bedroom apartments or two- and three-bedroom townhouses) to increase or decrease by substantially different amounts. We found that each year in over half of the MHAs, the year-on-year changes for different paygrades vary by more than 10 percentage points. If, for example, BAH increases by 10 percentage points for one paygrade, and in the same MHA in the same year it decreases by 5 percentage points for another paygrade, it is understandable that members in the latter paygrade could view their BAH as insufficient.[1] Although this volatility is somewhat smaller in MHAs with the largest (civilian) populations, it exists across all sizes of MHAs.

Another reason BAH may be perceived as insufficient is that on-base privatized housing standards are higher than BAH standards. With the exception of some older units that are now offered at a discount, all privatized housing units are now three-bedroom townhouses or bigger [3]. In contrast, E5s with dependents receive BAH tied to a two-bedroom townhouse, and E1s through E4s with dependents receive BAH tied to the midway point between a two-bedroom apartment and a two-bedroom townhouse, so they may perceive BAH as insufficient relative to what they expect on base.

Other findings

Mean versus median. BAH rates are currently based on the median (50th percentile) rents from the BAH surveys. Comparing the mean and median price in actual BAH surveys, we found that basing BAH on mean rates instead would increase BAH for some MHA-paygrade combinations and lower it for others. In some cases, the lowest paygrades would see the greatest reductions. If Congress is dissatisfied with the current BAH rates, it would be more straightforward to choose a higher or lower percentile for the BAH calculations rather than the mean. For example, setting BAH to the 60th percentile would increase it consistently.

Availability of suitable housing choices. We found that 92 percent of servicemembers reside in their assigned MHAs and 8 percent commute from neighboring MHAs. For those who choose to reside in neighboring MHAs, 60 percent choose MHAs with lower BAH rates, and presumably lower housing costs. The other 40 percent commute from MHAs with higher BAH rates.

Servicemembers choose their residences for many reasons, including spousal incomes and commutes, specific school districts, family preferences, and so on. It is difficult to ascertain their motivations without more direct information about these factors.

Not only are most members finding housing in their MHA, but they are also generally finding housing in higher quality neighborhoods relative to the civilian population. We compared the

[1] A member already stationed there and staying in that MHA would not see their BAH drop, but the reduction would take effect for members in that paygrade rotating into that MHA, at the same time that housing costs appear to be rising as evidenced by the increase in BAH for other grades.

ZIP codes that servicemembers choose within their MHAs to median gross rents reported in the ACS. In 74 percent of MHAs, servicemembers are choosing ZIP codes with higher median rents, which also correlates with higher quality housing and locations.

Suitability of the BAH housing profiles. Comparing the demographics of military families to the BAH housing profiles, we found that these standards should be sufficient, if each child were to have their own bedroom, in 69 to 90 percent of military families (69 for the E8, W2, and W3 paygrades, and 90 for the O2 paygrade). Applying on-base bedroom assignment policies, the BAH profiles are sufficient for 79 to virtually 100 percent of families depending on paygrade.

Flexibility to respond to markets. We found that over the long term, BAH responds to rising housing costs well: at a national average level, BAH has risen at least as much between 2006 and 2023 as other government-generated indices of housing cost. In the short run, BAH is not designed to adapt rapidly to volatile housing markets, and neither are other government-generated estimates of housing cost. BAH is more volatile than other government indices but not in a way that makes it more responsive to rapid changes in the market. Housing markets have been unusually volatile since the COVID-19 pandemic began, and both BAH and private-sector wages had difficulty keeping up with the rapid housing cost increases of 2021 and 2022.

Commercially generated indices have shorter lags than BAH or other government-produced measures. For example, by July of 2022, the Zillow index of rents in San Diego had risen 33 percent from January 2020, but BAH for an E5 with dependents there saw only a 0.7 percent increase during the same span. We note that commercial indices are not tied to the BAH profiles, nor do they exclude neighborhoods as unsuitable in the way that BAH surveys do, and they therefore cannot be used to simply set BAH levels as a replacement for the current BAH survey process.

Recommendations

Whether to incorporate school district information into BAH calculations. We recommend that DOD not involve itself in comparing the quality of civilian school districts, either within an MHA or across MHAs. Doing so would expose it to political risk, and the tasks of measuring school quality, quantifying its relationship with home prices, and determining the link between it and rental rates are all complex. A way to ensure that members have access to quality schools is to ensure that BAH is sufficient for them to live in higher cost neighborhoods, which is the case in most MHAs.

Whether to update BAH more frequently. Any change to BAH policy that allows it to update more frequently in response to the market would increase the total cost to the services, and they would learn the size of the increase only after the budget for the fiscal year has been built. As a result, if they have not budgeted enough to cover the increase, they would need to divert funds from other budget line items already approved by Congress. However, if Congress expects the recent high volatility in housing markets to continue, then such a change may be necessary. Achieving this change would require either making a topline increase to DOD funding, offsetting savings in BAH (e.g., a larger notional out-of-pocket contribution), or offsetting cuts elsewhere in the DOD budget.

Whether to develop a BAH algorithm. Private-sector stakeholders in property markets use sophisticated algorithms to price homes and to forecast where the market is going. A commercially developed BAH algorithm may be useful for DOD as well, though we do not know how much actual predictive power these models have. It is critical that this tool estimate prices for the housing standards set by the government, rather than be allowed to generate its own standards. Also, even after such a tool passes an experimental phase and DOD chooses to implement it, OSD and the services should continue to closely monitor the results to ensure that it is performing as well on the new data being fed to it and is not trending in an unexplained direction.

Whether to fully publish BAH methods. The current BAH methodology uses proprietary data, is complex, and requires many "data smoothing" adjustments. Therefore, publishing it in its entirety would be difficult and would likely not improve perceptions of transparency. If DOD replaced it with a more streamlined process that relies heavily on publicly available data, that would enable more transparency and perhaps more trust. We caution, however, that it is unlikely DOD can ever fully commit to a methodology up front and fully document it. Any process is sure to generate irregularities, and if DOD is unable to deviate from the published process to correct these irregularities, it could lead to many complaints.

Whether BAH is appropriate to Coast Guard installations. To enable the Coast Guard to compensate its members for adequate housing that they sometimes must find farther from their duty stations, we recommend granting more clearly defined authority for the secretary concerned to pay the higher BAH rate for a neighboring MHA when members and their dependents live in that neighboring MHA. We also recommend expanding the differential lease payments law (which currently applies only to DOD) to include the Coast Guard to improve the housing supply in areas with few year-round rentals.

Contents

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Introduction

QRMC background

In accordance with Section 1008 of Title 37, United States Code (USC), the President must direct an independent review of the principles and concepts of the military compensation system every 4 years [4].

The director of the 14th Quadrennial Review of Military Compensation (QRMC) asked CNA to review the statutory requirements and methodologies used to calculate the basic allowance for housing (BAH), basic allowance for subsistence (BAS), cost-of-living allowances (COLAs), and basic needs allowance (BNA) to ensure military members are food secure and can procure suitable housing. This report is one of two produced by a CNA study that addresses each of these allowances.

In addition, Section 662 of the 2023 National Defense Authorization Act (NDAA) calls for the Department of Defense (DOD) to provide a report to Congress on BAH [5]. The NDAA asks that DOD evaluate the following six specific issues:

1. The efficiency and accuracy of the current system used to calculate BAH
2. The appropriateness of using mean and median housing costs in such calculations
3. Existing military housing areas (MHAs) in relation to choices in, and the availability of, housing to servicemembers
4. The suitability of the six standard housing profiles in relation to the average family sizes of servicemembers, disaggregated by uniformed service, rank, and MHA
5. The flexibility of BAH to respond to changes in real estate markets
6. Residential real estate processes to determine rental rates

The NDAA also calls for DOD to provide recommendations on the following topics:

1. The feasibility of including information, furnished by federal entities, regarding school districts in calculating BAH
2. Whether to calculate BAH more frequently, including in response to a sudden change in the housing market
3. Whether to enter into an agreement with a covered entity to compile data and develop an enterprise-grade, objective, and data-driven algorithm to calculate BAH

4. Whether to publish the methods used by the secretary to calculate BAH on a publicly accessible website of the DOD
5. Whether BAH calculations appropriately account for increased housing costs associated with Coast Guard facilities

This report addresses all of the questions above. A companion CNA report for this QRMC explores possible reforms to the BAH process as well as analysis and recommendations about BAS and COLAs. A separate RAND report for the QRMC focuses on the food security concerns that motivated the BNA.

BAH definition and statutory requirement

As explained in the BAH primer published by the Office of the Secretary of Defense (OSD), BAH is a form of compensation designed to help members rent adequate housing near their duty stations when government housing is not available [1]. The BAH rate a member receives depends upon their rank, whether they have dependents, and the MHA of their duty station (with some exceptions if the dependents do not relocate). By law, the rate must be based on the cost of adequate housing for civilians of comparable incomes in the same area [2]. DOD interprets this as the local median rental cost for a given housing unit type, or "housing profile," in a suitable neighborhood, plus the average cost of utilities in that area [1]. Rank and dependent status determine which housing profile is used.

The six housing profiles for which DOD collects data are listed below. Most paygrades are tied to one of these or to a percentage difference between one of these anchor points and the next, but members in the grades of E-1 through E-4 with dependents are tied to the average of the cost of a two-bedroom apartment and a two-bedroom townhouse (by law).

- One-bedroom apartment
- Two-bedroom apartment
- Two-bedroom townhouse/duplex
- Three-bedroom townhouse/duplex
- Three-bedroom single family dwelling
- Four-bedroom single family dwelling

To provide some stability in household budgets and reduce the probability that members need to move during a tour at a duty station, the BAH rate a member receives can adjust up mid-tour but can only adjust down when the member has a permanent change of station (PCS), a reduction in rank, or a change in dependency status [1].

Members may choose to buy a home and use their BAH to make mortgage payments, but DOD policy specifies that BAH is tied to the rental market and not to ownership costs. Servicemembers are free to spend more or less than their BAH rate on housing as they see fit.

BAH data collection and calculation

BAH rates are traditionally calculated by surveying vacant rental units in each MHA. The surveys are supplemented by other data sources, including commercial real estate data bases and inputs from Military Housing Offices and privatized housing partners. The surveys are conducted annually from March through July.

Servicemembers are expected to pay a specified amount out of pocket in order to afford the standard BAH unit for their paygrade and location. This amount is termed an "absorption" rate. It is calculated to be 5 percent of the national average BAH rate for each paygrade. The absorption rate is a specified dollar amount that does not vary from location to location.

Background considerations about BAH

Although BAH rates are calculated such that they should cover 95 percent of the cost of appropriate and adequate housing based on geographic area, pay grade, and dependent status, the reality for individual servicemembers can vary widely. Personal circumstances and preferences can cause wide variations in the choice of rental homes and their costs. Even among servicemembers of the same grade, family size, and housing preferences who are assigned to the same base at the same time, housing costs might vary because of diligence in searching or simple random luck.

As a result, it is natural, and even unavoidable, that some servicemembers will end up with sizable out-of-pocket costs while others pay far less than BAH; the average expected out-of-pocket contribution has varied over time but has always been understood to be an *average*. These differences can be quite stark. Suppose the primary housing consideration for a servicemember is a short commute to work. An informal search of rental properties in the Washington, DC, area showed that a servicemember assigned to Joint Base Andrews could probably find a nearby home for somewhat less than BAH, while an otherwise identical member assigned to Walter Reed would likely pay about twice as much rent and face significant out-of-pocket costs. A similar, but even larger, disparity applied to members assigned to the Marine Corps Air Station at Miramar and the Naval Air Station North Island. Fortunately, in both cases members are free to choose the neighborhood in which they live and, if necessary, can trade commute times for rental rates.

In addition to these sorts of complexities, the single set of rates, though designed for two-parent families in which one parent is a servicemember and the other is a civilian, is used for dual-military couples, geo-bachelors, activated guard and reserve personnel, parents with joint custody, and others in various anomalous situations. It would be unrealistic to expect a single set of rates to be just right, or even close to right, across such a wide range of applications.

When comparing different geographic areas, the comparisons become far more difficult, and the relative winners and losers even harder to judge. In part this is because higher costs of living are often associated with more desirable locations, but individual servicemembers have idiosyncratic preferences about where to live. Thus, even if the system could somehow make purchasing power identical across all duty locations, some members would still come out ahead of others. Therefore, although we can state whether we are confident that a BAH rate for a given paygrade and MHA is sufficient to meet the statutory requirement for members receiving it, we cannot recommend one perfect table of BAH rates that meets all intents of the program equitably for all stakeholders at the minimum cost.

Organization of this report

The next 11 chapters discuss our analyses to answer each of the evaluations and recommendations requested by Congress in order.

We provide seven appendices. Appendix A provides details about the BAH estimation process. Appendix B presents tables of how much civilians spend on housing (rent plus utilities) as a function of their remaining income, type of home, and the overall housing costs of the area in which they live. Appendix C presents statistics on how many MHA-paygrade combinations have BAH that we can demonstrate with high confidence is sufficient. Appendix D presents the distribution of family size for each paygrade and how this compares with its housing BAH profile. Appendix E discusses the methodology we used to estimate the costs of changing the BAH housing standards. Appendix F provides an overview of housing rental market indices. Finally, Appendix G discusses academic research on the relationship between school quality and home prices.

How Accurate and Efficient Is the Current System Used to Calculate BAH?

For the great majority of BAH recipients, BAH is higher than median spending on rent and utilities by comparable civilians. This is especially so for servicemembers with dependents, particularly junior enlisted personnel or junior officers with prior enlisted service. The reasons for this are that Congress has set a BAH floor for junior enlisted personnel (a common standard for paygrades E1 through E4) and that officers with prior enlisted service receive more BAH than their peers of the same rank.

We used an innovative methodology that allowed us to assess the sufficiency of BAH both at a national average level and at the MHA level in 83 percent of locations. If we could not confidently determine the sufficiency of some rates in a specific MHA, we could often bound the maximum potential shortfalls.

In addition, we determined that BAH is highly volatile from year to year when compared to an alternate measure of housing cost. This volatility reduces the efficiency of BAH and may contribute to dissatisfaction with BAH. The disparity between the BAH profiles and the on-base privatized housing standard, which is even higher, may also contribute to dissatisfaction.

Accuracy: nationwide average

To directly assess the accuracy of the BAH to fulfill its legal and policy requirements, one would need to select a sample of housing areas and conduct more extensive BAH-like surveys to establish a fully accurate measure.[2] These results could then be compared to the current BAH rates to examine how far they deviate from full accuracy. Unfortunately, such an approach is beyond the scope of this QRMC study.

An alternative, indirect approach would be to see how changes in year-to-year BAH rates affect servicemembers' housing choices. A 2018 study for the Navy found that changes in BAH rates

[2] These surveys would use similar rules to BAH by restricting inappropriate neighborhoods, but they would use larger sample sizes for more statistical power. The process could only apply to MHA-profile combinations with a large enough rental market for these more extensive sample sizes to be possible.

relative to other housing metrics affect servicemembers' choices [6]. When BAH fell relative to other metrics, more servicemembers chose to reside in privatized military housing. When BAH increased relative to other metrics, more servicemembers chose to reside in civilian housing. Therefore, servicemember choices can be used as a predictor of year-to-year accuracy.

Our initial plan was to expand the 2018 study to include the other military services and use changing housing choices as a measure of the accuracy and consistency in BAH. However, we were not able to obtain occupancy data for servicemembers in the Army or Air Force's privatized housing projects. Therefore, we will interpret Congress's request to refer to evaluating the sufficiency of BAH to meet servicemember housing needs based on the standards set out by statute and DOD policies.

To evaluate the sufficiency of current BAH rates, we compared them to rental data from the American Community Survey (ACS). Conducted by the US Census Bureau, the ACS is the largest ongoing community survey in the US and is sent to about 3.5 million households each year [7]. The Census Bureau provides access to a large subset of ACS survey data, aggregated by public use microdata areas (PUMAs). ACS estimates are provided in 5-year increments, the latest being from 2017 through 2021. Unlike indices of housing cost, which can provide useful information about rates of change but not the appropriate levels for BAH, the ACS allows us to evaluate levels because it has information about both housing expenditures and income. Servicemembers earn more than civilian renters on average and therefore have higher housing standards. To evaluate the sufficiency of BAH, we used ACS data on household rents, incomes, housing type, bedrooms, household size, and age for the most recent 5-year estimates.

Comparing BAH to civilian housing expenditures

Our analysis of the ACS included innovative techniques for (1) identifying civilian income groups comparable to military servicemembers and (2) aggregating PUMAs to estimate the sufficiency of BAH rates.

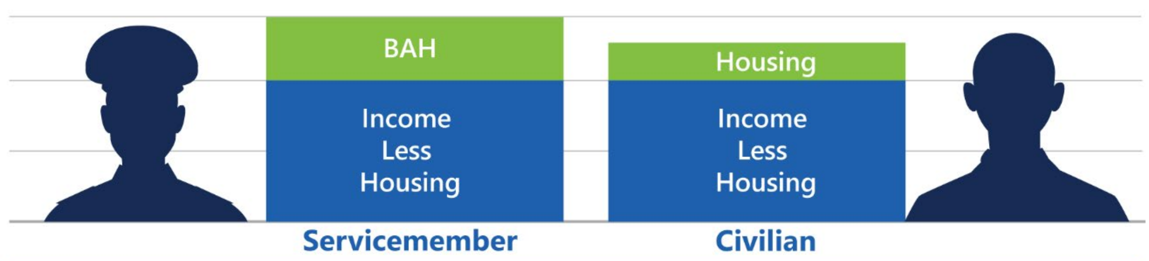
Identifying comparable income groups

BAH, with its associated absorption rates, is intended to equalize the non-housing income of servicemembers across the country. Servicemembers who rent the standard BAH unit for their paygrades are supposed to have equal amounts of remaining income regardless of where they are stationed in the US. Because we are interested in the sufficiency of BAH, we want to compare servicemembers to civilians with similar non-housing income; the member's regular military compensation (RMC) minus their BAH should match the civilian's household income minus their expenditures on rent and utilities.[3] To this end, we divided the ACS data into ventiles,[4] each containing about 5 percent of the sample used. Instead of grouping these ventiles by income, we grouped them by income less housing and utility expenses. We excluded civilians who live in mobile or group homes, and we used the Consumer Price Index (CPI)[5] to inflate the median values to January 2023 so they could be appropriately compared to the 2023 BAH rates that took effect at that time.

Finally, BAH is supposed to estimate the cost of vacant rental units, while the ACS estimates the costs of vacant and occupied units. We compared the rents paid by new movers—defined as tenants who have moved in within the last 12 months—and found they were on average 7.9 percent higher, so we adjusted all the median rents accordingly for this new renter premium.

The income-less-housing approach facilitates assessing the sufficiency of BAH rates across the country. BAH is a major component of military compensation. For an E-5 with dependents and 10 years of service, BAH can vary from 26 percent to 121 percent of basic pay, with the average being 55 percent [8-9]. Such a large variation makes comparisons with pure income ventiles difficult because the appropriate income comparison varies so greatly from location to location. However, comparing the servicemember to civilians with similar non-housing incomes (measured as income less rent or RMC less BAH) provides a much more stable comparison, which we illustrate in Figure 1.

Figure 1. Comparing BAH to housing expenditure of comparable civilian



Source: CNA.

[3] Although we compare members' RMC to civilians' total household income, we realize that members may have additional sources of income such as bonuses and special pays, spouses' wages and salaries, and investment income. A member whose total household income is significantly higher than their RMC may accordingly choose to spend more on housing than a civilian with household income equal to the member's RMC.

[4] Ventiles are 5 percentile increments. The full sample, therefore, is composed of 20 ventiles.

[5] The ACS uses the general CPI to adjust the results between its annual surveys. We tried to be consistent.

Nationwide average results

Table 1 shows how average BAH for each paygrade in 2023 compares with what comparable civilians spend on rent and utilities, if their incomes and housing expenditures are inflated to January 2023 dollars and if we assume they have just moved into a new home in the last year (as BAH recipients are likely to have done). For example, reading from left to right across the row for the W1 paygrade, we find that the average BAH paid to W1s with dependents in 2023 is 25 percent higher than what civilian households with the same income-less-housing would spend on rent and utilities, and that it would be 32 percent higher if BAH did not notionally require an out-of-pocket contribution. Continuing along the row, we find that the average BAH paid to W1s without dependents is 15 percent lower than expenditures of comparable civilians and would still be 11 percent lower without the notional out-of-pocket. For all other paygrades, and particularly for members with dependents, BAH is on average more than sufficient despite the notional "5 percent out of pocket" contribution.[6]

Table 1. Sufficiency of BAH at the national average level, by paygrade

Grade	% difference from civilian, with dependents	"5% out of pocket" added back in	% difference from civilian, without dependents	"5% out of pocket" added back in
E2	60%	68%	23%	29%
E3	57%	65%	26%	32%
E4	41%	49%	15%	21%
E5	45%	53%	27%	34%
E6	53%	61%	27%	34%
E7	38%	46%	17%	23%
E8	46%	53%	19%	25%
E9	26%	32%	10%	16%
W1	25%	32%	-15%	-11%
W2	39%	46%	18%	24%
W3	37%	44%	24%	30%
W4	26%	32%	13%	19%
W5	17%	23%	17%	23%
O1E	57%	65%	37%	44%

[6] Average compensation (including tax advantage) for servicemembers varies with family size, so to determine the comparable civilian for members with dependents, we used the average regular military compensation of members with the median number of dependents (among members with dependents) for their paygrade.

Grade	% difference from civilian, with dependents	"5% out of pocket" added back in	% difference from civilian, without dependents	"5% out of pocket" added back in
O2E	47%	55%	30%	36%
O3E	46%	54%	31%	38%
O1	27%	33%	15%	21%
O2	39%	46%	23%	29%
O3	35%	42%	23%	30%
O4	38%	46%	23%	30%
O5	51%	59%	28%	35%

Source: CNA.

[a] E2s, E3s, and E4s have different results even though their BAH standards are the same. This is because they have different RMCs, and BAH is intended to provide housing quality comparable to civilians with similar incomes. The DOD RMC calculator does not always provide estimates for E1s, so we were not able to include the E1 BAH amounts in our assessments.

Accuracy: across MHAs

We cannot use the ACS data to determine what comparable civilians spend on a particular housing type in a particular MHA, and therefore to directly measure how it compares to BAH for each paygrade-MHA combination. If one filters the ACS data by several attributes for specific areas, it can quickly devolve into small sample sizes, creating concerns about statistical validity. Instead, we developed a set of upper bounds against which we can compare BAH in 87 percent of MHAs. If a BAH rate exceeds this upper bound, we are confident that it is more than sufficient. Members in the most expensive 13 percent of households that we cannot develop an upper bound for are likely among the most highly compensated relative to their civilian peers because BAH applies the same set of housing standards even in the most expensive markets, whereas civilians adjust their housing choices based on local market conditions.

Grouping ACS survey samples to assess the MHA-specific sufficiency of BAH

To create these upper bounds, we grouped the PUMAs into low, medium, and high housing cost areas.[7] We also sorted MHAs by BAH and split them into sixths (halves of thirds) as shown in Figure 2. If the average housing costs in an MHA are at the *lower* end of a cost third, and yet BAH for a given paygrade is *higher* than the average housing expenditures of comparable civilians in that cost third, we are confident that BAH is sufficient for that paygrade and MHA. If average housing costs in an MHA are at the higher end of a cost third, and BAH for a given paygrade is higher than the average housing expenditure of comparable civilians in the *next* (higher) cost third, we are confident that BAH is sufficient for that paygrade and MHA.[8]

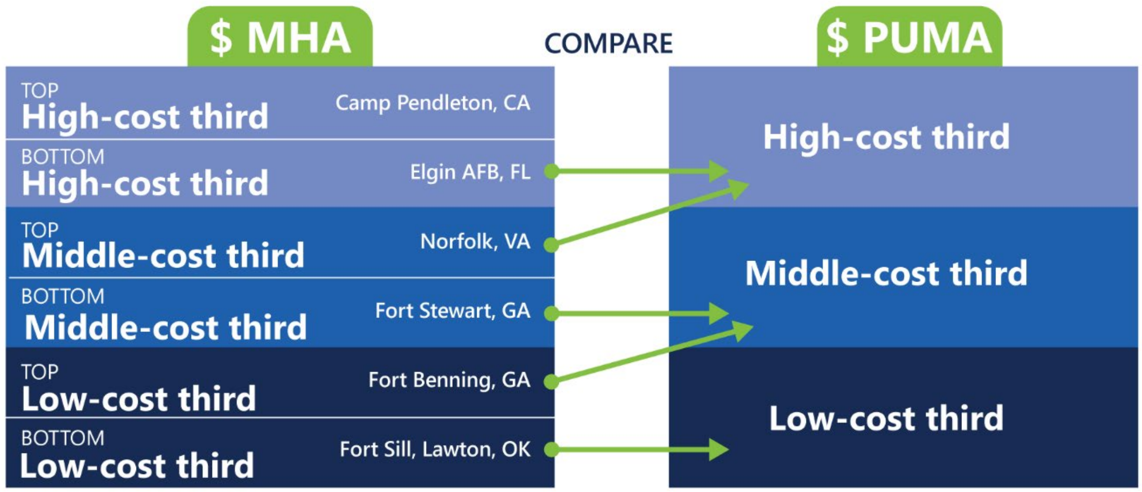
For example, suppose a member is stationed in the Norfolk, Virginia MHA, and BAH for their grade in that MHA is in the top half of the middle third of MHAs. If their BAH is higher than what comparable civilians spend on housing in the highest-cost third of PUMAs, then we are confident that their BAH is sufficient. This approach does not allow us to account for the 50 MHAs with the highest BAH (such as San Diego or Hawaii) because we do not have an upper bound against which to compare them. However, members in those high-cost MHAs are receiving BAH tied to a nationwide housing standard despite the fact that civilians tend to consume less housing in more expensive areas, so they are likely to be receiving more BAH than comparable civilians spend on housing.

[7] The available ACS data consisted of 2,351 PUMAs. We chose the half of these PUMAs (1,175) in which the percentages of active-duty military populations exceeded the ACS median in order to exclude locations that have essentially no servicemembers and are not relevant for comparison to BAH recipients.

[8] We were concerned about whether matching MHA BAH rates to ACS PUMAs by low-, medium-, and high-cost areas would be statistically valid. It implicitly assumes that MHAs with higher BAH rates map to PUMAs with higher average civilian rental expenditures and vice versa. We tested this correlation by identifying the 25 PUMAs with the highest military densities, which range in cost from Honolulu County-Koolaupoko to Pennyrile Area Development District (South) in Kentucky and map to 21 MHAs. The relative ordering of these MHAs by E5 with-dependents BAH has an 85 percent correlation with the relative ordering of the average housing costs in their respective PUMAs, and the correlation is even slightly higher if we use O3 with-dependents BAH.

In addition, we examined the ratios of the E1 to E4 with-dependents BAH rates in the MHA ordering to their corresponding mean rental costs in the PUMA ordering. The ratios stayed in a very tight range, suggesting that these are indeed comparable orderings. Both of these tests convinced us that the methodology comparing MHA BAH rates to PUMA rents using their relative rankings is indeed sound.

Figure 2. Comparing BAH within an MHA to housing expenditures in comparable-cost areas



Source: CNA.
The MHA listed in each cost tier is an example, but the exact set of MHAs assigned to each cost sixth will vary depending on the paygrade. Each BAH anchor point is estimated separately for each MHA and therefore the relative ordering of MHAs by BAH rate differs by grade.

Creating these upper bounds also involved using high estimates of servicemember incomes. Military pay is based on rank and years of service (YOS). For each paygrade, we used the maximum YOS for that paygrade, so it matches the highest ventile possible. For example, basic pay (BP) for an E5 maximizes out at 12 years of service. This is higher than the BP for the average E5. We compared the E5 BAH rates to civilian rental costs in ventiles comparable to this higher income level. We used the DOD RMC calculator to estimate the RMC for each paygrade[9] and MHA; doing so enabled us to include the tax advantage from allowances to create a high estimate to compare to the civilian ventiles. If the BAH rates exceeded these high-estimate medians, we concluded that BAH is at least sufficient.

Results across MHAs

Table 2 and Table 3 display the percentages of MHAs in which we confidently assess that BAH is sufficient for each paygrade. For example, of the 250 MHAs that we can compare against an

[9] The RMC calculator does not always provide income levels for E1 servicemembers, so we needed to exclude that paygrade from our analysis.

upper bound, the E5 row shows that BAH for an E5 with dependents meets or exceeds this upper bound in 244 MHAs, or 98 percent of them. Just as members with dependents receive higher BAH at the national average level, we also can confirm the sufficiency of their BAH in a higher percentage of MHAs.

Appendix B displays civilian spending on housing. For a given housing profile, civilians of different income levels spend very different amounts because number of bedrooms and housing type are just two of many factors that influence cost. Appendix C shows the maximum amount by which BAH could be insufficient across MHAs (the shortfall relative to our deliberate upper bound) when compared to civilian spending. These possible shortfalls relative to comparable civilians tend to be larger for members without dependents.

Table 2. BAH sufficiency statistics for servicemembers with dependents

Paygrade	Number of MHAs for which BAH is sufficient	Number of MHAs for which BAH may not be sufficient	Percent of assessed MHAs with sufficient BAH	Number of MHAs we cannot assess
E2[a]	247	3	99%	50
E3[a]	244	6	98%	50
E4[a]	239	11	96%	50
E5	244	6	98%	50
E6	218	32	87%	50
E7	223	27	89%	50
E8	250	0	100%	50
E9	250	0	100%	50
W1	203	47	81%	50
W2	240	10	96%	50
W3	250	0	100%	50
W4	250	0	100%	50
W5	226	24	90%	50
O1E	246	4	98%	50
O2E	250	0	100%	50
O3E	250	0	100%	50
O1	242	8	97%	50
O2	201	49	80%	50
O3	249	1	100%	50
O4	229	21	92%	50
O5	243	7	97%	50

Source: CNA.

[a] E2s, E3s, and E4s have different numbers of MHAs with sufficient BAH amounts even though their BAH standards are the same. This is because they have different RMCs, and BAH is intended to provide housing quality comparable to civilians with similar incomes. The DOD RMC calculator does not always provide estimates for E1s, so we were not able to include the E1 BAH amounts in our assessments.

Table 3. BAH sufficiency statistics for servicemembers without dependents

Paygrade	Number of MHAs for which BAH is sufficient	Number of MHAs for which BAH may not be sufficient	Percent of assessed MHAs with sufficient BAH	Number of MHAs we cannot assess
E2[a]	189	61	76%	50
E3[a]	165	85	66%	50
E4[a]	148	102	59%	50
E5	125	125	50%	50
E6	169	81	68%	50
E7	145	105	58%	50
E8	153	97	61%	50
E9	137	113	55%	50
W1	124	126	50%	50
W2	208	42	83%	50
W3	135	115	54%	50
W4	95	155	38%	50
W5	145	105	58%	50
O1E	210	40	84%	50
O2E	172	78	69%	50
O3E	148	102	59%	50
O1	130	120	52%	50
O2	188	62	75%	50
O3	138	112	55%	50
O4	147	103	59%	50
O5	175	75	70%	50

Source: CNA.

[a] E2s, E3s, and E4s have different numbers of MHAs with sufficient BAH amounts even though their BAH standards are the same. This is because they have different RMCs, and BAH is intended to provide housing quality comparable to civilians with similar incomes. The DOD RMC calculator does not always provide estimates for E1s, so we were not able to include the E1 BAH amounts in our assessments.

Efficiency

We also looked at the efficiency of BAH. *Efficiency* can be interpreted as cost effectiveness—are there cheaper and easier ways of calculating equally accurate BAH rates apart from the current survey process? As mentioned above, determining accuracy can be a difficult process. Efficiency can also be interpreted in a technical sense. An efficient estimator is characterized as having the smallest possible variance, indicating that a small deviance exists between the estimated value and the "true" value [10]. We will interpret efficiency in this more technical definition—that Congress is concerned about the “volatility” of BAH regarding changes in its annual rates compared to the housing market.

One of the striking things about the year-to-year changes in BAH rates is their volatility. Even within a single MHA, large differences in the increases between different anchor points and paygrades are common. This contrasts with other metrics about changing housing prices. The CPI provides one number for an entire area, implicitly assuming that all rents in that area increase or decrease at similar rates. The same is true for some commercial rent indices, such as the Zillow Observed Rent Index (ZORI) and the Penn State/ACY Marginal Rent Index (MRI). It is important to note that none of these indices can be used to set BAH rates as a replacement for the current BAH process because they do not align with MHAs and do not exclude neighborhoods based on DOD standards or link expenditures to civilians of comparable income. Appendix F contains descriptions of different rental market price indices.

One housing market index that does show different categories of housing within a specific area is the US Department of Housing and Urban Development (HUD) 50th percentile housing costs. However, the HUD data are much less volatile than the BAH. This is partly by design (HUD tries to maintain consistent cost ratios across different numbers of bedrooms in a given area), but it would likely be less volatile anyway for three other reasons. HUD uses Census data, it uses a set of four profiles instead of six (it only divides the data by number of bedrooms), and it expands the geographic footprint as needed to get statistical validity rather than being restricted to MHAs. In other words, it is not a substitute for the BAH process.

To measure this BAH volatility, we looked at the percentage increases in the different BAH rates and anchor point[10] rates for each MHA from 2007 through 2023. We considered the MHA rates to be volatile in a specified year if year-on-year changes for different BAH rates or anchor

[10] To estimate the BAH anchor point cost increases, we made several adjustments to the published BAH rates. First, we adjusted all the rates for the published absorption rate that servicemembers are expected to pay out of pocket for their BAH standard unit. Then we adjusted for renters’ insurance that had been included as part of the BAH until 2015. As far as we know, OSD never published specific amounts for renters’ insurance, other than estimating it to be 1 percent of BAH. The absorption rate for 2015 was also 1 percent of BAH, so we used that amount as an estimate for renters’ insurance and deflated it for previous years using the general CPI. Finally, we derived the anchor point estimates from these specific adjusted BAH rates. We estimated the one-bedroom apartment for each MHA to be this adjusted BAH rate (after adding the absorption amount and subtracting the estimated renters’ insurance amount for the applicable years) for an E4 without dependents. We estimated the two-bedroom apartment anchor amount using the E1 to E4 with-dependents adjusted BAH rate and the E5 with-dependents BAH adjusted rate. The two-bedroom townhouse was the E5 with-dependents adjusted BAH rate. The three-bedroom townhouse was the E6 with-dependents adjusted BAH rate. The three-bedroom single family detached (SFD) rate was the W3 with-dependents adjusted BAH rate. The four-bedroom SFD rate was the O5 with-dependents adjusted BAH rate.

point rates differed by more than 10 percentage points.[11] For example, if the BAH rate for a with-dependents paygrade increased by 8 percent from the previous year, but the BAH rate for another paygrade in that same MHA decreased by 3 percent that same year, we considered that MHA-year combination to have a volatile change in BAH.[12]

Efficiency results

If we define a volatile MHA year as one with a greater than 10 percentage point spread in year-on-year changes, more than half of the MHAs had volatile BAH rates in any specific year since 2008.[13] Even similar categories of housing often showed great volatility within the same MHA and year. For example, the difference in the annual rate changes between one- and two-bedroom apartments varied by up to 55 percentage points.[14] The maximum difference in the rate changes between two- and three-bedroom townhouses was 27.4 percentage points.[15] The maximum difference in the rate changes for three- and four-bedroom single family detached (SFD) homes was 34.5 percentage points.[16]

To put the BAH volatility into context, we compared it to the volatility of HUD's 50th percentile housing costs. HUD produces these costs each year for approximately 2,600 metropolitan statistical areas and counties. Using the same volatility metric, we found that the HUD estimates are generally much less volatile than BAH. In the average year between 2007 and 2023, approximately 16 percent of the HUD areas had volatile changes in their rates. In contrast, for the BAH anchor points, over 65 percent of the MHAs had volatile rate changes in an average year. Figure 3 shows the percentage of volatile areas for each year.

[11] The 10-percentage point difference is an arbitrarily chosen cut off, but by any measure, BAH has more variance in year-on-year changes within the same area and year than the HUD estimates.

[12] Using the calculation: 8 percent – (- 3 percent) >= 10 percentage points.

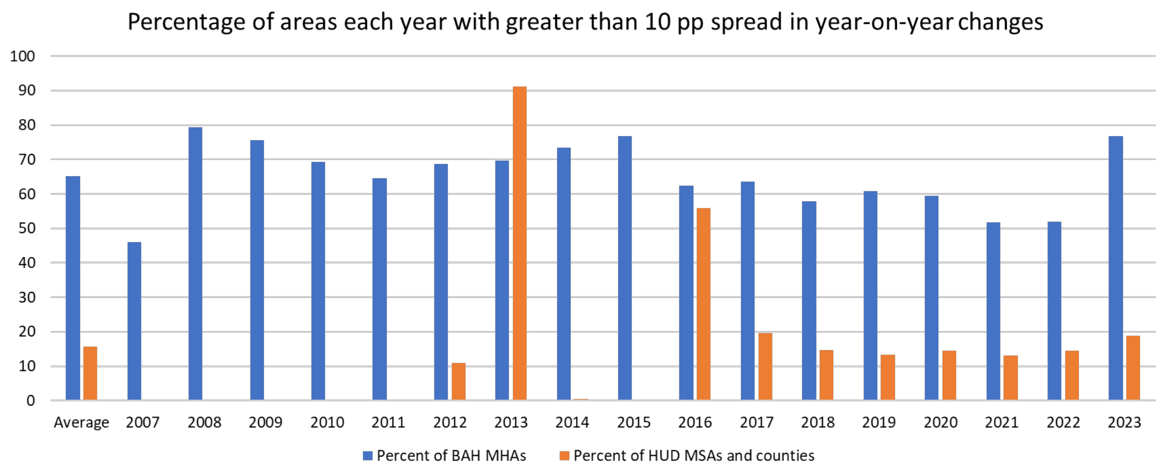
[13] In 2007, a little less than half of the MHAs had volatile BAH rates using this definition.

[14] This was in 2008 in Kodiak, Alaska, where the estimated cost of a one-bedroom apartment increased by almost 40 percent, but the two-bedroom apartment decreased by more than 15 percent.

[15] This was in 2012 in Minot, North Dakota, where the estimated cost of a two-bedroom townhouse increased by 66.3 percent, but the cost of a three-bedroom townhouse increased by 39.9 percent. All housing had large increases in that market that year, but the differences between units in the other categories were much smaller.

[16] This was in 2008 in Jackson, Tennessee, where the price of a three-bedroom SFD rose by 0.7 while the price of a four-bedroom SFD rose by 35 percent. Other housing categories rose in the 10 to 20 percent range.

Figure 3. Volatility comparison between BAH MHAs and HUD housing areas

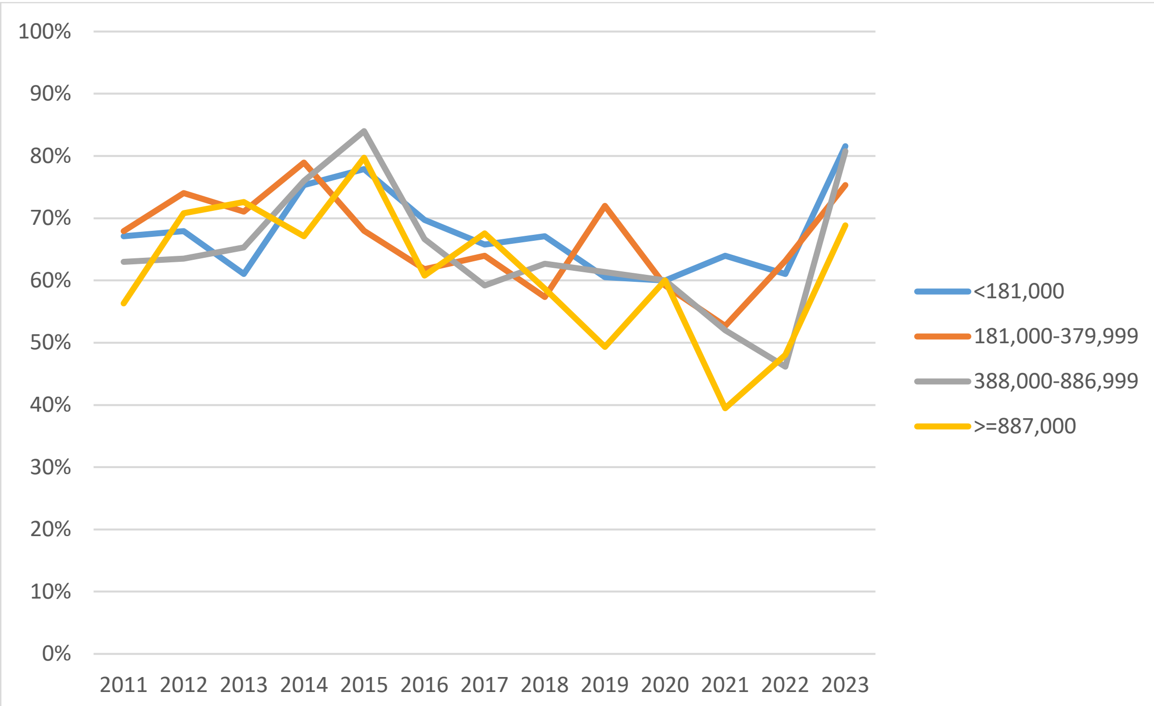


Source: CNA generated from historical BAH rates published at [Basic Housing Allowance | BAH Rate Lookup | Defense Travel Management Office (dod.mil)] and historical HUD estimates at [50th Percentile Rent Estimates | HUD USER.]

Note: The HUD data had high volatility in two outlier years: 2013 and 2016. We enquired about those years; it was suggested that they may have been the result of a recalibration of the HUD rates. We are still investigating for a more definitive answer.

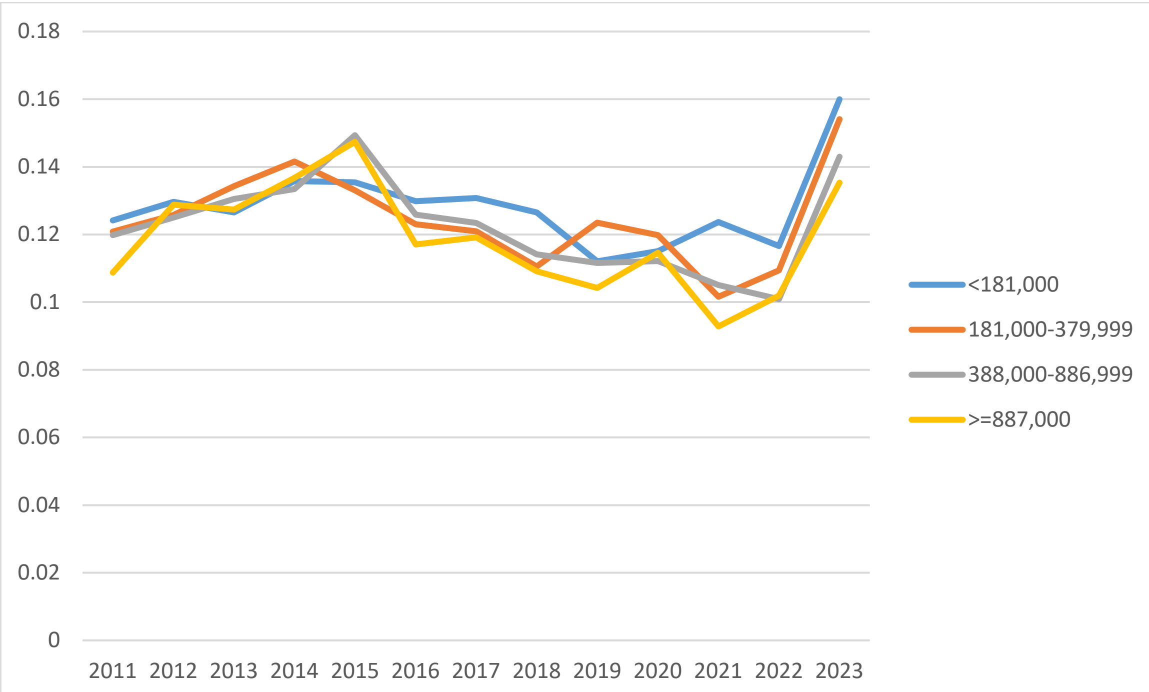
As noted above, BAH is estimated for each MHA regardless of its size, and it is to be expected that MHAs with smaller civilian populations would have fewer rentals available to sample in the BAH survey. These smaller samples, particularly for BAH profiles that are less common in that MHA (e.g., townhouses in some rural areas), have less statistical power and can generate more variance. However, as shown in Figure 4 and Figure 5, even the MHAs with the largest civilian populations (more than 887,000) have surprisingly high volatility.

Figure 4. Percentage of MHAs in which year-on-year change in BAH differs by more than 10 percentage points across anchor points, by MHA population and year



Source: CNA generated from historical BAH rates published at [Basic Housing Allowance | BAH Rate Lookup | Defense Travel Management Office (dod.mil)].
Note: MHAs are sorted by population into four equal sets of 75 each.

Figure 5. Mean percentage points difference between highest and lowest year-on-year change across anchor points, by MHA population and year



Source: CNA generated from historical BAH rates published at [Basic Housing Allowance | BAH Rate Lookup | Defense Travel Management Office (dod.mil)].
Note: MHAs are sorted by population into four equal sets of 75 each.

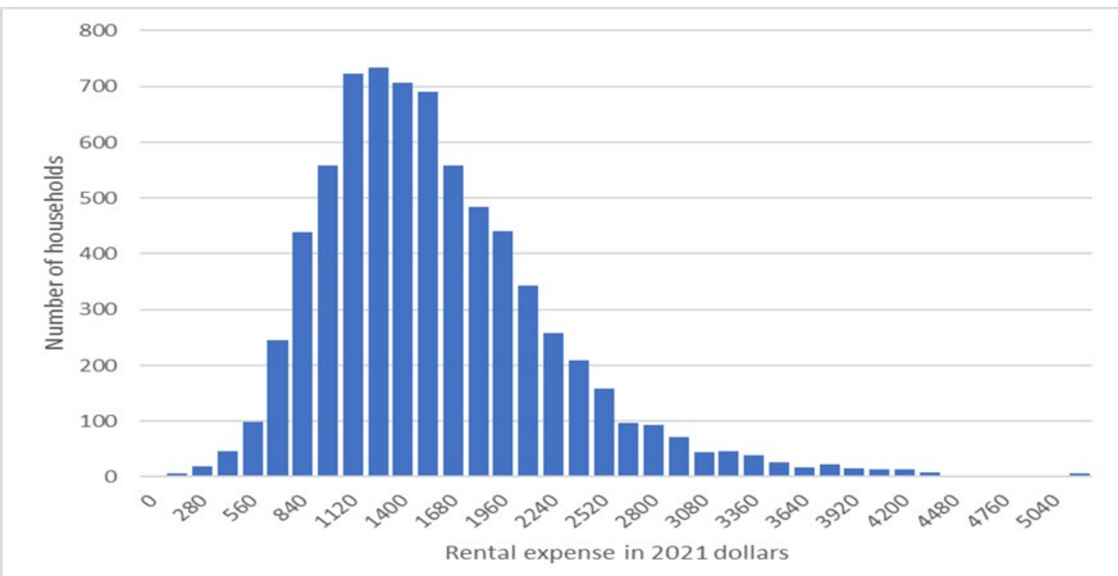
Discussion

Although BAH is high relative to civilian housing expenditures, it may be less so compared to servicemembers' expectations. This issue is related to the statistical problem of accurately setting the rate for each MHA, which can lead to BAH being far more generous for some MHAs than others, and to the significant differences in BAH changes across paygrades. BAH recipients may find that BAH relative to local civilian spending is lower in their current MHA than in their previous one or may learn it is lower than the MHA and paygrade combination of someone else they know. As a result, they may conclude that theirs is insufficient. We also note that some members are stationed in high-cost urban areas where they can trade a longer commute for lower rent or a larger home (e.g., stationed at the Pentagon and commuting from Stafford), and they may be dissatisfied if they are next stationed somewhere without that trade-off option.

Is the Mean, Median, or Another Percentile of the Housing Cost Distribution Appropriate?

In the general population, housing costs tend to have a longer tail to the right of the median than to the left, resulting in the mean being higher than the median.[17] For example, Figure 6 shows the distribution of housing expenditures for three-person civilian households with income-less-expenditures in the same range as an E8 with 18 years of service or an O3 with six years of service (the 80th to 85th percentile of the civilian distribution). The mean is $1,519 per month, higher than the median of $1,405 per month. In this example, the mean corresponds to the 58th percentile.

Figure 6. Distribution of monthly housing expenses for three-person households in the 80th to 85th percentile of income minus housing expenses



Source: RCF Economic and Financial Consulting, LLC., generated from ACS 2017–2021 data.

[17] This is common for many types of distributions that are limited to positive numbers because there is a limit to how low the numbers can go but not how high.

As part of the BAH sufficiency analysis, we compared the rental cost mean to its equivalent percentile for 352 different combinations of housing types and income-minus-rental-cost ventiles. The equivalent percentiles for those mean rents varied from the 48th percentile to the 63rd percentile, with the average being the 57th percentile.

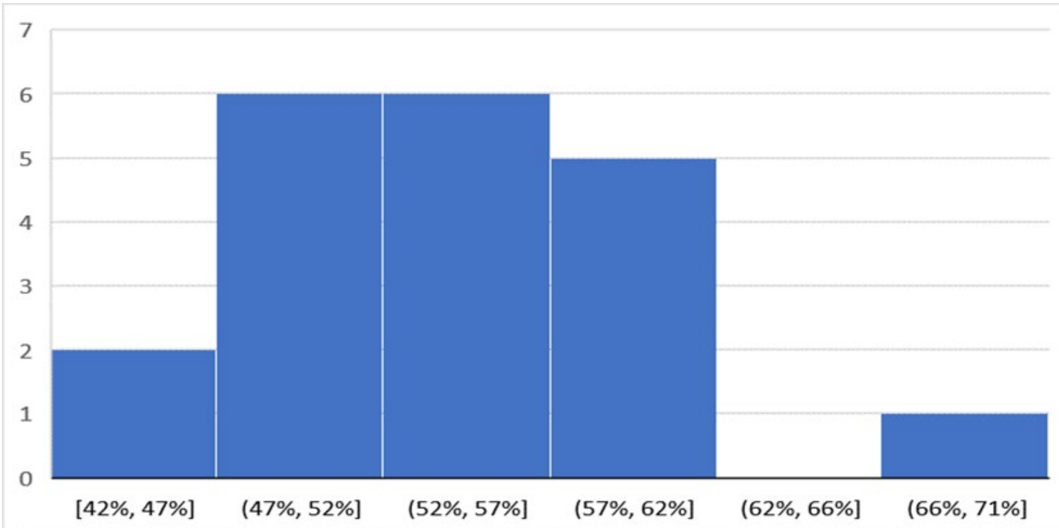
As an additional consideration, the BAH surveys exclude certain neighborhoods and typically have relatively small sample sizes. This can produce cost distributions with various and unexpected shapes. Although we do not have access to the raw data from BAH surveys conducted by Robert D. Niehaus, Inc., OSD Compensation determined the percentile that corresponds to the mean in 20 randomly chosen surveys (MHA-anchor point combinations). These 20 examples represent all six anchor points, all four Census regions, and communities ranging in size from Los Angeles, California, to Port Angeles, Washington. As shown in Figure 7, the means of these surveys correspond to anywhere from the 42nd to the 71st percentile of the survey. This is even more variable than the BAH sufficiency statistics based on the ACS survey.

Therefore, setting BAH rates according to means rather than medians would make members in some MHAs and paygrades worse off, and those who benefited would do so to an uneven degree. The survey in which the mean corresponded to the 42nd percentile was a survey of anchor point 1 (one-bedroom apartments) in Topeka, Kansas, indicating that in some cases the most junior and lowest paid members would be those adversely affected by this change.

If decision-makers are dissatisfied with the BAH rates provided by survey medians,[18] it would be better to choose another specific percentile for setting rates. Doing so would raise or lower BAH in a consistent manner, whereas basing the rates on sample means would not.

[18] Median values are equivalent to the 50th percentile of a sample population.

Figure 7. Percentiles corresponding to the average means for 20 BAH survey areas



Source: OSD Compensation analysis of BAH survey data gathered by Robert D. Niehaus, Inc.

Do Existing MHAs Contain Suitable Choices of Available Housing for Servicemembers?

Servicemembers have many reasons for choosing where they want to reside. Some want to minimize commutes to their assigned duty stations. Some want to minimize commutes for their spouses. Some desire their children to attend specific schools. Some choose to have long commutes in order to afford a larger home or to be close to family. Without specifically asking servicemembers for their reasons, we can only hypothesize.

Using data from the Defense Manpower Data Center (DMDC), we estimated that 92 percent of servicemembers reside in the MHAs of their assigned duty stations. Comparing DMDC and ACS data, we found that most servicemembers are residing in ZIP codes that have appropriate rental cost demographics.

Approach

We used two methods to determine whether the current MHAs contain suitable housing for servicemembers. First, we used DMDC data from October 2022[19] to determine the percentages of servicemembers residing in their assigned MHA or commuting from a neighboring MHA. Second, we compared the ZIP codes where servicemembers reside to income and rental cost demographic data from the ACS to determine the relative quality of the neighborhoods servicemembers are choosing.

[19] These data are from the DMDC BAH file and the Active Duty Personnel Master File. We chose the October 2022 data because that is the latest period that DMDC has data from all of the military services..

Findings

What we know about housing availability within existing MHAs

We estimated that about 92 percent of servicemember families reside within their assigned MHAs and 8 percent commute from neighboring MHAs.[20] This figure excludes BAH recipients whose residential ZIP code is neither in their BAH ZIP code nor an adjacent one because we could not distinguish between out-of-date residential address and true geo-bachelors.[21]

Of those servicemembers with dependents who choose to reside in neighboring MHAs, about 40 percent commute from MHAs with higher BAH rates (and presumably higher housing costs) than their duty station's MHA. Approximately 60 percent of servicemembers residing in neighboring MHAs choose MHAs with lower BAH rates (and presumably lower housing costs). Where MHAs are directly contiguous and non-trivial numbers of BAH recipients commute from a home in one to a duty station in the other, OSD implements data-sharing agreements so that rents in some ZIP codes are factored into calculating BAH for both MHAs.

We found a few MHAs with high shares of BAH recipients commuting from outside. Out of 300 MHAs, there are 28 with fewer than 70 percent of recipients living within the MHA, and 5 have fewer than half living within the MHA. These 28 MHAs are named for cities or counties rather than installations and tend not to be near any major military installation.

Quality of servicemember housing

Distribution of member ZIP codes relative to civilian peers

We can also indirectly assess some quality aspects of the locations chosen by servicemembers using data from the ACS from 2011 to 2021. We compared demographic data for the ZIP codes where servicemembers choose to reside within their MHA to data in the corresponding ACS ZIP Code Tabulation Areas (ZCTAs).[22]

[20] This analysis excludes geo-bachelors whose residential ZIP code and BAH ZIP code are not in neighboring MHAs, suggesting their families reside in more distant locations.

[21] Roughly a quarter of address ZIP codes for servicemembers with and without dependents were located more than 100 miles from their duty stations. We believe that some are geo-bachelors and that some records are not current; therefore, we exclude them from our statistics. Also, only one percent of personnel assigned to county cost groups (duty stations without MHAs) have residential ZIP codes that match the county to which they are assigned, which suggests sparse housing in those counties but also suggests many out-of-date addresses.

[22] In most cases, the ZCTA is identical to the ZIP code for an area—but this is not always true. Therefore, we used a crosswalk linking ZCTAs to ZIP codes from the Uniform Data System (UDS) Mapper website.

For their BAH surveys, OSD Compensation tracks the subset of ZIP codes within MHAs where servicemembers reside. This subset of ZIP codes is commonly referred to in DOD as "Effective Market Areas" (EMAs). We matched the EMAs to their corresponding ZCTAs and ranked them among all the ZIP codes within specific MHAs. We ranked the ZIP codes by median gross rents and median incomes from the ACS.[23]

The EMA ZIP codes typically had higher gross rents than the rest of the ZIP codes within the MHAs. This was true for 74 percent of the MHAs. Because rent is an indicator of housing quality and location desirability, this suggests that servicemembers are finding available housing in better areas within the MHAs.

Table 4 shows the range of differences between MHA ZIP codes within and outside of the EMAs. The largest differences came out to be +/- $474, with the average across all MHAs being $80.

Table 4. Range of average gross rent differences for MHA ZIP codes inside and outside the EMAs

	BAH MHA	BAH MHA name	Average gross monthly rent (in $2022)		Difference (EMA minus non-EMA)
			ZIP codes inside EMA	ZIP codes outside EMA[a]	
Highest difference	RI256	Newport, RI	$1,610	$1,136	$474
Median difference	IL335	Springfield/ Decatur, IL	$875	$789	$86
Lowest difference	CT051	New Haven/ Fairfield, CT	$1,478	$1,952	-$474
National average			$1,163	$1,084	$80

Source: CNA generated using the Census Bureau's Data Explorer tool.
[a] Excludes MHAs that have no ZIP codes outside the EMA.

From these data, we found that servicemembers are usually finding housing in the more expensive ZIP codes within their MHAs. However, in some MHAs, they are choosing less expensive ZIP codes. In the 74 percent of MHAs where servicemembers choose more expensive ZIP codes, it is by an average rent difference of +$139. In the 26 percent of MHAs where they choose less expensive ZIP codes, it by a difference of -$88. Altogether, these numbers provide

[23] The specific methodology used was to download selected pre-generated tables from the Census Bureau's Data Explorer tool to obtain data on median gross rents (includes contract rent plus additional costs for utilities (i.e., water, electricity, and gas) and fuels) and median incomes. These data are available at the ZIP code tabulation area (ZCTA) level and derived from the ACS 5-Year Estimates Subject Tables.

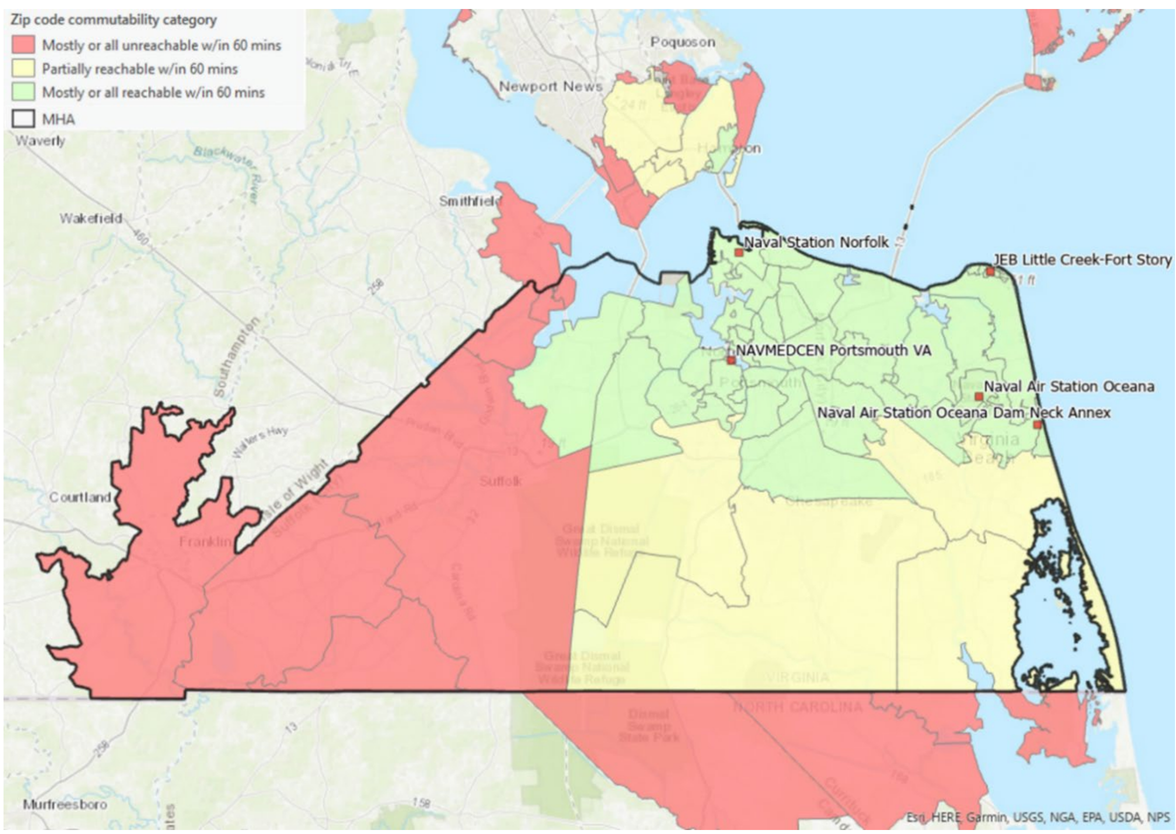
a national average of servicemembers residing in EMA ZIP codes with rents that are $80 more than the other MHA ZIP codes.

Commuting times

MHAs are intended to provide suitable housing areas with reasonable commutes for servicemembers. Reasonable commuting times are not precisely defined, but we interpret them to be within a 60-minute drive during typical rush hours.

Estimating commute times to duty stations using MHA boundaries is complicated by their size and the distances between installations in some MHAs. We provide an example in Figure 8 as a demonstration of the geospatial analysis that is possible for MHAs. ZIP codes shaded red are mostly outside a 1-hour commute radius for at least one primary installation.

Figure 8. Commute times for Norfolk/Portsmouth, Virginia, MHA (VA 298)



Source: CNA generated from overlapping 60-minute driving isochrones of primary military installations within the MHA.

Installations near MHA boundaries

We do not know the reasons for the choices BAH recipients make regarding where to live. Servicemembers who choose more expensive MHAs may have working spouses who add to the family's income, or they may not be able to find suitable housing in their assigned MHA. Servicemembers who commute from MHAs with lower housing costs may do so in order to afford a larger home than the BAH standard. Without a specific survey, focus group, or other data collection process, it is not possible to know for certain.

Sometimes, a base installation may not be in the center of the MHA, but closer to the boundaries. As a result, servicemembers may have reasonable commutes from neighboring MHAs. If that neighboring MHA has lower housing costs, then a member commuting from there should have sufficient BAH. However, this proximity to the boundary could be problematic if the neighboring MHA has higher housing costs.

How Suitable Are the Six Standard Housing Profiles to the Average Family Sizes of Servicemembers?

We compared the BAH housing profiles to the demographics of military families. For the great majority of families, the number of bedrooms provided by BAH should be sufficient. For a married couple who would like each of their children to have a separate bedroom, the BAH housing standards should be sufficient for 69 to 90 percent of military families depending upon paygrade.[24]

We estimated the costs of changing the BAH profiles to different standards, some depending upon family size. Depending on the standard chosen, the rough estimate of the additional cost ranges from a high of $2 billion to a potential savings of $1 billion per year.

The problem of BAH not providing enough bedrooms for larger military families has been lessening over time. Similar to civilians, servicemembers are choosing to delay marriage and have fewer children. If these trends continue, it will have important ramifications for BAH and the demand for other family-related benefits.

The original NDAA request was to evaluate the suitability of the housing profiles in relation to average family sizes disaggregated by uniformed service, rank, and MHA. However, we could evaluate this only in relation to DOD-wide family sizes disaggregated by rank. Data were not available to disaggregate the results by uniformed service and MHA.

Background and approach

BAH was designed so that servicemember families could afford to rent similar quality homes regardless of where in the US the servicemember was assigned. Therefore, BAH standards need to be specified for each paygrade with corresponding rents estimated throughout the nation.

[24] In practice, the number of bedrooms that a given paygrade rates when calculating BAH does not determine the size of home that the member will rent or buy, even if the member spends exactly their BAH on housing each month, because the number of bedrooms is one of several factors (e.g., quality of neighborhood, proximity to amenities, and age of structure) that determine a unit's price. A member receiving BAH at a rate meant for more bedrooms who has fewer dependents may choose a more expensive location, and vice versa.

Servicemembers are not required to rent these types of homes, but if they choose to do so, the median price of their paygrade's housing standard should be covered by the servicemember's BAH and absorption amounts. This policy is in contrast to the assignment policy if the servicemember family chooses to reside in on-base privatized housing. There, the unit provided for that servicemember's BAH rate (without any absorption amount) depends upon family size.

We compared the current BAH housing standards for members with dependents to the 2023 family-size statistics reported by the OSD (Personnel and Readiness), Directorate for Compensation [8].[25] We considered the implications of these family sizes if each child had their own bedroom, or if the number of bedrooms followed on-base housing standards, which allow children under 10 years old to share with a sibling of the same gender and children under 6 to share with a sibling of either gender [11-12].

We also examined the economic literature and ACS data to examine whether housing expenses increase with household size. We used cost and demographic averages from OSD Compensation to estimate rough costs for increasing BAH to match on-base housing standards. The detailed rules for adjusting each member's profile based on family size are found in Appendix E.

Finally, we looked at longer term demographic trends to assess whether potential problems between family sizes and BAH standards have been growing or diminishing over time.

Findings

Adequacy of the BAH housing profiles

Appendix D shows the current distribution of family sizes by paygrade for BAH recipients with dependents to the 2023 family size statistics reported by OSD (Personnel and Readiness).

If we assume that the first dependent is the servicemember's spouse and that it is desirable for children (assumed to be any subsequent dependents) to have separate bedrooms, then these BAH standards have bedroom numbers that are sufficient for between 69 percent and 90 percent of servicemember families for their respective paygrades (94 percent for O7s, though officers of flag rank typically live on base). There is no simple pattern in the relationship between paygrade and this adequacy metric because as members become more senior, their families tend to grow and their housing profiles do as well.

[25] We used the annually published Selected Military Compensation Tables, or "Green Book."

The military's on-base housing standards, however, do permit children to share bedrooms depending on age and gender. Appendix D also shows the different percentages of each paygrade for which the BAH standards provide sufficient numbers of bedrooms based on whether children can share bedrooms. (It varies by paygrade based on the assumptions made regarding the age of the family's children.) We estimate that between 82 percent and virtually 100 percent of servicemember families have sufficient bedrooms for their family size based on bedroom sharing rules.

Servicemembers without dependents

For servicemembers without dependents, the BAH housing standards are usually higher than on-base standards. The BAH standards for enlisted servicemembers range from a one-bedroom apartment for E1s to E4s up to about halfway between a two- and three-bedroom townhouse for E9s. These are better than barracks standards, where servicemembers typically must share a bedroom until E5 and do not get their own bathroom until E7. The lowest BAH housing standard includes a bathroom, a full kitchen, and more than one room.

Comparison with civilian housing choices

From academic literature, we found that within a specific income level, civilian households with more children tend to increase their housing expenses by very little or not at all [13-14]. In examining ACS data, we found a small increase in housing expenses within income levels as household size increases. The average amount was $36 per additional person after the first two people. This increase appears small enough that it may only be due to increased utility costs. Based on these findings, the with-dependents BAH policy of providing one rate regardless of family size appears to be consistent with the civilian population.

Cost estimate of aligning BAH with on-base standards

We estimated the costs of aligning BAH with on-base housing standards for servicemembers with dependents. These cost estimates are rough and include all military paygrades through O6.

To adjust BAH recipients' housing profiles as a function of family size so that BAH provides one bedroom for each child (up to a four-bedroom single family detached home, as that is the largest BAH profile) for all military paygrades, the cost would be approximately $1.1 billion per year. To increase BAH so that it corresponds to the on-base standard that younger children can share a bedroom, the cost would be roughly $340 million per year.

Current on-base and privatized housing mostly consists of three- and four-bedroom units [3]. Some two-bedroom units are available, but servicemembers who accept these smaller units tend to be given discounts from their BAH rates. This suggests that a three-bedroom unit has become the de facto minimum standard for privatized family housing. The cost to increase BAH rates to match this de facto standard of three bedrooms for most and four bedrooms for larger families would be roughly $1.8 billion per year.

Finally, many smaller military families receive extra bedrooms by residing on base and through the BAH standards. For example, a married couple with one child would be entitled to only a two-bedroom home if based solely on family size. If DOD changed BAH rates to precisely match family sizes (both for larger and smaller families, but with a two-bedroom minimum for members with dependents), we estimate that it would result in a net annual *savings* of $1 billion because more BAH recipients would experience a reduction than an increase.[26] Table 5 summarizes the estimated costs for these hypothetical BAH alternatives. It applies only to members with dependents; we assume DOD would not reduce BAH for members without dependents to match their on-base housing standards.

Table 5. Estimated costs for alternative BAH standards

Alternative BAH standards	Estimated Changes to DOD's annual BAH costs
Current BAH costs (2023 estimated)	$26.8 billion[a]
Increase BAH to cover 1 bedroom per child up to 4-bedroom home	$27.9 billion ($1.1 billion higher)
Increase BAH to correspond with on-base bedrooms per child with sharing permitted for younger children	$27.1 billion ($0.34 billion higher)
3-bedroom de facto on-base standard with 4 bedrooms for larger families	$28.6 billion ($1.8 billion higher)
Strict family-size BAH standard with shared bedrooms for younger children	$25.8 billion ($1.0 billion savings)

Source: CNA analysis base on Selected Military Compensation Tables, Jan. 1, 2023 [8].
Does not include members without dependents.
[a] Source: DOD Press Release, "DOD Releases 2023 Basic Allowance for Housing Rates," Dec. 14, 2022 [15].

These rough estimates are all based on average BAH costs per paygrade listed in the Selected Military Compensation Tables [15]. They do not adjust for the distribution of family sizes

[26] This assumes that children can share bedrooms consistent with the rules for on-base privatized housing. If instead a one-bedroom-per-child rule is used in combination with smaller family sizes, the savings would be less at an estimated $234 million per year.

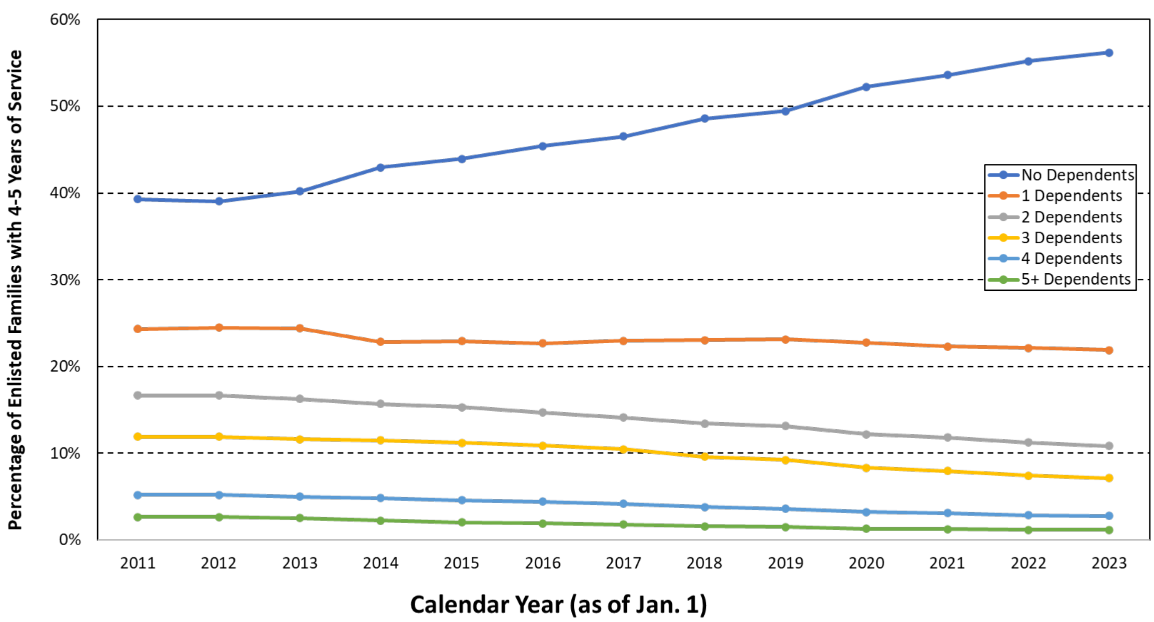
across different MHAs. They also do not adjust for any changes to servicemember family-size choices due to receiving additional BAH payments for larger families.

Has this problem been increasing or decreasing over time?

Congress is concerned about families being inadequately housed based on the number of bedrooms in their BAH profiles, but this issue is becoming less of a problem over time. Using the Selected Military Compensation Tables, we examined family-size trends in the military from 2011 through 2023. Military servicemembers reflect the trends seen in the rest of the US population—they are deciding to marry later and have fewer children.

Figure 9 shows the trends in the number of dependents for enlisted servicemembers with 4 to 5 years of service. The number of single servicemembers increases consistently and dramatically from 39 percent to 56 percent between 2011 and 2023. Those servicemembers with two or more dependents decrease from 36 percent to 22 percent over the same period.

Figure 9. Number of dependents for enlisted members with 4 to 5 years of service, by calendar year



Source: CNA generated from Selected Military Compensation Tables [8].

Although Figure 9 shows data for only enlisted servicemembers with 4 to 5 years of service, we found similar trends for other years of service and within paygrades.

However, in all age ranges from 21 through 60, military heads of household tend to have more dependents than civilian heads of household the same age according to the ACS. Therefore, although they are following civilian trends, military servicemembers still marry younger and have more children than civilians.

We have not seen other analyses that identify these trends in marital and family-size choices. If these trends continue, they will have important ramifications not just for the adequacy of the BAH standards but also for BAH budget estimates, the demand for on-base and privatized housing, and the demand for other base services, such as childcare centers and medical facilities.

How Flexible Is BAH to Respond to Changes in Real Estate Markets?

BAH simply was not designed for rapid surges in the housing market, such as the surge that occurred in 2021 and 2022. Its responsiveness over longer time horizons is much better: at a national average level, BAH has risen at least as much between 2006 and 2023 as other government-generated indices of housing costs.[27] The exception is four-bedroom homes, for which average BAH growth between 2006 and 2023 was slightly lower. However, BAH comes with a built-in time lag of about 6 months at the beginning of the year and about 18 months by the end of the year because it is based on rents surveyed between March and July of the previous year. Therefore, during 2021 and 2022, this lag resulted in its relative changes falling far behind in some markets in the short run. We note that private-sector wages also failed to keep up with rising housing costs during those years, so military families were far from the only Americans struggling with inflation.

Approach

First, we examined whether BAH growth over time has exceeded, matched, or failed to keep up with other government-generated measures of housing cost on average. These include the HUD estimate and the rent of primary residence component of the CPI calculated by the Bureau of Labor Statistics (BLS). We did this by normalizing all cost measures to 100 in 2006 and tracking their value as a percentage of this initial amount. The CPI measure of rent of primary residence does not break out prices for different types of homes and includes utilities only if they are included in the monthly rent payment. However, the HUD estimates median rents separately for different numbers of bedrooms (studio through four-bedroom) and includes all utility payments associated with the home, as does BAH.[28]

Then, we considered how BAH changes in the last three years have kept up with recent price surges (as measured by commercial indices), and we looked at San Diego as an example (discussed in the next subsection).

[27] These include HUD estimates of the 50th percentile rent and the CPI rent of a primary residence.

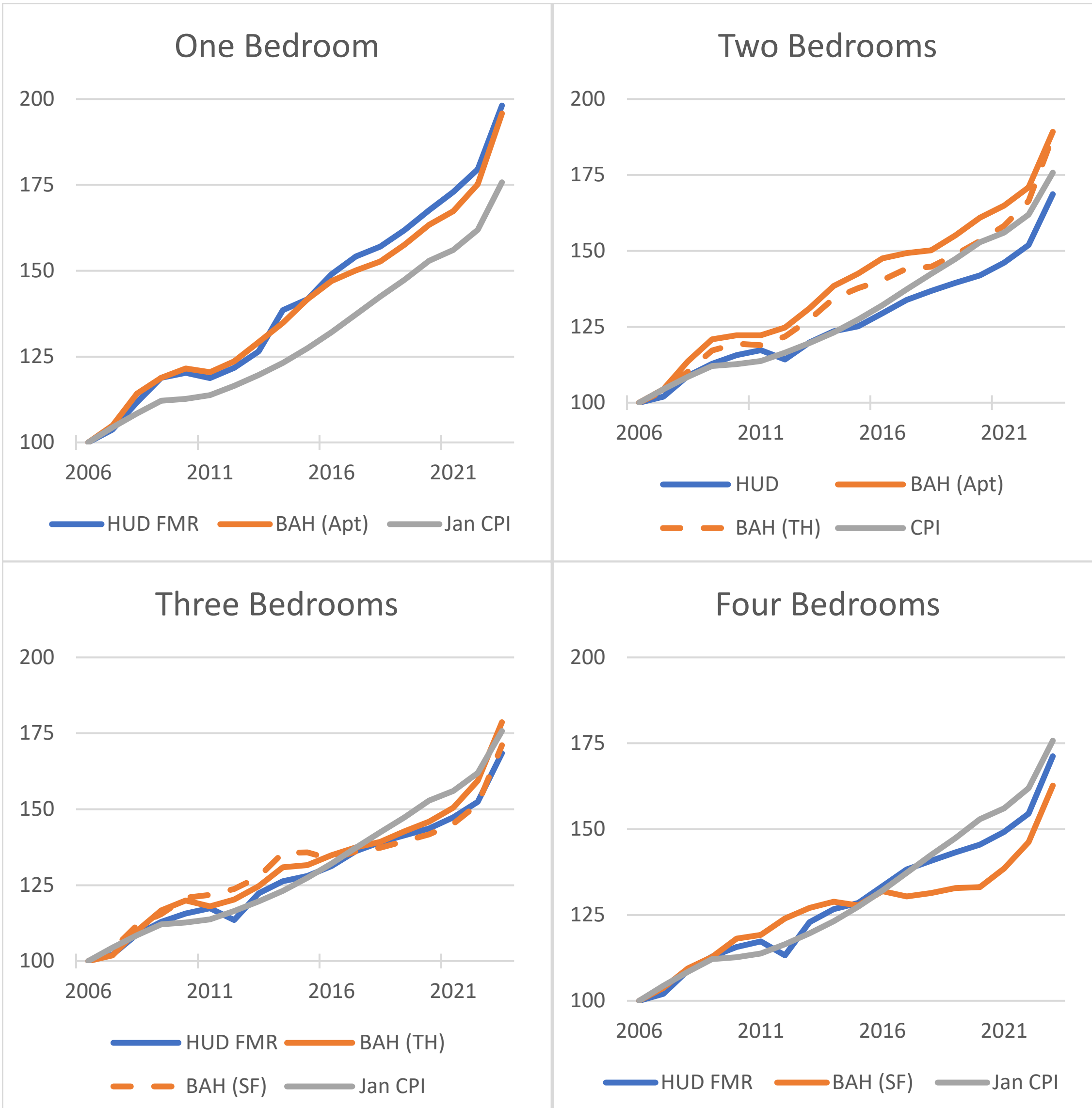
[28] BAH and the HUD measure include water and energy consumption by the home but not entertainment, such as internet and cable TV.

Findings

We see from Figure 10 that BAH costs grew by the greatest amount in this period for the smallest rental units (and vice versa).[29] However, BAH did not consistently outpace or lag HUD 50th percentile growth. The two measures tracked closely for one-bedroom and three-bedroom dwellings, BAH grew more quickly for two-bedroom dwellings, and HUD Fair Market Rent (FMR) grew more quickly for four-bedroom dwellings starting in 2015 (during a period from 2015 to 2020 in which BAH barely increased at all).

[29] BAH measures were created by averaging the costs at each anchor point corresponding to a given dwelling type and bedroom number, and by weighting by the number of servicemembers corresponding to that anchor point in each MHA as of FY 2022. Since anchor points depend on the presence of dependents, servicemembers whose dependent status was unknown were omitted from these calculations. Duty MHA was used for all servicemembers except those both listed as receiving BAH at their residence and with a known MHA of residence who were assigned to their duty MHA. When a given dwelling type and number of bedrooms had separate anchor points for servicemembers with dependents and without dependents, BAH values and servicemember counts with dependents were used.

Figure 10. Comparison of cost indices, normed to 2006



Source: CNA analysis of data from the US Department of Housing and Urban Development and the US Bureau of Labor Statistics.
Abbreviations: HUD = US Department of Housing and Urban Development; FMR = Fair Market Rent; Apt = Apartment; TH = Townhouse; SF = Single Family House; CPI = Consumer Price Index

However, these are long-term trends, and BAH's short-term flexibility is another issue. By statute, BAH rates update when basic pay updates, which occurs once per year in January [2]. As a result, from January through December of a calendar year, BAH payments are based on the prices sampled between March and July of the previous calendar year. As a result, BAH rates have a lag of at least 5 months the day they take effect, and of at least 17 months by the end of the year.

Ordinarily, the effect of this lag is small relative to the volatility in BAH and to the other factors that drive how much members pay for housing. Between 2006 and 2020, the CPI index of rent on primary residence rose 53 percent, equivalent to an average compounded rate of about 3 percent per year. However, between 2020 and 2023, this measure grew at an average of 4.8 percent per year, and the increase was much higher in some markets. We will demonstrate this by showing percentage changes from January 2020 for a BAH anchor point (the E5 with dependents BAH that is supposed to cover a two-bedroom townhouse) and a more responsive commercial index of rents.

Let us take San Diego as an example. As shown in Table 6, by July of 2023, a commercially generated index of rental prices in the San Diego metropolitan area had risen 39 percent since January of 2020. BAH for an E5 in 2023 had not quite grown at the same rate but was still 33 percent higher than in 2020. By 2022, observed rents had risen 22 percent by January of that year and 33 percent by July of that year (from a 2020 baseline), but BAH was less than a percent higher than 2020 and actually *lower* than it had been in 2021. BAH simply was not designed for rapid surges in the market such as this. Members rotating into this MHA in 2022 and still receiving essentially the same BAH that their predecessors there received two years earlier would not be able to find the same quality of housing as those predecessors because BAH had not kept up with local rents.

Table 6. E5 with dependents BAH change from 2020, San Diego MHA, and commercial rent index for same market

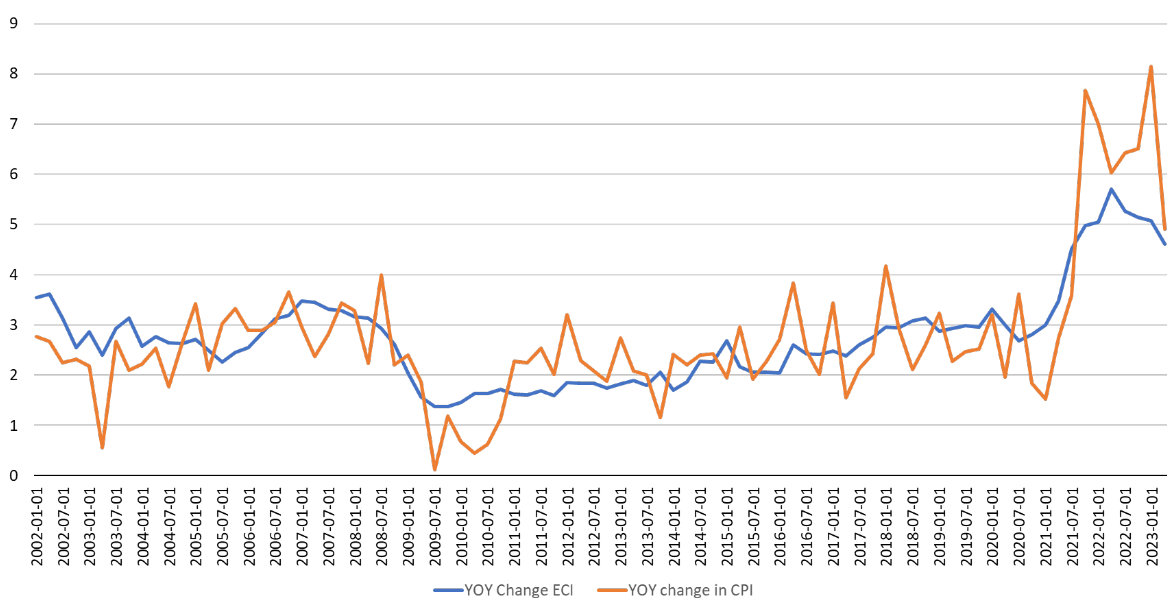
	Jul 2020	Jan 2021	Jul 2021	Jan 2022	Jul 2022	Jan 2023	Jul 2023
E5 BAH year-on-year (YOY) change	N/A	3.5%	N/A	-2.6%	N/A	32.1%	N/A
E5 BAH change from 2020	N/A	3.5%	N/A	0.7%	N/A	33.1%	N/A
Zillow Observed Rent Index (ZORI) YOY change	1.1%	3.5%	12.5%	17.9%	18.1%	8.6%	4.6%
ZORI change from Jan 2020	0.1%	3.5%	12.6%	22.0%	33.0%	32.5%	39.2%

Source: CNA generated from OSD Compensation-provided BAH rates and the Zillow-generated ZORI index.

Private-sector wages and inflation

During the rapid market fluctuations of 2021 and 2022, private-sector wages did not keep pace with inflation either, so if this is a failing of BAH, it is not unique to BAH or to the public sector. Figure 11 shows that although wages and consumer prices mostly moved together between 2002 and 2020 (though inflation dropped in 2009 and 2010 and caught up in 2011 through 2013), the surge in consumer prices (inflation) from 2021 through 2023 was well above wage growth [16]. We also note that this measure of income is before taxes and transfers and that both civilians and military personnel received large non-wage transfers from the government.

Figure 11. Yearly wage increases versus median CPI (inflation) for US private-sector workers



Source: CNA generated from Federal Reserve Economic Data [16].
Note: ECI is employment cost index: wages and salaries: private industry workers.

In fact, there has been a long-term trend of housing becoming increasingly unaffordable for civilians, as measured by its growing share of their total household expenditures. Shelter made up 28.1 percent of an average consumer basket of goods and services in 1994, and it had risen to 33.5 percent by 2019, *before* the COVID-19 surge [17]. We will discuss some drivers of this surge in the next chapter.

Responsiveness to utilities costs

Finally, utilities are a component of BAH and require their own estimation methodology. Currently, this estimate is based on the ACS, which asks households how much they spend on electricity, gas, water, and fuel. The 5-year moving average in the ACS means that these data have a lag of 2 to 7 years, so the contractor that prepares the estimates compensates for this lag using the fuels and utilities component of the CPI [18]. Using inflators to approximately compensate for the lags in the BAH process is a reasonable approach and one used by other indices as well. However, in the case of utilities, we note that public utility companies publish their current rates, so a more direct approach to estimate changes in utilities costs for an MHA could involve the military housing office (MHO) looking up the rate adjustments of the local utility providers, with some OSD oversight of this process.

How Do Residential Real Estate Processes Determine Rental Rates?

Residential rental rates are estimated based on a combination of factors that can vary by location and over time based on the real estate market. Supply and demand dynamics depend on economic conditions such as inflation, population growth, housing supply, federal interest rates, and other factors. Some of the key factors that landlords or property managers consider when estimating rental rates include the following: location (e.g., safety of the neighborhood, proximity to public services such as public transportation, school districts, employment), the property type, the size and layout of the property (e.g., number of bedrooms, bathrooms), the condition and quality (e.g., age, recent remodel or renovations, amenities), operating costs (e.g., taxes, mortgage payments, utilities, maintenance costs, homeowners association fees, property management costs), historical demand and rent from comparable properties in the neighborhood, and seasonal variation [19].

Local regulations and rent control ordinances can limit how much landlords can increase rents. For example, landlords in California cannot raise rents by more than 5 percent plus the percentage change in the CPI, with a maximum allowable increase of 10 percent every 12 months [20]. When calculating rental increases, landlords have flexibility (within local regulations) in calculating the percent of rent increase, but typically landlords increase rent by around 3 percent each year [21]. Landlords need to find a balance between increasing rent to cover increasing operating expenses (e.g., increasing home insurance premiums) and keeping good renters in place.

We found that government indices, including those produced by HUD and the BLS, have lags relative to commercial indices, and that large housing providers and their investors now use tools with forecasting capability that have the potential to help DOD set BAH rates, as we will discuss in a later chapter. We also found that because of the importance of a property's location to its market value, the implied assumption in BAH policy that a house is more expensive than a townhouse is not accurate on average.

Approach

We learned of alternate measures of housing cost used by the market through discussions with HUD and with the American Apartment Owners Association (AAOA) and through internet searches. For qualitative information about how lessors set prices, we spoke to an AAOA representative. We compared changes in government and commercial indices over time, both at the national average level and in specific local markets, to examine both the volatility and responsiveness of the government estimates. We also examined recent academic and professional writings about drivers of the recent volatility in the housing market. Finally, we used ACS data to compare the observed average prices of different housing profiles and determine whether their relative prices are in the same order that BAH implicitly assumes they should be.

Findings

State of the market and available tools

Many in the real estate industry, including the AAOA, expect that the current trend of delayed home ownership will continue and that the housing shortage will mostly be addressed through the increased supply of rental units, especially since numerous city- and state-level tax, financial, and regulatory incentives are encouraging the construction of multifamily buildings [22-24]. Given the high demand and low inventory of existing homes, the rising mortgage rates, the tendency of real estate investors and corporations to outbid first-time home buyers, and the supply chain issues making it more expensive to construct new homes, prospective homeowners are continuing to rent for longer, and investors are betting on a “renter nation.” In many real estate markets, rental unit supply is catching up with the demand, and rental prices are starting to level off.

When we asked about how suppliers know what to charge for new construction that has not been priced before, the AAOA said the priority is to fill the property, so they err to the low side. Then they can raise rates incrementally on existing tenants and experiment one at a time with higher rents as units become available for new tenants. Currently, suppliers have more freedom to raise rents for new tenants, which is one reason for the recent mover premium in our methodology for comparing BAH to expenditures for comparable civilians.

To estimate rental rates, property owners and real estate professionals typically conduct local real estate market research and consider the various factors described above. Many property managers also use online rental estimate tools such as Zillow’s Rental Manager, Rentometer, TruVest, and RentCast to estimate what they can charge for their rental property. Some companies utilize proprietary algorithms based on public property data and rental property listings, or they may use other tools to gather average or median rental statistics by ZIP code and rental comparables by entering a specific address. Real estate professionals, developers, and investors often use subscription-based real estate management services offered by RealPage, Yardi, CoStar Group, Moody’s Analytics REIS, and CoreLogic Inc., which provide analytic products, consulting services, property management software, and market insights and trends based on forecasts.

Comparison of government and commercial indices

Rent is a major contributor to inflation, which accounts for the biggest proportion of the CPI—34 percent consists of spending for shelter [25].[30] Based on the latest data from the BLS from August, the July shelter component was the largest contributing factor for both the overall inflation increase and the core inflation increase.[31] CPI shelter was up 7.7 percent over the 12-month period ending in July 2023 [26].

However, the CPI has a lag in how rental data are reflected due to the annual cycle of lease renewals. Since most leases last for a year, a renter's cost stays the same over the course of the year, and it will take a year to have a clearer picture of the changes in the rental market.

Housing rental market indices can be used to track and analyze trends in the rental market, though not to directly set BAH rates because they do not align with MHAs and do not exclude neighborhoods inappropriate for servicemembers or identify spending of comparable civilians. Many prominent indices often give different measurements of rental inflation. We provide a summary of available US rental growth indices and their methodologies in Appendix F.

The BLS conducted a study comparing new indices they created using a repeat rent index methodology using BLS rent microdata and found that the discrepancy between the CPI and many notable alternative indices such as ZORI, the MRI, and the Single Family Rent Index (SFRI) is almost entirely explained by differences in rent growth for new tenants relative to the average rent growth for all tenants. The authors found that indices calculating rent inflation for new tenants lead the BLS rent inflation by 1 year [27].

Exploring differences in rental indices: year-over-year changes and trends over time

In this next section, we explore how these rental indices differ, comparing the ZORI, Apartment List Index, HUD 50th percentile rents, CPI rent of primary residence, and BAH Anchor Point data. We compare year-over-year changes in growth and normalized indices showing cumulative change from the baseline in January 2017 (the first year Apartment List data were

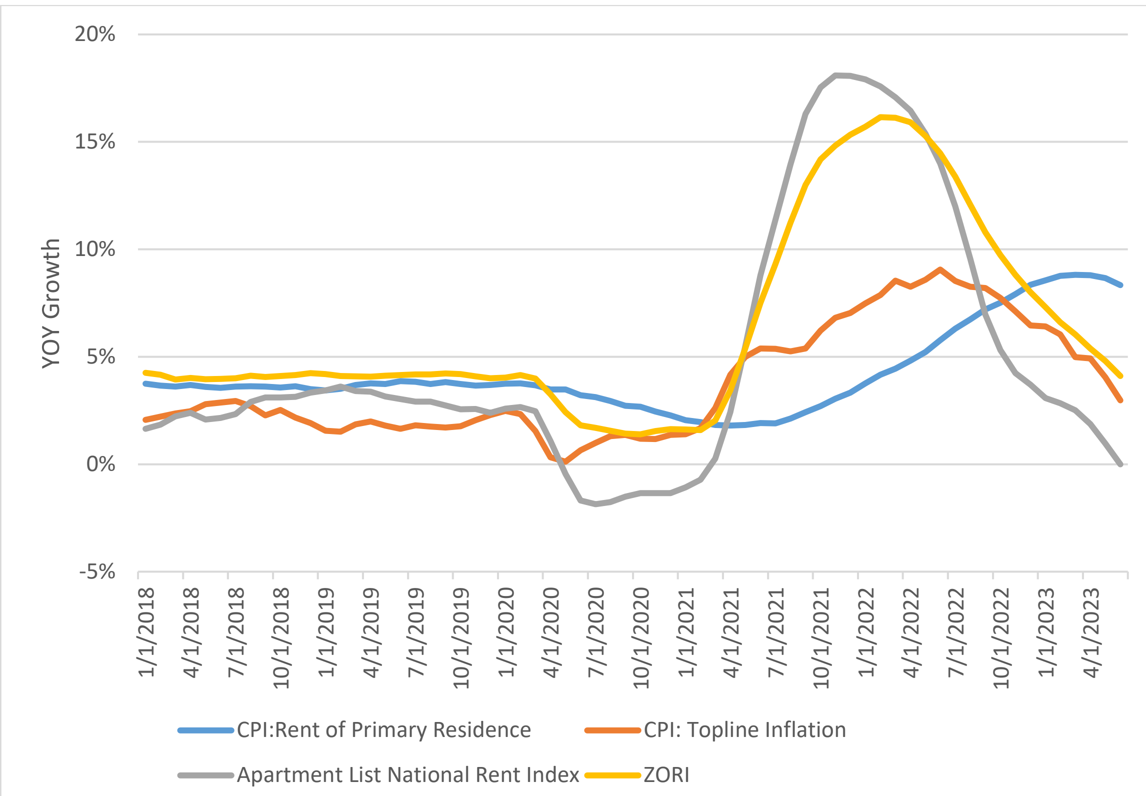
[30] The shelter component of CPI includes both rent of primary residence and owner's equivalent rent of primary residence, in addition to insurance and temporary shelter while traveling.

[31] Core inflation excludes food and energy from the market basket.

reported). We present national-level comparisons and provide examples from select MHAs for which we had CPI rent data for a matching CBSA.

Figure 12 compares CPI data with Apartment List national rent index and ZORI year-over-year increases by month from January 2018 to June 2023. ZORI and Apartment List peaked between November 2021 and March 2022 with up to 18 percent year-on-year (YOY) growth. Topline CPI inflation peaked in June of 2022, and the CPI for rent peaked in April of 2023 at 8.8 percent YOY growth and is just starting to recede.

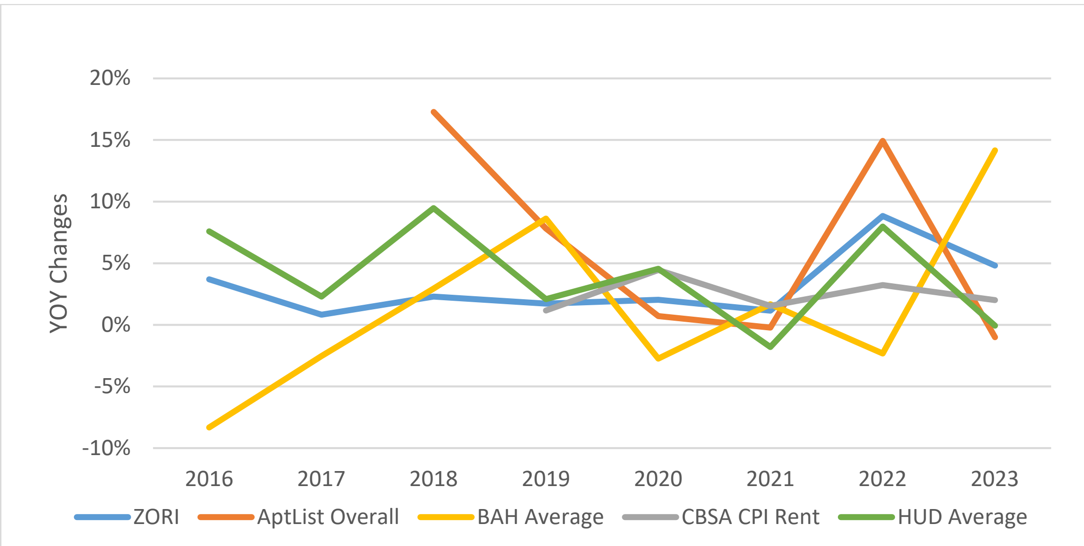
Figure 12. Year-over-year growth in Apartment List rent index versus ZORI versus CPI (rent) versus CPI (overall)



Source: CNA generated from Zillow, Apartment List, and Bureau of Labor Statistics indices.

We observed that there is more volitity in the BAH YOY changes compared to the ZORI, Apartment List, and CPI rent indicies. We observed pre-pandemic volitility with greater than 10 percentage point differences in BAH YOY changes in a number of metropolitan areas, including Atlanta, Boston, Chicago, Honolulu, New York, and St. Louis. Some MHAs also have fluctuating YOY trends with positive growth one year and negative growth the following year, including Anchorage, Boston, Chicago, Dallas, Detroit, Honolulu, New York, and Philadelphia. The CPI rent, ZORI, and Apartment List indicies have tended to consistently have positive rental growth, except in 2021. Figure 13 shows the example of the Honolulu market, where average BAH fell in 2022 at the same time that commercial indices were spiking.

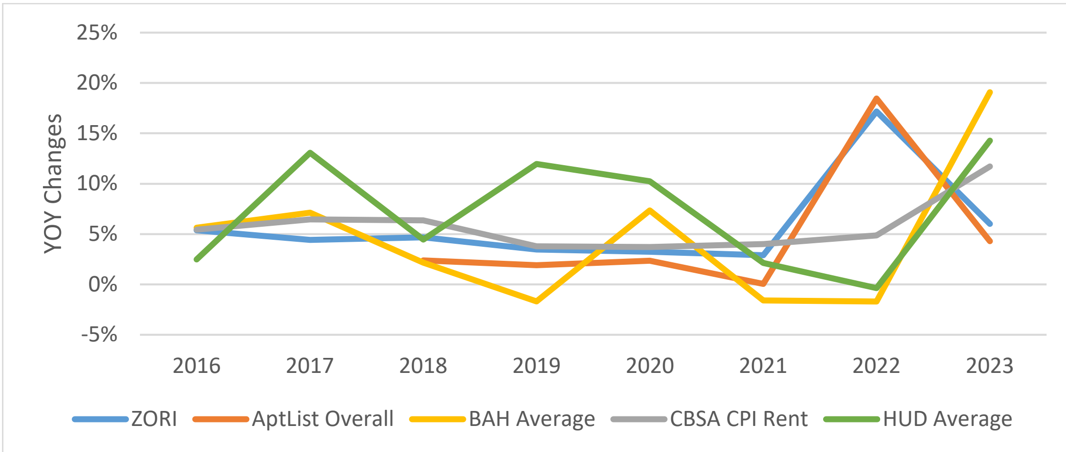
Figure 13. Year-over-year growth for MHA HI408: Honolulu County, Hawai'i



Source: Zillow, Apartment List, DOD, BLS, HUD.

We also observed pre-pandemic HUD volatility (greater than 10 percentage point swings in YOY changes), which was greatest in Boston, Dallas, Denver, San Francisco, and Seattle. The HUD estimates were typically more volatile from year to year than the ZORI or Apartment List indices, as shown in the example of Dallas in Figure 14. This volatility is likely due to the way DOD and HUD calculate their rental estimates each year and make adjustments, rather than being reflective of what was actually occurring in the rental market.

Figure 14. Year-over-year growth for MHA TX277: Dallas, Texas



Source: Zillow, Apartment List, DOD, BLS, HUD.

Due to the COVID-19 pandemic, rising home prices, rental property shortages, and subsequent inflation, rental costs have significantly shifted over the past few years. Across all the MHAs, we observed that ZORI and Apartment List indices sharply increased in YOY growth in 2022, with up to 20 percent YOY increases (e.g., Atlanta, New York, and Seattle); these increases were higher than BAH, CPI, or HUD YOY growth. However, in 2023, when the ZORI and Apartment List YOY increases slowed, we observed that BAH, CPI, and HUD had larger increases in YOY growth. This finding is consistent with what we found in literature, due to the inherent lag in how CPI, HUD FMR, and BAH are calculated.

Recent pandemic-related effects on home prices

A number of economic factors have changed during and since 2020, including households' cash on hand and their spending on such things as experiences and non-perishable goods. Two things that have affected housing markets in particular are remote work and interest rates. The ability to relocate and work remotely reduced demand for housing in some places and increased it in others, but overall appears to have increased house prices [28-29]. Also, higher interest rates increase the cost of purchasing a home and reduce incentive to sell one, which raises the demand for rentals and therefore puts upward pressure on rents [30].

Does BAH drive rental costs?

Some suspect that the BAH rates themselves determine rents in certain locales. It has been claimed that landlords raise rents in response to BAH rates. Although it is true that landlords will provide a quality of housing that is appropriate to their customer base, it is unlikely they have enough power to set rents in specific markets. Servicemembers also have an incentive to choose housing appropriate to their compensation and to bargain with landlords whenever possible because the amount of BAH they receive is independent of what they spend on rent.

We are aware of only one study that examined the effect of BAH changes on changes in observed market rents. That CNA study was published in 2002 and examined the housing markets in Oahu, Hawai'i, and in Clarksville, Tennessee, near Fort Campbell [31]. It considered the degree of competition among landlords in the local area, the flexibility of supply (housing supply near Fort Campbell had grown significantly in the previous decade), and past estimations of the income elasticity of housing demand (i.e., how much households increase their expenditure on rent for each dollar of additional income). It also directly estimated the effect of BAH increases on rents in these markets by comparing areas with higher and lower military densities within the MHA, and it found little effect. The study also noted that the Overseas Housing Allowance, which depends on how much the recipient actually spends on rent, is much more likely to affect rents.

The six BAH profiles versus the reality of the market

Finally, we note that the supply and demand conditions that drive the residential real estate market do not necessarily align with the assumptions underlying the six housing profiles. The BAH policy that ties profiles to paygrades implicitly assumes that a four-bedroom single family dwelling is more expensive than a three-bedroom single family dwelling, which is in turn more expensive than a three-bedroom townhouse or duplex, and so forth.

In practice, BAH surveys sometimes produce cost estimates for the different anchor points that do not line up in this order for a given MHA. If left uncorrected, these "inversions" would result in some members receiving less BAH than members in a lower paygrade in the same MHA. BAH policy places all paygrades in an order such that an E6 with dependents receives more BAH than an O2 with dependents and less than a W1 with dependents, and so on.[32] So, if the estimated cost of a three-bedroom townhouse is higher than that of a three-bedroom single family dwelling in an MHA, OSD must adjust these estimates to ensure not only that a W3 with

[32] The ordering is different for members without dependents than members with dependents, and E1 through E4 all receive equal BAH.

dependents receives more BAH than an E6 with dependents, but also that there is enough separation between them for the seven intervening grades (W1, E7, O1E, W2, E8, O2E, and O3) to each receive more BAH than the grade below.

Analysis of ACS data reveals that these "inversions" are not deviations from the norm but, in fact, the norm for the private market. Average monthly rent nationwide for a three-bedroom townhouse or duplex ($1,456) is greater than for a three-bedroom detached house ($1,183).[33] In fact, in an area covered by North Dakota, South Dakota, Montana, and Wyoming, it is much more expensive even than a four-bedroom detached house ($1,141 versus $774). This is nearly the case in Arkansas, Mississippi, Oklahoma, and Alabama as well. The reason is that townhouses tend to be in more expensive locations that are closer to amenities and more employment opportunities.

Some indices of housing costs apply only to apartments or only to single family dwellings, but the HUD 50th percentile estimate applies to all housing types and breaks them out by number of bedrooms only. Given the differences across markets in the relative cost of a detached home and an attached home, an approach using four anchor points instead of six may be more suitable to define BAH profiles and calculate BAH rates.

[33] These are 2021 prices.

Feasibility of Including School District Information in Calculating BAH

There are two ways to interpret how and why school quality could affect the calculation of a suitable BAH rate. One is a comparison of school quality within an MHA to ensure that BAH covers the cost of housing in the areas with better schools, which in most cases would tend to be in higher cost areas. We have determined that BAH recipients tend to live in higher cost ZIP codes than the civilians in their MHA. The other is a comparison of school quality across MHAs to compensate members who have been assigned to an installation with poorer public education and may want to make additional investments supporting their dependents' education.

Economic literature has tried to explicitly tie school quality to housing prices since 1969, building on a broader literature on how neighborhoods form based on tastes for (and ability to afford) different local amenities and measures of neighborhood quality [32-33]. There is a broad consensus that school quality affects housing prices, but settling on a specific number has proven challenging.

Challenges in three areas explain why it is difficult to produce a single estimate for the effect of school quality on housing prices: research methodology, terminology, and local context.

Challenges related to research methodology reflect that many measures of neighborhood quality are correlated with the strength of local public schools. For example, people who value high-quality public schools are also likely to value public safety, short commute times, public parks, access to local businesses, and other factors that affect housing prices, so determining the effect of just one is extremely hard. Several strategies attempt to isolate the impact of schooling from that of other amenities, with varying degrees of success. All strategies employed have limitations that make them difficult to apply across MHAs to calculate BAH. We discuss this academic research further in Appendix G. Even if methodology were not a concern, defining school quality is not straightforward. For example, a school's value-added—not the level of its students' scores, but the degree to which it improves scores relative to how the same student would perform elsewhere—may be more valuable to a new homebuyer than its overall achievement level; however, value-added measures may reflect measurement error or vary substantially across years, particularly in areas with few students, and are available for relatively few grades [34]. The scope at which quality is computed or aggregated will also be relevant to policy-makers. For example, if a family is zoned to a high-achieving school in a low-achieving district (or vice versa), which should BAH take into account?[34] And to what extent should BAH take shifts in individual school catchment or district boundaries into account?

The research literature and BAH also reflect different assumptions—research on school quality centers on purchase prices, while BAH is defined to reflect rental rates.[35] Although the two are highly correlated, school quality could be reflected differently in purchase prices than in rents. For example, since buying a house requires a longer term commitment to a specific area, school quality might correlate more closely with purchase prices than with rents. For this reason, the impact of school quality on the purchase price of housing might not be directly translatable to the same increase in BAH.

Finally, even if an accurate measure of the impact of school quality on housing prices could be defined and computed, it would likely vary from place to place and require a great deal of ongoing research to incorporate properly [38]. A DOD-endorsed comparison of the quality of public school districts across different areas of the country would also expose it to political risk, as locally elected politicians may question the ranking of their constituents' schools or use these relative rankings to advocate for a different laydown of installations.

We note that local and state governments and some private entities do publish data about schools' test scores, teacher workforce, student demographics, and so on. The services may consider such data when choosing where to locate installations. However, such consideration is based on subjective judgement calls and is not the same thing as including this information in the formal process to calculate BAH. If inclusion of school quality in BAH is to be considered in some capacity, it makes the most sense to do so through an experimental algorithm for possible later use, as discussed in a subsequent chapter.

[34] There is some evidence, for example, that the demographics of individual schools—but not overall school districts—are reflected in house prices, indicating that families may be less likely to consider school district characteristics than those of their specific schools [35]. However, a study of simultaneous shifts in school catchment and district boundaries in Shelby County, Tennessee, found that district rezoning had between 1.5 and 2 times the effect of a 1 standard deviation increase in a school's test scores [36].

[35] Studies also use different measures of purchase value; for example, those that do not have access to sale data can use aggregate housing indices (which do not fully reflect new construction or updates), owner valuations (which are systematically overstated), or advertised house prices (which vary from actual sales, but not necessarily in a known, systematic fashion) [37].

Frequency of Calculating BAH

By law, barring extraordinary circumstances, BAH rate adjustments can take effect only at the same time as basic pay table adjustments [2]. This requirement has effectively caused BAH rate adjustments to be annual events. Combined with the lag time required to incorporate surveys of housing costs, this requirement means that BAH rates for individual members are frequently based on housing costs well over a year out of date.

In times of modest inflation, and in areas with relatively stable housing prices, the time between the collection of cost data and the subsequent adjustments to the BAH rates is of little concern. Cost differences in other factors tied to housing, such as commuting distance, amenities, and quality of the neighborhood, are likely to swamp any differences caused by the time lag. Conversely, during periods of high inflation, or in areas where housing costs are increasing rapidly for other reasons, the time lag could result in BAH rates too low for the allowance to serve its intended purpose. This would be particularly true among servicemembers moving into a new housing area, as those with existing leases or mortgages are unlikely to experience the full effects of unexpected rental rate increases.[36]

Again, the lag time between the collection of survey data and the actual adjustment of BAH rates is of serious concern only when inflation is high, or housing costs are unstable for other reasons. If, for example, housing costs went up a steady 2 percent per year, then in the summer months, when servicemembers are most likely to move, the BAH rates for their new locations would be about 2 percent lower than they theoretically should be. But that 2 percent difference is likely dwarfed by countless other factors and, at worst, it simply means the notional out-of-pocket cost is bit higher than it might otherwise have been. In contrast, if housing costs jumped 10 percent or 12 percent, either across the country or in a particular area, servicemembers who did not have fixed leases or mortgages in place would likely face either significant additional out-of-pocket costs or settle for housing that is below standards.

Increases in out-of-pocket expenses caused by cost increases that occur between BAH rate adjustments could be mitigated in a number of ways, but any mitigation would entail either a significant increase in the cost of BAH to the military departments or some sort of offsetting reduction in overall BAH levels. If the former, it could be funded either by an increase in DOD's

[36] Recall that when rental prices are falling in an area, members already stationed there are shielded from a decline in BAH because they may be locked into a longer term lease or mortgage. Other members may be able to profit from this rate protection by moving or negotiating a new lease at a lower price.

topline or by cuts to other DOD programs. Several types of adjustments are considered in detail below.

Options for how to allow BAH to adjust more flexibly

More frequent updates: BAH rates are currently adjusted at the beginning of each year along with the basic pay tables. Although it would require legislative relief, there is no insurmountable reason BAH rates could not be adjusted more frequently. In particular, BAH rates could be adjusted twice a year, cutting on average 6 months of lag from each adjustment.[37] Such a change would cause survey costs to increase, perhaps even double, but those costs are trivial compared to the overall cost of BAH.[38] A much larger cost would result from the reality that, given that average rates typically increase with each adjustment, the military departments would end up paying additional BAH for the second half of each year. There would be some offsetting savings from areas in which the BAH rates declined, but those tend to be few. In addition, because of rate protection for those already assigned to such areas, savings would be seen only from those members newly moving into such areas.

Increased flexibility to adjust rates: Following Hurricane Katrina, Congress authorized the secretary concerned to increase BAH rates in real time for areas subject to a major disaster declaration [39]. Authority to make ad hoc BAH rate changes for various reasons could be expanded, though this would require additional legislation. Such a proposal could have minimal administrative cost, but to the extent the authority was exercised, it would be unambiguously costly. Additionally, DOD would need to determine how such adjustments would be made and create a system for evaluating the merits of proposed adjustments.

Include expected inflation in BAH rates: Because of the lag time to calculate new rates, the BAH tables are about 6 months out of date at the start of the year and about 18 months out of date at the end of the year, creating an average lag of roughly one year. If DOD expected housing prices to increase at, say, a 2 percent annual rate, it could effectively eliminate the expected cost of that lag to the servicemembers by adding 2 percent to the annual BAH increase.[39] For this change to be effective, DOD would have to be able to predict rental price increases with at

[37] Because it takes considerable time to conduct and implement surveys, this would not cut the lag time in half.

[38] OSD reports that the average annual cost of the BAH contract is $1.7 million, compared to the estimated $26.8 billion paid to BAH recipients.

[39] If compounding is considered, the actual increase would be slightly smaller than 2 percent.

least modest accuracy. Even at that, such a change would only partially address unanticipated jumps in rental prices in particular markets.

Basing BAH rates, in whole or in part, on more responsive indices: Currently, BAH rates are determined through a process dependent on customized housing surveys commissioned by DOD. Given the nature and methodology of the surveys, the considerable lag between the sampling of housing costs and implementation of the resulting BAH rates is largely unavoidable. As explained above, if inflation is high or some local housing markets are particularly hot, the lag will cause the calculated BAH to be significantly too low for its intended purpose. There are, however, other readily available sources of data on inflation in general, or on housing rental costs in particular. DOD could consider incorporating one or more such measures into its BAH calculations to help calculate interim adjustments, though we emphasize that these measures do not align with MHAs or with DOD standards and cannot be used as replacements for the current process. At a minimum, such a move could introduce more recent data into each calculation, and BAH rates might even be adjustable within a year as cost indices are updated, though still protecting members already there from reductions just as the current system does.

Funding additional rate adjustments

Each of the proposals above would result in servicemembers, on average, receiving higher BAH when they reside, or move into, areas with housing costs significantly higher than projected by the survey results. The additional cost to DOD depends on which housing areas would see rate adjustments and how large those adjustments might be. Compensating for minor increases in individual housing markets might not prove prohibitively costly, but even modest across-the-board adjustments could result in profound increases in outlays. An overall 5 percent increase in BAH to compensate for increased inflation, for example, would cost nearly $1.5 billion in FY 2024.

Each of the proposals above would likely involve significant additional cost to the military departments. In addition, the first two would complicate budgeting and execution. Any additional BAH funding needed for mid-year, or ad hoc, rate changes would be difficult to estimate in time for the regular budgeting process and would not be known with any precision until well into the execution year. With annual BAH expenditures approaching $30 billion, even the funding to accommodate a percentage point or two of unbudgeted price increases would represent a significant sum and require accommodation in the execution year.

Barring significant increases in the services' budgets for BAH, there is little room to accommodate rate adjustments in markets with unexpectedly high housing costs and essentially no potential to accommodate inflationary spikes that affect most, or all, of the country.

Despite the financial difficulties, the rationale for rate adjustments in the face of unexpected price hikes is largely twofold. First, without some sort of adjustment, members living off base would see a decline in their purchasing power while those living on base would not. Second, military members are subject to frequent moves as a part of their employment, which limits the feasibility of home ownership and may preclude their taking advantage of benefits other renters enjoy, such as rent control or long-term relationships with landlords.

Conversely, it could be argued that other adults in this country are expected to cope with inflation largely on their own. They may lose out because their rent goes up sooner than their wages, but they may come out ahead on things like existing student loans and car loans that effectively decline in cost with higher inflation. Civilian employees of DOD are expected to wait until the start of the year for their locality pay to adjust to changes in local conditions and to pay their rent based on a pay table that changes only once a year.

If, however, adjusting BAH rates for those facing high out-of-pocket costs is a priority, and if Congress does not directly address the higher cost through top-line increases or offsetting cuts elsewhere in the DOD budget, there are potential offsets within BAH that could provide some funding.

Some servicemembers decline government quarters or space in privatized on-base housing. And though they are free to do so, one might reasonably argue that they could face some BAH reduction if they are inclined to make that choice.

Another group that might be potential candidates for a more modest BAH is dual-military couples residing in the same housing area. Currently, both members receive their full BAH even though it is generally reasonable to assume that they share a common home and a common bedroom. We note that reducing BAH for a member married to another BAH recipient could create a disincentive for dual-military couples to marry.

Additionally, one might argue that members who are already living in a given area are less likely to see housing cost increases as large as those newly moving to the area. Those already residing in the area may have leases or mortgages that limit their cost increases. At a minimum, they are likely to know the area better than new arrivals and thus be more likely to find a better deal on housing. Accepting that logic, special rate increases might apply only to those newly entering an area, just as rate reductions generally do not apply to those already living in an area.

Finally, there is nothing magical about the current standard of 5 percent out of pocket. In the relatively recent past, the target out-of-pocket rate has been as high as 15 percent and as low as zero [39]. Changing the notional out-of-pocket rate from 5 percent to 8 percent (that is, intending BAH to cover 92 percent of housing costs on average) would save DOD 3.16 percent of its total BAH cost. Even if privatized housing was excluded from the reduction, the potential savings available to be targeted toward areas with costs that rose exceptionally fast would be considerable.

Advisability of a Covered Entity to Develop a BAH Algorithm

Section 662 of the 2023 NDAA calls for an evaluation by the Secretary of Defense of "residential real estate processes to determine rental rates" and a recommendation by the Secretary of Defense regarding "whether to enter into an agreement with a covered entity, to compile data and develop an enterprise grade, objective, data-driven algorithm to calculate BAH" [5].

Following up on this, Section 625 of an unsigned version of the 2024 NDAA directs the Secretary of Defense to "enter into an agreement with a covered entity pursuant to…calculate, using industry-standard machine learning and artificial intelligence algorithms, the monthly rates of BAH for not fewer than 15 MHAs."

Well-known commercial entities including Zillow and Redfin use algorithms to process large amounts of market data and boast that their forecasts of homes' values have a median error rate of only about 2 percent for homes that are on the market [40-41]. We do not know how much such tools would contribute to DOD's ability to forecast changes in local rental markets over a span of a year or more. However, it is reasonable to ask how all these data and also the commercial algorithms that predict values using the data may help improve the accuracy and effectiveness of BAH.

To address this question, we first revisited the statutory mandate for BAH:

> The Secretary of Defense shall determine the costs of adequate housing in a military housing area in the United States for all members of the uniformed services entitled to a basic allowance for housing in that area. The Secretary shall base the determination upon the costs of adequate housing for civilians with comparable income levels in the same area [2].

Thus, setting BAH requires not only estimating the current market value of a home, but also determining which homes are adequate for civilians of comparable income. Broadly speaking, there are two possible approaches to this: either directly observe what civilians with the same income-less-housing cost spend on housing in the servicemember's area and set BAH equal to that, or make a judgment call about what is "adequate" and then estimate its cost in that area. Currently, DOD uses the latter approach, and judgment calls are not an appropriate responsibility for machine learning and artificial intelligence (AI). As noted in the *Economist*, AIs may be recruited by their designers or trainers to serve objectives that are not transparent, and even if not, "would you trust a ten-year-old whose entire sense of reality had been formed by surfing the internet?" [42].

However, a key insight from existing commercial algorithms *is* highly relevant to BAH: there are now more efficient ways to sample housing rental market data than the current BAH surveys. In fact, HUD reports that it now uses six commercially generated rental indices to calculate its Fair Market Rents: Zillow, Apartment List, CoreLogic, Real Page, REIS (produced by Moody's Analytics), and CoStar, in addition to government-generated data from the Census Bureau. Therefore, if the government sets standards of what constitutes adequate housing for servicemembers, commercial indices may be an efficient and flexible way to update estimates of the cost of that housing.

Moreover, machine learning may be able to go beyond indices of the local housing market to estimating the price of a particular set of housing attributes that DOD has deemed adequate. This is known as a hedonic pricing model: a model that predicts the price of a good as a function of observable characteristics of that good. For example, suppose that a cost index in a given market may experience fluctuations driven by demand for vacation and retirement homes near water, but the algorithm does not require proximity to water and produces a more stable estimate. In this case, a machine learning algorithm trained on the correct variables would produce more accurate estimates of the cost of adequate housing than would a commercial index. As attempts to measure value-added by schools become available, such as those calculated by the not-for-profit organization GreatSchools, experiments with a machine learning algorithm could include a school value-added requirement determined by DOD officials.

We note that DOD would need to monitor the performance of these machine learning algorithms, and particularly how they perform when the set of variables from which they generate their estimates differs from the set of estimates on which they were trained. A logical robustness check to run before using these algorithms would be to feed them data with missing values for some variables that are likely to frequently have missing values in the markets where they will be employed.

Finally, it is worth considering that machine learning may be useful to forecast future changes in rental costs, solving the lag problem in BAH rates. HUD reports that it has begun forecasting changes in rent levels, but it does not yet have confidence in its ability to do so. Private firms and the Federal Reserve also attempt to forecast changes in the CPI and could generate forecasts specifically of the housing component of the CPI [43-44]. Therefore, the primary value of the AI experiment called for by the unsigned 2024 NDAA may be to test the accuracy of AI-generated forecasts of changes in average rent levels within an area, using observable data about local supply and demand changes.

Advisability of Publishing BAH Methodology on a Public Website

Setting actual BAH rates is a complicated process. MHAs need to be drawn around each base or geographic grouping of bases. Individual neighborhoods then need to be evaluated for, and potentially eliminated from, use in the calculations for any of a variety of reasons. Next, rental and utility rates need to be surveyed or otherwise estimated, after which anomalies and outliers need to be identified and examined. Only then can DOD begin to set the actual rates for each area and category of servicemember. At each stage in the process, there is a certain unavoidable amount of subjectivity. Additional accuracy, complexity, or consistency would certainly be possible, but would likely come with additional costs and increased time needed to complete the process.

Currently, OSD publishes a primer on BAH that explains much of the methodology but not in enough detail to replicate the process of setting actual rates. Given the inherent subjectivity in deciding issues such as where to draw boundaries between MHAs, which neighborhoods to exclude from consideration, and how to deal with extreme outliers, the current rate setting system does not lend itself to any straightforward description of the overall methodology used. At best, DOD might be able to publish the detailed methodology used for each MHA, but this would likely be a significant burden, be of little intrinsic value, and could invite second guessing.

Publishing its methodology might be practical if DOD relied on a more standardized rate setting process. However, the more standardized the process is, the more likely it is that unreasonable or anomalous results could sneak into the rates. Additionally, any requirement for full disclosure of the methodology would effectively prohibit the use of any proprietary data in the rate setting process. That limitation could have the potential to limit contractor support in data collection or evaluation.

Publishing the BAH methodology in more detail may contribute to greater trust in the process *if* it is accompanied by a change to a more streamlined process using publicly available indices that is easier to document and if it comes with a published caveat that OSD in consultation with the services may deviate from this methodology in unusual circumstances. Even in this case, members may come to regret the change if their complaints about the suitability of the BAH rate for their MHA are more difficult to address given the need for OSD to then document a deviation from the published methodology.

Appropriateness of BAH to Coast Guard Facilities

Each year, the Coast Guard publishes a list of Critical Housing Areas (CHAs), some of which are MHAs and others of which are identified by ZIP code only. The 2023 list includes 31 CHAs, 14 of which are associated with an MHA. These are locations where the service expects members may not wish to house their families, and members with dependents who receive orders to a CHA may request a housing allowance based on a different location.

Most of the CHAs are in remote locations such as Garibaldi, Oregon, and Demopolis, Alabama. However, the list also includes the Camp Lejeune, North Carolina, MHA. From internet searches for units available to rent, we found that CHAs typically have fewer available rentals listed than other Coast Guard duty stations. We also identified a total of 21 neighboring MHAs (less than 60 miles away) for these CHAs, and we found that 12 of these 21 neighboring MHAs had higher BAH rates across most or all paygrades than the BAH available for the CHA. We also found very few rental listings in most of these neighboring MHAs. For example, the St. Mary and Terrebonne, Louisiana, MHA (listed as a CHA) had five Zillow listings and a RentCast average monthly listings of 19, while its neighboring MHA of Lafayette, 25 miles away, had even fewer listings.

Therefore, members' requests to receive BAH for a different location may be due to an inability to find available housing close to their duty stations, or due to housing that they consider more suitable being in a higher cost neighboring MHA.

We note that the Coast Guard operates in some locations where it has already determined that BAH cannot provide servicemembers with housing because there is no market for year-round rentals. In these locations, government-owned housing is provided instead. One example is the Island of Nantucket, a popular seasonal haven for wealthy families.

Two changes to law may benefit the provision of suitable housing for Coast Guard families. First, Section 2877 of Title 10 USC allows services to provide differential lease payments to lessors whom the servicemembers are also paying rent to. If the member pays approximately their BAH rate for rent, but this is not enough to incentivize lessors to make year-round rentals available, the service can provide an additional incentive. However, this law applies only to services in the DOD, and it could be changed to include the Coast Guard, which falls under the Department of Homeland Security [45].

Also, Section 403 of Title 37 allows the secretary concerned to pay BAH for the location where the family resides or for the previous duty station if "the member's assignment to duty in that area, or the circumstances of that assignment, require the member's dependents to reside in a different area" [2]. This language does not cover members without dependents or members living with their dependents but outside their assigned MHA or county cost group (CCG).[40] Because many Coast Guard members find suitable housing in a higher cost nearby county (such as those assigned to Port O'Connor, Texas, who find housing in higher cost Victoria, Texas), we recommend clarification of the law to allow the secretary concerned to pay BAH for a more expensive neighboring MHA in which the member resides, with or without dependents.

This concludes the recommendations requested by Congress for this report. Our companion report builds on several analyses summarized here and offers recommendations for alternate methodologies to determine BAH. In this report, we provide appendixes reviewing the current BAH methodology, displaying some of our results in further detail, reviewing details on housing market indices that may be useful elements in the construction of alternate approaches to BAH, and reviewing research on the relationship between school quality and housing markets.

[40] Members, such as recruiters, who live in an area with too few BAH recipients to justify an MHA have their BAH set by using BAH rates in MHAs that have similar cost profiles according to the Housing and Urban Development estimates of Fair Market Rent.

Appendix A: BAH Process

The BAH program is designed to compensate servicemembers for off-base housing comparable to their civilian counterparts. Data are collected in approximately 300 MHAs across the United States (including Alaska and Hawai'i) to determine local median rent and average utility costs for different types of rental units.[41] The different types of rental units, called housing profiles, are linked to paygrades representing the average housing choice by civilians with comparable incomes.

Rental cost data collection

A BAH rate is calculated for each housing profile by MHA [1]. Data collection occurs every March through July during peak PCS season. Rental cost data are collected through three sources:

1. Nationwide commercial rental subscription database: provides verified property costs for over 100,000 multifamily rental units
2. Local installation MHO representatives: provide local knowledge on real estate contacts, neighborhood quality unique market factors, and servicemember living patterns
3. BAH data collection contractor: independent market research specialists

The three sources provide a series of checks and balances to ensure accuracy. The nationwide database is updated monthly over the collection period. For each given unit, the median of the monthly prices is used as the final BAH sample price. The BAH contractor also collects and verifies residential vacancy listings information from trusted sources such as Multiple Listing Service (MLS), Zillow, and Trulia. The MHO representatives review the database- and contractor-collected data to confirm the included properties meet BAH standards. BAH standards exclude data from certain types of properties such as mobile homes, efficiency apartments, furnished units, income-subsidized complexes, age-restricted facilities, and seasonal units. The remaining properties are screened to ensure each unit included in the data:

Meets building safety codes and is in good repair

[41] Although servicemembers are not prohibited on using BAH for a mortgage payment, BAH is designed to reflect the rental market only.

- Is not in a high-crime neighborhood (i.e., an area with a crime rate over twice the national average)
- Is within a set of ZIP codes in which 90 percent of servicemembers assigned to the MHA live
- Is in an area where typical civilian incomes are comparable to regular military compensation (basic pay plus BAH plus BAS plus the tax advantage resulting from tax-free allowances)

The data collection contractor then validates the data submitted from the three sources by:

- Establishing the availability and location of each unit in the survey sample
- Verifying the current rental rates
- Identifying any utility inclusions in the rental rates
- Determining price differences for different lease terms (BAH uses a standard 12-month lease price for its data collection)

The DOD aims to gather about 30 to 75 units per housing profile for each MHA. This allows them to estimate with 95 percent statistical confidence a median rent that is within 10 percent of the true median rent. If the number of available units does not reach this quorum, the DOD will use overall housing cost trends to estimate a specific housing profile or use other methods to estimate rates (such as asking landlords to price their seasonal units as if they were annual).

Calculating BAH for locations outside of an MHA

DOD determines BAH rates for every location in the US, even those outside of MHAs. To determine the BAH in these areas, DOD uses FMR data from the Department of Housing and Urban Development to order counties from lowest to highest housing cost. The counties are then organized into 39 groups of comparable housing costs called CCGs. The CCGs serve as a crosswalk for counties within an MHA to counties outside of an MHA, as each CCG includes both types. The BAH rate of counties within an MHA is used to calculate the BAH rate for their CCGs. This CCG BAH rate is applied to all counties within that CCG that is outside of an MHA. CCG BAH rates apply to less than 2 percent of BAH-eligible servicemembers.

Utility cost data collection

DOD uses data from the US Census Bureau's ACS and the BLS Regional CPI to calculate utility cost data. The ACS provides electricity, heating fuel, and water and sewer costs for approximately 1 percent of the entire US population each year. DOD uses the latest 5 years of data to identify costs specific to each housing profile in each MHA [18]. Since there is a 2- to 7-year lag in ACS data, CPI data are used to scale the data to current-year utility costs. The utility cost estimates are baseline rates. If electricity, water, and gas/fuel are included in the monthly rental of a unit, the utility costs added to the rent to obtain a total housing cost (THC) will exclude the included utility.

BAH rate calculations

DOD uses six housing profiles "anchored" to nine paygrades to calculate BAH for all remaining paygrades. The six housing profiles, with the paygrades used as anchor points, are shown in Table 7. The E4 anchor points for servicemembers with and without dependents represent the minimum housing standards and apply to all lower ranks (the standard for E1 to E4 with dependents is halfway between the two-bedroom apartment anchor point and the two-bedroom townhouse anchor point). OSD Compensation has noted that some of these profiles are rare in some MHAs, such as single family dwellings in dense urban areas or apartments in coastal areas with vacation homes. This can lead to small sample sizes and estimation irregularities.

Table 7. BAH housing profiles

Housing profile	Grade with dependents	Grade without dependents
1-bedroom apartment		E4
2-bedroom apartment		O1
2-bedroom townhouse/duplex	E5	O1E
3-bedroom townhouse/duplex	E6	O3E
3-bedroom single family dwelling	W3	O6
4-bedroom single family dwelling	O5	

Source: BAH primer [1].

After all of the data are collected, DOD reviews the local median housing costs for each MHA and applies data smoothing quality control procedures to mitigate sampling errors or data anomalies. OSD Compensation reports that the data smoothing process is used for three main reasons: to increase confidence for low sample sizes, to ensure BAH rates progress as paygrades progress, and to limit volatility from year-to-year market changes. The BAH rates for each of the anchor points are equal to the THC (median rent costs plus average utility costs) for that housing profile in each MHA. For all non-anchor point paygrades, the BAH rate is calculated by interpolating between anchor points. First, DOD calculates the difference between the upper and lower anchor points. Second, a specified percentage is applied to that difference to obtain a dollar amount. Then, that dollar amount is added to the lower anchor point to obtain the BAH rate for the paygrade in question. Table 8 demonstrates these calculations for an E7 with dependents using the lower and upper anchor points of E6 and W-3, respectively.

Table 8. BAH calculation example

Description	Formula	Example
E6 with dependents local housing cost (3-BR TH)	A	$1,000
W3 with dependents local housing cost (3-BR SFD)	B	$1,200
Difference	C: B-A	$1,200 - $1,000 = $200
36% of that difference	D: C x %	$200 x 0.36 = $72
E7 with dependents interpolation	A+D	$1,000 + $72 = $1,072

Source: BAH primer [1].

Even with the help of the data smoothing process, BAH rates may fluctuate from one year to the next because the process is designed to accurately reflect changes in market conditions. To prevent servicemembers from being penalized for signing long-term leases or contracts, they are entitled to keep their existing rate if the new rate (published January 1) decreases. Servicemembers are eligible for rate protection unless their status changes due to PCS, reduction in paygrade, or change in dependency status.

Appendix B: Civilian Housing Expenditures

In these tables, for a given percentile range of civilian household income minus housing expenses, we list example military paygrades that tend to fall in that range (which can vary slightly from one area to another and by dependent status because of differences in the tax advantage). We then display what the median civilian in that range spends on various types of housing. These figures include both rent and utilities. Table 9 shows results across all PUMAs nationwide, and the subsequent tables show results for the top, middle, and bottom third of PUMAs in terms of housing cost. So, for example, civilians with the same amount of income left over to spend on things other than housing as an E5 will spend $1,784 on a two-bedroom townhouse in a high-cost area, $1,313 on a two-bedroom townhouse in a medium-cost area, and $1,053 on a two-bedroom townhouse in a low-cost area.

Table 9. Median civilian monthly housing expenditures by income range: nationwide

Income range	Example paygrades	All	1 BR APT[a]	2 BR APT	2 BR TH[b]	3 BR TH	3 BR SFD[c]	4 BR SFD
90–95%	E9, O4	$1,954	$1,894	$1,897	$2,047	$2,248	$1,896	$2,269
85–90%	W3, O3	$1,733	$1,668	$1,720	$1,745	$2,015	$1,699	$2,031
80–85%	E7, W2	$1,607	$1,557	$1,601	$1,590	$1,900	$1,592	$1,934
75–80%	W1, O2	$1,498	$1,429	$1,502	$1,509	$1,790	$1,503	$1,858
70–75%	E6, O1	$1,416	$1,370	$1,416	$1,442	$1,755	$1,436	$1,745
65–70%	E5	$1,349	$1,281	$1,345	$1,401	$1,670	$1,391	$1,724
60–65%	N/A	$1,281	$1,221	$1,281	$1,351	$1,681	$1,344	$1,640
55–60%	E4	$1,251	$1,184	$1,264	$1,306	$1,560	$1,320	$1,601
50–55%	E3	$1,194	$1,110	$1,214	$1,292	$1,608	$1,285	$1,535
45–50%	E2	$1,166	$1,080	$1,181	$1,240	$1,478	$1,264	$1,498

Source: American Community Survey (ACS) 2017–2021 data from the half of public use microdata areas (PUMAs) that have above the median share of military personnel. Tabulated by RCF Economic and Financial Consulting, LLC., and adjusted from 2021 to 2023 dollars by CNA using the CPI. Which ventile (5 percentage point range) of civilian income-less-housing a paygrade aligns with varies slightly by MHA and by dependency status.

[a] APT = apartment

[b] TH = townhouse or duplex

[c] SFD = single family dwelling (detached house)

Table 10. **Median civilian monthly housing expenditures by income range: high-cost areas**

Income range	Example paygrades	All	1 BR APT[a]	2 BR APT	2 BR TH[b]	3 BR TH	3 BR SFD[c]	4 BR SFD
90–95%	E9, O4	$2,320	$2,141	$2,211	$2,374	$2,550	$2,428	$2,731
85–90%	W3, O3	$2,113	$1,910	$2,062	$2,094	$2,376	$2,214	$2,516
80–85%	E7, W2	$1,999	$1,825	$1,943	$1,965	$2,306	$2,133	$2,482
75–80%	W1, O2	$1,901	$1,708	$1,872	$1,952	$2,251	$2,068	$2,408
70–75%	E6, O1	$1,830	$1,651	$1,807	$1,859	$2,174	$2,062	$2,385
65–70%	E5	$1,787	$1,601	$1,775	$1,784	$2,079	$2,021	$2,331
60–65%	N/A	$1,727	$1,560	$1,737	$1,755	$2,140	$1,977	$2,279
55–60%	E4	$1,668	$1,489	$1,691	$1,684	$2,062	$1,949	$2,295
50–55%	E3	$1,644	$1,476	$1,673	$1,685	$1,987	$1,901	$2,276
45–50%	E2	$1,598	$1,415	$1,647	$1,676	$2,013	$1,923	$2,215

Source: ACS 2017–2021 data from PUMAs that have above the median share of military personnel and have housing costs in the highest third. Tabulated by RCF Economic and Financial Consulting, LLC., and adjusted from 2021 to 2023 dollars by CNA using the CPI. Which ventile (5 percentage point range) of civilian income-less-housing a paygrade aligns with varies slightly by MHA and by dependency status.

[a] APT = apartment

[b] TH = townhouse or duplex

[c] SFD = single family dwelling (detached house)

Table 11. **Median civilian monthly housing expenditures by income range: medium-cost areas**

Income range	Example paygrades	All	1 BR APT[a]	2 BR APT	2 BR TH[b]	3 BR TH	3 BR SFD[c]	4 BR SFD
90–95%	E9, O4	$1,683	$1,375	$1,575	$1,692	$1,905	$1,771	$2,049
85–90%	W3, O3	$1,566	$1,316	$1,490	$1,523	$1,777	$1,689	$1,902
80–85%	E7, W2	$1,483	$1,281	$1,416	$1,452	$1,717	$1,626	$1,860
75–80%	W1, O2	$1,413	$1,230	$1,361	$1,394	$1,618	$1,560	$1,871
70–75%	E6, O1	$1,367	$1,213	$1,322	$1,354	$1,620	$1,529	$1,744
65–70%	E5	$1,315	$1,161	$1,286	$1,313	$1,614	$1,490	$1,756
60–65%	N/A	$1,275	$1,141	$1,257	$1,321	$1,635	$1,481	$1,706
55–60%	E4	$1,252	$1,121	$1,245	$1,275	$1,500	$1,432	$1,634
50–55%	E3	$1,213	$1,071	$1,214	$1,283	$1,548	$1,421	$1,639
45–50%	E2	$1,184	$1,060	$1,192	$1,218	$1,477	$1,391	$1,586

Source: ACS 2017–2021 data from PUMAs that have above the median share of military personnel and have housing costs in the middle third. Tabulated by RCF Economic and Financial Consulting, LLC., and adjusted from 2021 to 2023 dollars by CNA using the CPI. Which ventile (5 percentage point range) of civilian income-less-housing a paygrade aligns with varies slightly by MHA and by dependency status.

[a] APT = apartment

[b] TH = townhouse or duplex

[c] SFD = single family dwelling (detached house)

Table 12. Median civilian monthly housing expenditures by income range: low-cost areas

Income range	Example paygrades	All	1 BR APT[a]	2 BR APT	2 BR TH[b]	3 BR TH	3 BR SFD[c]	4 BR SFD
90–95%	E9, O4	$1,229	$1,052	$1,151	$1,286	$1,448	$1,298	$1,514
85–90%	W3, O3	$1,163	$971	$1,098	$1,202	$1,315	$1,233	$1,402
80–85%	E7, W2	$1,116	$938	$1,071	$1,159	$1,360	$1,188	$1,318
75–80%	W1, O2	$1,071	$903	$1,034	$1,071	$1,308	$1,165	$1,251
70–75%	E6, O1	$1,032	$888	$994	$1,102	$1,254	$1,126	$1,237
65–70%	E5	$1,016	$889	$983	$1,053	$1,267	$1,116	$1,197
60–65%	N/A	$977	$843	$952	$1,053	$1,192	$1,085	$1,201
55–60%	E4	$972	$818	$958	$1,028	$1,191	$1,086	$1,192
50–55%	E3	$929	$796	$927	$1,011	$1,196	$1,040	$1,170
45–50%	E2	$913	$781	$903	$1,013	$1,164	$1,049	$1,143

Source: ACS 2017–2021 data from PUMAs that have above the median share of military personnel and have housing costs in the bottom third. Tabulated by RCF Economic and Financial Consulting, LLC., and adjusted from 2021 to 2023 dollars by CNA using the CPI. Which ventile (5 percentage point range) of civilian income-less-housing a paygrade aligns with varies slightly by MHA and by dependency status.

[a] APT = apartment

[b] TH = townhouse or duplex

[c] SFD = single family dwelling (detached house)

Appendix C: BAH Sufficiency Statistics

Here, we tabulate the largest possible shortfall for MHA-paygrade combinations in which BAH does not exceed our upper bound. Reading across the first row, we see that of three MHAs in which E2 BAH may be insufficient, the maximum shortfall is under $10 in two of them and under $50 in the remaining one. The same row in Table 14 shows that the possible shortfall is less than 1 percent in two of them and less than 5 percent in the third. Tables 15 and 16 repeat the results for BAH recipients without dependents. These figures were generated based on the assumption that BAH recipients can be expected to contribute an average of 5 percent of the cost of their housing out of pocket, though as we showed in Table 1, most members should in practice not need to do so in order to match the housing expenditures of comparable civilians.

Table 13. Maximum potential monthly dollar shortfalls for MHAs where BAH may be insufficient for servicemembers with dependents

	Number of MHAs with maximum BAH shortfall (in dollars)					
Paygrade	Less than $10	$10–$25	$25–$50	$50–$100	$100–$200	Over $200
E2	2	0	1	0	0	0
E3	3	2	1	0	0	0
E4	4	4	2	1	0	0
E5	3	2	1	0	0	0
E6	3	11	4	10	4	0
E7	3	7	3	10	4	0
E8	0	0	0	0	0	0
E9	0	0	0	0	0	0
W1	7	5	3	12	19	1
W2	2	2	3	3	0	0
W3	0	0	0	0	0	0
W4	0	0	0	0	0	0
W5	2	3	6	5	8	0
O1E	1	1	2	0	0	0
O2E	0	0	0	0	0	0
O3E	0	0	0	0	0	0
O1	4	1	3	0	0	0
O2	5	7	5	9	21	2
O3	1	0	0	0	0	0
O4	3	2	4	8	4	0
O5	2	4	1	0	0	0

Source: CNA.

Table 14. Maximum potential monthly shortfalls for MHAs where BAH may be insufficient for servicemembers with dependents (as a percentage of BAH)

	Number of MHAs with maximum BAH shortfall (as a percentage of BAH)					
Paygrade	**1% or less**	**1%–3%**	**3%–5%**	**5%–10%**	**10%–20%**	**Over 20%**
E2	2	0	1	0	0	0
E3	3	2	0	1	0	0
E4	5	3	2	1	0	0
E5	3	2	1	0	0	0
E6	13	9	7	3	0	0
E7	10	8	6	3	0	0
E8	0	0	0	0	0	0
E9	0	0	0	0	0	0
W1	10	8	11	17	1	0
W2	4	6	0	0	0	0
W3	0	0	0	0	0	0
W4	0	0	0	0	0	0
W5	5	8	10	1	0	0
O1E	2	2	0	0	0	0
O2E	0	0	0	0	0	0
O3E	0	0	0	0	0	0
O1	5	2	1	0	0	0
O2	11	8	12	17	1	0
O3	1	0	0	0	0	0
O4	5	8	8	0	0	0
O5	6	1	0	0	0	0

Source: CNA.

Table 15. Maximum potential monthly dollar shortfalls for MHAs where BAH may be insufficient for servicemembers without dependents

	Number of MHAs with maximum BAH shortfall (in dollars)					
Paygrade	Less than $10	$10–$25	$25–$50	$50–$100	$100–$200	Over $200
E2	7	7	17	30	0	0
E3	5	15	16	33	16	0
E4	5	4	26	24	43	0
E5	9	12	10	35	51	8
E6	6	9	14	29	23	0
E7	3	10	9	26	52	5
E8	1	12	15	23	26	20
E9	6	6	12	34	30	25
W1	7	7	13	27	41	31
W2	3	5	10	15	9	0
W3	7	7	12	33	30	26
W4	6	5	8	24	33	79
W5	5	7	10	18	32	33
O1E	5	6	11	14	4	0
O2E	7	9	12	22	28	0
O3E	3	7	10	17	38	27
O1	6	11	19	30	38	16
O2	6	14	14	16	12	0
O3	7	5	15	22	36	27
O4	2	4	7	15	38	37
O5	7	4	8	17	20	19

Source: CNA.

Table 16. Maximum potential monthly shortfalls for MHAs where BAH may be insufficient for servicemembers without dependents (as a percentage of BAH)

	Number of MHAs with maximum BAH shortfall (as a percentage of BAH)					
Paygrade	1% or less	1%–3%	3%–5%	5%–10%	10%–20%	Over 20%
E2	7	13	18	21	2	0
E3	5	22	13	37	8	0
E4	5	21	10	37	29	0
E5	10	17	13	45	38	2
E6	8	19	17	35	2	0
E7	5	16	15	49	20	0
E8	6	21	17	32	21	0
E9	8	20	19	37	29	0
W1	10	13	17	35	51	0
W2	3	12	8	16	3	0
W3	11	19	19	37	29	0
W4	9	12	18	38	68	10
W5	9	15	16	38	27	0
O1E	7	16	11	6	0	0
O2E	11	20	11	34	2	0
O3E	9	12	18	34	29	0
O1	8	19	19	42	32	0
O2	12	21	11	18	0	0
O3	10	18	21	31	32	0
O4	5	12	14	36	36	0
O5	8	15	17	21	14	0

Source: CNA.

Appendix D: Family Size and Suitability of Profiles

Table 17 shows the distribution of family size among BAH recipients with dependents by paygrade. For example, 61 percent of E1 to E4 personnel with dependents have only one dependent, in most cases a spouse. In addition, 23 percent have two dependents, 11 percent have three, 4 percent have four, and 1 percent have five or more. The percentage with only one dependent reaches its low point at E8 or O5 and then begins to climb again as children grow up and leave home.

Table 17. Distribution of family size by paygrade and BAH standard housing units

Paygrade	Num. of bedrooms	Formal BAH profile	Number of dependents 1	2	3	4	5+
E1 to E4	2	Halfway between 2-BR apt and townhouse	61%	23%	11%	4%	1%
E5	2	2-BR townhouse	45%	26%	19%	8%	3%
E6	3	3-BR townhouse	28%	24%	28%	14%	7%
E7	3	3-BR townhouse plus 36% toward 3-BR SFD[a]	18%	21%	32%	19%	10%
E8	3	3-BR townhouse plus 75% toward 3-BR SFD	15%	20%	35%	20%	11%
E9	3	3-BR SFD house plus 16% toward 4-BR SFD	18%	25%	33%	16%	7%
W1	3	3-BR townhouse plus 1% toward 3-BR SFD[a]	25%	20%	31%	16%	8%
W2	3	3-BR townhouse plus 52% toward 3-BR SFD[a]	18%	19%	32%	20%	11%
W3	3	3-BR SFD[a]	14%	20%	34%	20%	11%
W4	3	3-BR SFD house plus 22% toward 4-BR SFD	18%	22%	34%	18%	9%
W5	3	3-BR SFD house plus 48% toward 4-BR SFD	26%	27%	30%	11%	5%
O1E[b]	3	3-BR townhouse plus 44% toward 3-BR SFD[a]	59%	17%	15%	7%	3%
O2E	3	3-BR townhouse plus 93% toward 3-BR SFD[a]	57%	18%	15%	7%	3%

Paygrade	Num. of bedrooms	Formal BAH profile	Number of dependents				
			1	2	3	4	5+
O3E	3	3-BR SFD house plus 26% toward 4-BR SFD	41%	22%	22%	10%	5%
O1	2	2-BR townhouse plus 11% toward 3-BR townhouse	59%	17%	15%	7%	3%
O2	3*	2-BR townhouse plus 98% toward 3-BR townhouse	57%	18%	15%	7%	3%
O3	3	3-BR townhouse plus 98% toward 3-BR SFD[a]	41%	22%	22%	10%	5%
O4	3	3-BR SFD house plus 58% toward 4-BR SFD	20%	20%	32%	18%	10%
O5	4	4-BR SFD	14%	17%	36%	21%	12%
O6	4	4-BR SFD plus 1%	17%	20%	36%	19%	9%
O7	4	4-BR SFD plus 2%	22%	21%	35%	16%	6%

Source: BAH Primer and 2023 Green Book [1, 8].

[a] BAH standards are either one of the six anchor points or an in-between proportional amount between anchor points.

[b] Although the Green Book reports on officers with prior enlisted service separately, the distribution of family size it reports for them is proportionately the same as for other officers of the same paygrade, so it appears to have calculated percentages for each paygrade as a whole.

Based on these numbers and assumptions about the ages of the children, in

Table 18 we estimate the percentage of families in each paygrade for whom the associated housing profile provides enough bedrooms, under two sets of assumptions. For example, members below the grade of E5 who have dependents receive BAH tied to the prices of two-bedroom apartments and townhouses. For 84 percent, those two bedrooms would be enough for each child to have their own room (they have either zero or one child). For 95 percent, those two bedrooms would be enough for each child under age six to have their own room or share with one sibling, and we assume that all children of members in those paygrades are under age six.

Table 18. Percentages of families with sufficient bedrooms under the current BAH profiles

Paygrade	Number of bedrooms in BAH standard	Percentage of families with sufficient bedrooms in BAH standard units	
		With 1 child per bedroom	With sharing bedrooms[a]
E1 to E4	2	84%	95%
E5	2	70%	89%
E6	3	79%	94%
E7	3	71%	80%
E8	3	69%	79%
E9	3	76%	84%
W1	3	76%	84%
W2	3	69%	79%
W3	3	69%	79%
W4	3	73%	82%
W5	3	84%	89%
O1E[b]	3	90%	94%
O2E	3	90%	93%
O3E	3	85%	90%
O1	2	76%	91%
O2	3*	90%	100%
O3	3	85%	95%
O4	3	72%	81%
O5	4	88%	100%
O6	4	91%	100%
O7	4	94%	100%

Source: Reference: BAH Primer and 2023 Green Book [1, 8].
[a] We assume E6s and O3s with multiple dependents have a child over 6; E7s, O4s, and warrant officers with multiple dependents have a child over 10; children under 10 may share a bedroom with a sibling of the same gender; and children under 6 may share a bedroom with one sibling of either gender. We also assume that two siblings have a 50 percent chance of being the same gender and that a six-year-old with three younger siblings has a 12.5 percent chance of being a different gender than all three of them.
[b] Although the Green Book reports on officers with prior enlisted service separately, the distribution of family size it reports for them is proportionately the same as for other officers of the same paygrade, so it appears to have calculated percentages for each paygrade as a whole.

Appendix E: BAH Profile Adjustment Rules Based on Family Size

Here we explain our rules for estimating the cost of a policy change aligning BAH with family size. We assumed that the first dependent is a spouse sharing a bedroom with the member. We did not have data on the ages of members' children, so we made assumptions about them based on experience. We assumed that enlisted members in the grades E6 and above and officers in the grades O3 and above who have two or more dependents have a child over the age of 6. And we assumed that enlisted members in the grades of E7 and above, warrant officers, and commissioned officers in the grades of O4 and above who have two or more dependents have a child over the age of 10, and if there is a second child that child is over the age of 6.

Table 19 explains our adjustment rules. For example, paygrades E1 through E5 and O1 rate less than a three-bedroom townhouse (technically, so do O2s, but by only 2 percent of the difference from a two-bedroom). At those grades, we assumed that children are younger than 6 years old, so each child can share a room with one sibling. A family size of five or six implies more children than fit in one bedroom, so we upgraded them to the BAH for a three-bedroom townhouse (which we assumed is the average of that for an E6 with dependents and an O3E without dependents, or $2,396 per month).

Table 19. Possible adjustment for family size

Current profile	Family size	Adjustment
Less than a 3-BR TH	5 or 6 (more than 2 children)	All assigned to 3-BR TH
3-BR TH or higher but less than a 4-BR SFD	6, with 1 child over 6YO	Assign one-eighth to 4-BR SFD (6YO is different gender from all younger siblings)
	5, with 1 child over 10YO and another over 6YO	Assign one-half to 4-BR SFD (6YO is different gender than younger sibling)
	6, with 1 child over 10YO and another over 6YO	All assigned to 4-BR SFD
Higher than 3-BR TH	4 (2 children)	Assign all to 3-BR TH
Higher than 2-BR TH	1, 2, or 3	Assign all to 2-BR TH

Source: CNA generated.

Appendix F: Overview of Housing Rental Market Indices and Methodologies

Zillow Observed Rent Index (ZORI) is a repeat rent index that is constructed by Zillow, a leading online real estate marketplace, with data starting from 2014. Zillow analyzes the rental prices from various sources, including their own rental listings and public data, to estimate changes in rental prices over time. The index takes into account the rental prices of various types of housing units such as apartments, townhouses, condos, and single family homes.

ZORI is designed to provide a timely and granular understanding of rental market trends accounting for changes in the types of rental properties available over time using a repeat rent or repeated transaction methodology. It calculates price differences for the same rental unit over time, and it then aggregates those differences across all properties repeatedly listed for rent on Zillow. It covers a wide range of geographic areas, including national, metropolitan, county, city, and ZIP levels for all regions where the available data are sufficient. It also uses weights for the index based on the latest data from the US Census Bureau ACS in which units that appear more frequently in the Zillow data are weighted less and those that appear less frequently are more heavily weighted. It uses the ACS to get the age of a building and the number of units it contains and breaks out three categories: single unit (detached and attached), two to four units, and five or more units in a building. Once the index is constructed, it is smoothed using a 3-month exponentially weighted moving average.

Consumer Price Index (CPI) is a widely recognized economic indicator published by the BLS in the United States. The CPI is a broad-based index that reflects changes in overall cost of living. It measures changes in the prices of a basket of goods and services, including housing or shelter. Shelter includes owner's equivalent rent and rent of primary residency. The rental component of CPI is based on housing surveys conducted by BLS through which they collect data on a sample of rental units and calculate changes in rent prices. The CPI survey uses stratified sampling methodology [25]. The CPI rent for primary residence data is available for select consolidated metropolitan statistical areas.

Penn State/ACY Marginal Rent Index (MRI) is constructed using data from Real Capital Analytics, which contains rental property transaction prices and capitalization rates for large professionally managed multifamily properties that have sold more than once since 2000 [46]. It is a product of two aggregate indices: a national repeat-sale index and the seller's forward-looking estimates of average multifamily income yield (cap rate). The baseline rent index is then scaled to match the Repeat Rent Index developed by the same authors [47]. The MRI covers 20 states and 34 metropolitan areas [48].

ApartmentList Rent Estimates are estimates of the median rent across new leases signed in a given market and month. They start with the ACS of median rent for recent movers and extrapolate the data forward to the current month using a growth rate calculated using their listing data. They calculate growth rates using a same-unit analysis (similar to Case-Shiller's approach) that compares only units with transactions in multiple time periods to get an accurate picture of rent growth that controls for compositional changes in available inventory. It estimates median rent for city, county, core-based statistical area, or state.

Zumper calculates current median asking rents for one- and two-bedroom apartments for the top 100 cities and 300 additional cities within major metropolitan areas. The data are sourced through a combination of proprietary listings posted by landlords and brokers through Zumper's Landlord Platform and third-party listings from MLS providers.

RentCast is a real estate and property data application programming interface (API) that provides on-demand access to over 140 million property records, owner details, home value and rent estimates, comparable properties, and active sale and rental listings, as well as aggregate real estate market data. Users can query the rent estimate for a specific address or for latitude and longitude coordinates, and it will return the estimated rent expected from a long-term rental lease and provide comparable rental listings. They obtain their data from public county records, recorded deeds, tax assessor databases, and online real estate listing websites with historical aggregated rental market data by ZIP code starting in April 2020. The API is free for up to 50 calls per month, but long-term API contracts can be purchased.

Rentometer is a website that estimates rent prices for specific neighborhoods. Looking up rent estimates is free, but real estate professionals can purchase API contracts and tools. It collects and analyzes approximately 10 million rental records per year.

TruVest is a real estate investment, development, and technology company. It provides free rent estimates, mortgage estimates, property valuations, and property taxes on its website for any residential property in the US. The rental estimate model is based on a self-learning AI engine. For subscribers, it provides additional data analytics including rental and sales comparables, long-term investment projections, and estimates on capitalization rates and return on investment (ROI) for investment properties.

CoreLogic Single Family Rental Index (SFRI) is a private repeat rent index developed by CoreLogic, a global property information, analytics, and data solutions provider. SFRI includes higher tiered detached single family rental units, which realtors advertise in the MLS, and it also tracks rental price changes nationally and across 20 metropolitan areas [27]. Since the SFRI is based on MLS data, it is not representative of the general rental market, in which the Census's Rental Housing Finance Survey estimated that only 11 percent of single-unit rental properties are listed using a real estate agent and listed on MLS. Although data are not available publicly online, CoreLogic publishes articles on housing market trends on their website: Property Market Insights | CoreLogic®.

HUD Fair Market Rent (FMR) is calculated by HUD and is used as a reference point for determining rental assistance payments in various housing programs, including the Section 8 housing choice voucher program. HUD establishes a base rent for two-bedroom units using 40th percentile estimates of gross rent from the 5-year ACS. It then makes adjustments using a recent movers adjustment factor that is based on a ratio of the gross rents paid by recent movers from the 1-year ACS in order to gather the most accurate, comprehensive rental data at the local level. Gross rent includes the cost of shelter plus utilities (except telephone, cable or satellite television, or internet). It is then adjusted for inflation from the ACS year, which is calculated using the CPI, and a trend factor is applied using the expected future level of gross rent CPI to calculate the FMRs ahead of each fiscal year. The bedroom ratios are then applied to calculate rents for zero-bedroom (efficiency), one-bedroom, two-bedroom, three-bedroom, and four-bedroom units.

The FMR is adjusted annually to reflect changes in market conditions, with updated rates effective October 1 each year. It is not intended to represent the actual rental price for a specific unit or property, but rather a standard for determining rental subsidies based on market conditions. FMR may not always align with the actual rental prices in a particular area, especially in areas with rapidly changing rental markets. In FY 2023, the HUD methodology was modified because the Census Bureau could not release standard 1-year estimates from the 2020 ACS due to the COVID-19 pandemic. Instead, HUD utilized a multipronged approach that included six sources of rental data—four private and two public. The two public sources were Zillow's Observed Rent Index and Apartment List Rent Estimates. The four private sources were SFRI, RealPage (formerly Axiometrics) average effective rent per unit, Moody's Analytics REIS average gross revenue per unit, and the CoStar Group average effective rent. For these private sources, data and methodology were not available online but were available for purchase. To estimate an average gross rent inflation factor, HUD used private-sector rent data in which at least three sources cover the FMR area.

HUD 50th percentile rent: The methodology for determining the 50th percentile rents is the same as determining the FMR, but instead of using 40th percentile estimates of gross rent from the 5-year ACS, it uses the 50th percentile rent.

Table 20. Comparison of rental market indices

Characteristics	HUD 50th Pct	AptList	ZORI	CPI	MRI	SFRI	Zumper
Metric	Median Rent	Index	Index	Index	Index	Index	Median Rent
Start of data	2001	2017	2014	1953	Unknown	unknown	2018
Geographic coverage	Metropolitan areas and counties	500 cities, 50 states, and DC, National	National, metro, county, city, ZIP code	National, Census Regions, Division, Consolidated Metropolitan Statistical Areas	20 states and 34 metro areas	US, 20 major metro areas	Top 100 cities by pop and 300 cities within metro areas
Data sources	ACS, BLS	ACS and AptList Data	Zillow Data and ACS weights	BLS, FRED, St. Louis Federal Reserve	Real Capital Analytics	MLS	Zumper Landlord platform and MLS
Break out by unit sizes	Zero-BR (studio), 1-BR, 2-BR, 3-BR, and 4-BR units	1- and 2-BR	N/A	N/A	N/A	Single Family Homes	1- and 2-BR
Frequency of updates	Annual	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Transparency and replicability	HUD has access to more data than publicly available	Rental data are proprietary, but methodology is published	Rental data are proprietary, but methodology is published	Data Available	Penn State researchers, published papers	Corelogic data are not publicly available	Rental data are proprietary
Method	ACS recent movers, adjusted	ACS recent movers, rent growth using repeat rents	Repeat rent	Stratified Sampling	Repeat sale	Repeat rent	Median asking rents
Data availability	Online	Online	Online	Online	Private	Private	Online

Source: CNA generated.

Appendix G: Research on School Quality and Housing Prices

Some studies of school quality and local housing costs use an instrumental variables strategy, relying on variation across neighborhoods in some factor strongly associated school quality that does not otherwise affect housing prices. For example, Downs and Zabel (2002) and Gibbons and Machin (2003) argue that the percent of the local population within a certain age range would be such a variable; however, the age distribution of a neighborhood likely affects its housing prices through mechanisms other than school quality, and similar arguments could likely be made for many other suggested variables [35, 49].

Another strategy is to examine houses very close to a school district or school catchment boundary, on the logic that nearby houses should have access to similar amenities and differ primarily based on assigned school quality. This approach is generally favored over instrumental variable approaches, but it still has its own challenges. Geographic proximity does not prevent housing prices or neighborhood quality from changing abruptly; for example, distance alone does not necessarily take boundaries such as highways or rivers into account [50]. Even if two areas are initially similar, positive feedback loops between school quality, neighborhood quality, and income levels can lead to diverging neighborhood quality and housing prices in nearby homes [51-52]. Similarly, living near a school district or catchment boundary could reflect some degree of risk tolerance in case the boundary shifts; however, some studies use alignment between district or catchment boundaries and (more stable) town boundaries to avoid this issue [53-56].

A third strategy is to look at houses that have been sold multiple times and evaluate how changes in sale price are associated with school quality [57-58]. This approach's strength is that comparing houses against their prior sale value implicitly accounts for all fixed characteristics of each house and its neighborhood; however, it cannot account for other changing measures of neighborhood quality that may be correlated with school quality. Furthermore, houses that are sold multiple times over a relatively short period of time may be systematically different from those that are not (e.g., if they are seen as particularly good or bad for young families) and therefore their sale values may have a different relationship with local school quality.

Figures

Tables

Abbreviations

AAOA	American Apartment Owners Association
ACS	American Community Survey
AI	artificial intelligence
API	application programming interface
BAH	basic allowance for housing
BAS	basic allowance for subsistence
BLS	Bureau of Labor Statistics
BNA	basic needs allowance
BP	basic pay
CCG	county cost group
CHA	critical housing area
COLA	cost-of-living allowance
CPI	consumer price index
DMDC	Defense Manpower Data Center
DOD	Department of Defense
EMA	effective market area
FMR	fair market rent
HUD	Department of Housing and Urban Development
MHA	military housing area
MHO	military housing office
MLS	Multiple Listing Service
MRI	Marginal Rent Index
NDAA	National Defense Authorization Act
OSD	Office of the Secretary of Defense
PCS	permanent change of station
PUMA	public use microdata area
QRMC	Quadrennial Review of Military Compensation
RMC	regular military compensation
SFD	single family detached [home]
SFRI	Single Family Rent Index
THC	total housing cost
USC	United States Code
YOS	years of service
YOY	year-on-year
ZCTA	ZIP code tabulation area

ZORI	Zillow Observed Rent Index

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3003 Washington Boulevard, Arlington, VA 22201
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Report on the Calculation of the Basic Allowance for Housing, Basic Allowance for Subsistence, and Cost-of-Living Allowances

Adam M. Clemens, Daniel M. Leeds, Jaclyn Rosenquist, Robert P. Trost, and Samuel A. Yellin

with contributions by Robert W. Shuford

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Abstract

This report for the 14th Quadrennial Review of Military Compensation (QRMC) focuses on allowances: the Basic Allowance for Housing (BAH), Basic Allowance for Subsistence (BAS), and Cost-of-Living Allowances (COLAs). A companion report focuses exclusively on BAH, responding to congressional questions posed about it in the Fiscal Year 2023 National Defense Authorization Act. We found that BAH is, on average, higher than what civilians of comparable income spend on rent and utilities. However, BAH is also volatile: in any given year, more than half of military housing areas (MHAs) have a greater than 10 percentage point spread across the year-over-year BAH changes for different paygrades in that MHA. This volatility is the result of the Department of Defense estimating the cost of six different housing profiles in each of the about 300 MHAs every year. We recommend three possible courses of action to reform BAH, each of which use other government-generated data and would make BAH more predictable. We also found that the statutory definition of BAS is unclear and has led to it drifting upward over time relative to the price of food in a way that Congress probably did not intend, and we recommend tying its level to the US Department of Agriculture's estimate of the cost of a liberal food plan for an adult man. Finally, COLAs—both in the contiguous United States and overseas—are in part driven by the Living Pattern Survey, which is infrequent, is not verified, and can lead to counterintuitive outcomes. Commissaries and exchanges keep records of the volume of sales to active duty servicemembers, which could directly verify how much access to on-base savings affects the local cost of living for servicemembers.

This work was created in the performance of Federal Government Contract Number N00014-22-D-7001.

Cover image: Air Force 1st Lt. Russell Bowman embraces his family at Joint Base Charleston, South Carolina, October 3, 2022, upon returning home from deployment. Photo by Airman 1st Class Christian Silvera.

Approved by: **January 2025**

Jennifer Griffin, Research Program Director
Marine Corps and Defense Workforce Program
Resources and Force Readiness Division

Executive Summary

This report for the 14th Quadrennial Review of Military Compensation (QRMC) focuses on three allowances: the Basic Allowance for Housing (BAH), Basic Allowance for Subsistence (BAS), and Cost-of-Living Allowances (COLAs). A companion report focuses exclusively on BAH, responding to congressional questions posed about it in the Fiscal Year 2023 National Defense Authorization Act. This report summarizes key findings from that report, analyzes the data and methodologies used to calculate BAS and COLAs, and recommends possible courses of action (COAs) for reforming BAH.

What we were asked to do

The QRMC director asked CNA to review the statutory requirements and methodologies used to calculate BAH, BAS, and COLAs to ensure military members can procure suitable housing and food. We answered six questions about BAS:

1. How is BAS currently computed?
2. What purchasing power should BAS provide?
3. How often should BAS be calculated?
4. Should BAS vary by geographic area?
5. How do other measures of food prices compare with the US Department of Agriculture's (USDA) liberal food plan?
6. How much would it cost to extend BAS to servicemembers' dependents?

The QRMC director also asked us to examine the data and methodology used to calculate both contiguous United States (CONUS) COLA and overseas COLA (OCOLA). This request included tracking the history of COLA rates in some locations, determining the drivers of changes in the rates over time, and considering ways to stabilize COLA rates.

Finally, the QRMC director asked us to develop recommendations to reform BAH based on our analyses, including implementation and messaging plans.

What we did

We compared BAS values against the cost of the USDA's liberal food plan. To address whether annual BAS updates can sufficiently capture short-term variation in food prices, we used quarterly data from October 1999 through October 2023 on the cost of the USDA's liberal food plan for men aged 19 to 50. We then looked at possible methods to update BAS more frequently or incorporate forecasts of the cost of food. To address regional food costs, we used a county-level measure from Feeding America, a not-for-profit organization that links food banks and other food programs across the United States.

Given recent concerns about the food security of military families, we estimated the cost to extend BAS to dependents using data on household size by paygrade. Unfortunately, these data do not include the ages of dependents, so we made assumptions about dependents' ages (and assumed a 50/50 gender mix) based on the members' paygrades.

We reviewed the Office of the Under Secretary of Defense (OUSD) for Personnel and Readiness' (P&R's) data and processes to determine both CONUS COLA and OCOLA payments. We examined changes in these values over time and compared data internal to these processes against other data sources. Specifically, we compared Living Pattern Survey (LPS) reports of how much servicemembers shop on base versus off base against commissary sales to active-duty personnel, and we compared CONUS COLA indices to Bureau of Labor Statistics data on the non-housing cost of living in specific metropolitan areas.

What we found

How is BAS computed: BAS was initially set between the monthly cost of the moderate food plan (a healthy diet for the second-highest income quartile) and the cost of the liberal food plan (a healthy diet for the highest income quartile) for an adult man. However, over time, BAS has risen faster than the cost of these food plans and is now on par with the cost of the liberal food plan. This rise in BAS occurred because the statutory rule for updating BAS implicitly assumes that food costs always rise, and the Department of Defense (DOD) has codified this assumption by leaving BAS constant when the cost of the liberal food plan falls and by raising BAS by the same percentage when the cost of the food plan rises.

How often should BAS be calculated: Because BAS is updated annually and food costs rise more often than they fall, BAS has a lag that results in it undershooting the cost of the food plan on average. If it were always updated to the cost of the liberal food plan (with the exception that it cannot fall), between 2001 and 2023 it would have been an average of $11 per month below the liberal food plan ($6 per month if we exclude the post-COVID-19 period of high inflation). There are options to build in a forecast of future food cost growth based on growth over the previous year, and which option performs best on historical data depends on how we prioritize different objectives.

Should BAS vary by geographic area: Food costs vary significantly by geographic area. Of the 50 largest military housing areas (MHAs), the one with the highest food costs is 50 percent more expensive than the one with the lowest. Even omitting the 10 highest and the 10 lowest out of these 50, the 11th highest is 14 percent more expensive than the 40th highest. However, we based these data on the USDA thrifty market basket, which is intended for those in the lowest income quartile.

Cost to extend BAS to dependents: We estimate that extending BAS to dependents would add either $5 billion or $6.2 billion to the program's cost depending on whether it is tied to the moderate or the liberal food plan, which would almost double the program's cost.

Although data collection and processing for CONUS COLA are extensive and well documented, the results are surprising, not well explained, and difficult to interpret. For example, the estimated national average cost rose 24 percent between 2023 and 2024 without a clearly documented explanation. This rise appears to largely have been driven by some implausibly low costs in the 2023 estimate, so it is likely the process is improving. Also, the LPS at different locations shows significant differences in the percentage of goods purchased at on-base commissaries. Because these figures are self-reported and can have a strong effect on the COLA, OUSD (P&R) could verify the LPS results by looking at commissary sales per servicemember. CONUS COLA indices *are* correlated with local consumer price index less shelter indices, indicating that they have some validity, and this correlation is likely to increase if the CONUS COLA process becomes more stable.

Some overseas locations in the same country that are not very far apart have large OCOLA differences. OUSD (P&R) notes that the primary reason for these differences in OCOLA payments is that the LPS at these locations can show large differences in the percentage of goods purchased at on-base commissaries and exchanges. For example, a June 27, 2023, memo for Germany shows substantial differences in some market basket categories between Kaiserslautern and Wiesbaden [1]. These two sites are only about 60 miles apart, but the Meat and Dairy Category is 29 COLA points higher in Wiesbaden than in Kaiserslautern, and the Household Furnishings category is 43 COLA points higher in Wiesbaden than in Kaiserslautern. OUSD (P&R) could verify the LPS results by determining whether the commissary sales per servicemember at Wiesbaden and Kaiserslautern are consistent with the LPS results.

OCOLA payments can vary substantially year to year. Some commands do not understand the OCOLA process and provide bad advice to their servicemembers [2]. For example, the monthly OCOLA payment for servicemembers living in Yokota, Japan, went from $421 in 2021 to $0 in 2024, in part because of US inflation. OUSD (P&R) could develop a process to stabilize OCOLAs. One method could be to follow a BAH-like procedure, meaning that the OCOLA payment cannot decline below the amount the servicemember receives when they first arrive at their OCONUS (outside the contiguous United States) new duty station but can increase.

Finally, we wish to highlight two planned OCOLA reforms that we support. First, CNA concurs with OUSD (P&R)'s decision to eliminate the "miscellaneous" category that accounted for the purchase of an automobile in the OCOLA market basket of goods and services. Second, after a short-lived congressional intervention that interfered with the OUSD exchange rate accumulator, which adjusts the OCOLA rates in the military biweekly pay periods to account for 5 percent or larger swings in exchange rates, OUSD (P&R) intends to return to using it. We would not currently recommend lowering the threshold for receiving OCOLA below the planned level of 107; DOD should update OCOLA's computational methodology and should study the effects of planned reforms before considering further changes to the threshold.

What we recommend

What purchasing power should BAS provide: We recommend revising the law to define BAS such that its values are recentered on the cost of the USDA liberal food plan for an adult man, clearly defining the target. Doing so would not change BAS's value in the short term but would prevent further unintended drift.

We recommend BAH reform to reduce volatility and improve transparency. To do so, we developed three COAs: tweak BAH, consolidate BAH, or overhaul BAH.

The tweak COA keeps the existing six housing profiles that OUSD (P&R) uses to estimate housing costs, but rather than re-estimating the cost of each profile in each of 300 MHAs each year, it would do so only for a quarter of MHAs each year. Each MHA would receive a BAH update tied to the Department of Housing and Urban Development's (HUD's) estimate of changes in local median rents in three of every four years and be re-baselined in the fourth.

The consolidate COA would, as in the tweak COA, use HUD estimates to update BAH in three out of four years for a given MHA, but it also would consolidate the current six BAH housing profiles into four to improve the available sample size and avoid imposing assumptions about the relative market value of one property type versus another. Servicemembers in some paygrades would see a BAH increase on average from this approach, and other servicemembers would see a decrease. For those who would see an expected decrease on average, we recommend phased implementation to mitigate this decrease when the servicemembers next rotate.

The overhaul COA does away with housing profiles entirely and ties BAH directly to its statutory requirement, which is to enable servicemembers to afford housing comparable to that rented by civilians of comparable income. To achieve this overhaul, OUSD (P&R) would need to partner with the US Census Bureau to generate accurate estimates of what civilians comparable to each paygrade spend on rent and utilities in each MHA. BAH is currently higher on average than what civilians spend on housing, and we assumed it would remain so by applying a consistent multiplier greater than one. By focusing directly on money rather than profiles, this COA would emphasize to members that they are receiving *more* than their civilian peers spend on housing and that they can choose how to spend the money.

In this report, we provide analytic support to help implement these COAs, but DOD must ultimately select one over the others based on how much political will it has for reform. Any of these BAH reforms would draw attention and require careful messaging to servicemembers and to other stakeholders, and we provide OUSD (P&R) with sample messaging materials for each in a separate enclosure.

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Contents

Introduction

QRMC background

In accordance with Section 1008 of Title 37, United States Code, the President must direct an independent review of the principles and concepts of the military compensation system every 4 years [3].

The director of the 14th Quadrennial Review of Military Compensation (QRMC) asked CNA to review the statutory requirements and methodologies used to calculate the Basic Allowance for Housing (BAH), Basic Allowance for Subsistence (BAS), and Cost-of-Living Allowances (COLAs) to ensure military members can procure suitable housing and food. Other federally funded research and development centers were simultaneously asked to support the QRMC with studies of basic pay, food security of military families, spousal income, and entitlements for deployed members.

BAH, BAS, and COLA definitions

As explained in the BAH primer published by the Office of the Secretary of Defense, BAH is a form of compensation designed to help members rent adequate housing near their duty stations when government housing is not available [4]. The BAH rate a member receives depends on their rank, their number of dependents, and the military housing area (MHA) of their duty station (with some exceptions if the dependents do not relocate). By law, the rate must be based on the cost of adequate housing for civilians of comparable incomes in the same area [5]. The Department of Defense (DOD) interprets this cost as the local median rental cost for a given housing unit type, or "housing profile," in a suitable neighborhood, plus the average cost of utilities in that area [4]. Rank and dependent status determine which housing profile DOD uses.

DOD collects data on six housing profiles:

1. One-bedroom apartment
2. Two-bedroom apartment
3. Two-bedroom townhouse/duplex

4. Three-bedroom townhouse/duplex
5. Three-bedroom single family dwelling
6. Four-bedroom single family dwelling

Most paygrades are tied to one of these or to a percentage difference between one of these housing profiles (also referred to as "anchor points") and the next. Until passage of the Fiscal Year (FY) 2024 National Defense Authorization Act (NDAA), law required that BAH for members in the grades of E-1 through E-4 with dependents be tied to the average of the cost of a two-bedroom apartment and a two-bedroom townhouse. The law still requires that E-1 through E-4 servicemembers receive the same BAH rate, but now it does not specify the profile [6].

To provide some stability in household budgets and reduce the probability that members need to move during a tour at a duty station, the BAH rate a member receives can adjust up mid-tour, but it can adjust down only when the member has a permanent change of station (PCS) move, has a rank reduction, or no longer has dependents [4].

Members may buy a home and use their BAH to make mortgage payments, but DOD policy specifies that BAH values are tied to the rental market and not to ownership costs. Servicemembers are free to spend more or less than their BAH payment on housing as they see fit; any BAH payment not spent on housing is free to be spent on other goods or services.

BAS is a tax-free allowance meant to offset costs for a uniformed member's meals. This allowance is based on the military's history of providing room and board (or rations) as part of an enlistee's pay and is not intended to offset the costs of meals for family members. Because BAS is intended to offset the meal costs, its level is linked to the price of food as reported in the US Department of Agriculture's (USDA's) food plans for men aged 19 to 50 [7].

Contiguous United States (CONUS) COLA is a taxable supplemental allowance that helps offset expenses for servicemembers assigned to expensive CONUS areas. The rate varies by geographic location and by "spendable income," which is a function of rank, years of service, and number of dependents. It is updated annually and applies only to members in MHAs with a COLA index (i.e., ratio of local cost to national average) above a set threshold.

Overseas COLA (OCOLA) is a nontaxable allowance designed to ensure servicemembers assigned to a permanent duty station outside the contiguous United States (OCONUS) (i.e., foreign countries, US territories, Alaska, and Hawai'i) maintain a level of purchasing power equivalent to servicemembers stationed in CONUS. It can be updated more frequently than annually to reflect currency exchange rate changes and has no minimum threshold.

Companion report on BAH

This report is a companion to the CNA report *Evaluation of Basic Allowance for Housing,* which addresses 11 congressional questions in the FY 2023 NDAA [8-9]. We summarize its findings in this report to provide motivation and context for the possible BAH reforms we discuss later.

We are delivering this report in two volumes for two reasons: timing and structure. CNA provided *Evaluation of Basic Allowance for Housing* to the sponsor halfway through the study because the FY 2023 NDAA required that DOD report to Congress on those questions at that time. We based the analysis in that report on 2023 BAH rates and on the most recent US Census Bureau data available. We delivered it as a finished product, and we are keeping it separate rather than attempting to update it.

We also structured *Evaluation of Basic Allowance for Housing* to exactly match the order of the questions Congress posed. Keeping the two volumes separate preserves that structure. This report goes beyond the NDAA requirement by considering BAH reforms that Congress did not directly inquire about and by analyzing the other allowances (BAS, CONUS COLA, and OCOLA).

Organization of this report

The next chapter highlights our BAH findings from the companion report. The following three chapters describe our analyses of BAS, CONUS COLA, and OCOLA. The final chapter describes three possible courses of action (COAs) for BAH reform. Appendix A expands on our analysis of possible approaches for building food cost forecasts into BAS to address the inherent lag. Appendix B describes the exchange rate accumulator used to adjust OCOLA to account for currency exchange rate fluctuations. Along with this report, we have provided separate enclosures containing fliers to explain the BAH reform COAs (if DOD were to implement one) and crosswalks mapping MHAs to other geospatial units used by other government agencies.

Basic Allowance for Housing Findings

The 2023 NDAA called for an analysis of the accuracy, efficiency, and responsiveness of BAH; the suitability of the housing profiles associated with it; and the availability of suitable housing in MHAs. Here we review highlights from our report addressing these questions.

Accuracy: nationwide average

We interpret BAH accuracy as sufficiency to meet the statutory requirement: enabling members to afford housing comparable to that of civilians of comparable income. For most BAH recipients, BAH is *higher* than median spending on rent and utilities by comparable civilians, chiefly because DOD views some low-rent living arrangements (e.g., living with roommates or in high-crime neighborhoods) as unsuitable for servicemembers and does not include them when calculating BAH. This is especially true for servicemembers with dependents—particularly junior enlisted personnel because Congress has set a BAH floor for junior enlisted personnel (a common standard for paygrades E-1 through E-4).

To evaluate the sufficiency of current BAH rates, we compared them to rental data from the American Community Survey (ACS). Conducted by the US Census Bureau, the ACS is the largest ongoing US community survey and is sent to about 3.5 million households each year [10]. The US Census Bureau provides access to a large subset of ACS survey data, aggregated by public use microdata areas (PUMAs). ACS estimates are provided in 5-year increments.[1] Unlike housing cost indices, which can provide useful information about rates of change but not appropriate BAH levels, the ACS allows us to evaluate BAH levels because it has information about both housing expenditures and incomes. To evaluate the sufficiency of BAH, we used ACS data on household rents, incomes, housing type, bedrooms, household size, and age for the most recent 5-year estimates.

BAH, with its associated absorption rates, is intended to equalize the non-housing income of servicemembers across the country. Servicemembers who rent the standard BAH unit for their paygrades are supposed to have equal amounts of remaining income regardless of where they are stationed in the US. On the whole, servicemembers earn more than civilian renters on average and therefore have higher housing standards; however, because we are interested in

[1] At the time we delivered our BAH report, the most recent available 5-year increment was 2017 through 2021, and we display in this review the results from that report. Data from 2018 through 2022 are now available, and we use them later in this report when describing proposed reforms to the BAH interpolation table.

BAH sufficiency, we want to compare servicemembers to civilians *who have similar amounts of non-housing income*. A servicemember's regular military compensation (RMC) minus their BAH should match the civilian's household income minus their expenditures on rent and utilities.[2] To this end, we divided the ACS data into ventiles,[3] each containing about 5 percent of the sample used. Instead of grouping these ventiles by income, we grouped them by income-less-housing and utility expenses. We excluded civilians who live in mobile or group homes, and we used the Consumer Price Index (CPI)[4] to inflate the median values to January 2023 so that we could appropriately compare them to the 2023 BAH rates that took effect at that time.

Finally, BAH is supposed to estimate the cost of vacant rental units, whereas the ACS estimates the costs of vacant and occupied units. We compared the rents paid by new movers—defined as tenants who have moved in within the last 12 months—and found that they were on average 7.9 percent higher, so we adjusted all median rents accordingly for this new renter premium.

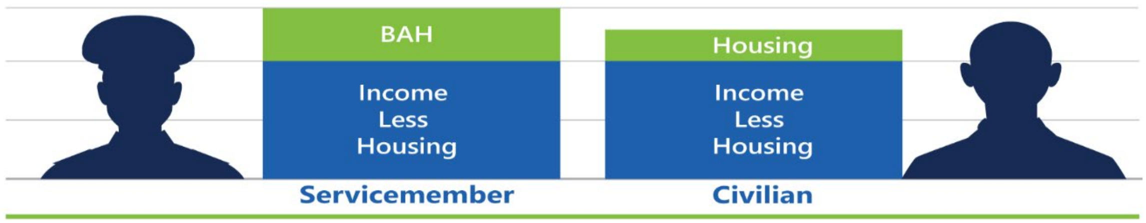
The income-less-housing approach facilitates assessing the sufficiency of BAH rates across the country. BAH is a major component of military compensation. For an E-5 with dependents and 10 years of service, BAH can vary from 26 percent to 121 percent of basic pay, with the average being 55 percent [11-12]. Such a large variation makes comparisons with pure income ventiles difficult because the appropriate income comparison varies so greatly from location to location. However, comparing servicemembers to civilians with similar non-housing incomes (measured as income less rent or RMC less BAH) provides a much more stable comparison. As we illustrate in Figure 1, servicemembers are able to spend more on housing than civilians of equivalent non-housing income.

[2] Although we compare members' RMC to civilians' total household income, we realize that members may have additional sources of income such as bonuses and special pays, spouses' wages and salaries, and investment income. A member whose total household income is significantly higher than their RMC may accordingly choose to spend more on housing than a civilian with household income equal to the member's RMC. This more expensive housing choice would be partially funded through sources other than BAH, such as spousal income.

[3] Ventiles are 5 percentile increments. The full sample, therefore, comprises 20 ventiles.

[4] The ACS uses the general CPI to adjust the results between its annual surveys. We are consistent.

Figure 1. Comparing BAH to housing expenditure of comparable civilian



Source: CNA.

Table 1 shows how average BAH for each paygrade in 2023 compares with what comparable civilians spend on rent and utilities, if their incomes and housing expenditures are inflated to January 2023 dollars and if we assume they have just moved into a new home in the last year (as BAH recipients are likely to have done). We make the comparison both for the average BAH rate that members actually receive and for the average cost that the Office of the Under Secretary of Defense (OUSD) for Personnel and Readiness (P&R) estimates for their housing profile, considering that current policy is for members to pay a small share of this cost out of pocket (an average of 5 percent).

Table 1. Sufficiency of BAH at the national average level, by paygrade

Grade	% difference from civilian, with dependents	"5% out of pocket" added back in	% difference from civilian, without dependents	"5% out of pocket" added back in
E-2	60%	68%	23%	29%
E-3	57%	65%	26%	32%
E-4	41%	49%	15%	21%
E-5	45%	53%	27%	34%
E-6	53%	61%	27%	34%
E-7	38%	46%	17%	23%
E-8	46%	53%	19%	25%
E-9	26%	32%	10%	16%
W-1	25%	32%	-15%	-11%
W-2	39%	46%	18%	24%
W-3	37%	44%	24%	30%
W-4	26%	32%	13%	19%
W-5	17%	23%	17%	23%
O-1E	57%	65%	37%	44%

Grade	% difference from civilian, with dependents	"5% out of pocket" added back in	% difference from civilian, without dependents	"5% out of pocket" added back in
O-2E	47%	55%	30%	36%
O-3E	46%	54%	31%	38%
O-1	27%	33%	15%	21%
O-2	39%	46%	23%	29%
O-3	35%	42%	23%	30%
O-4	38%	46%	23%	30%
O-5	51%	59%	28%	35%

Source: CNA.

Note: E-2s, E-3s, and E-4s have different results even though their BAH standards are the same because they have different RMCs, and BAH is intended to provide housing quality comparable to civilians with similar incomes. The DOD RMC calculator does not always provide estimates for E-1s, so we were unable to include the E-1 BAH amounts in our assessments.

For example, reading from left to right across the row for the E-5 paygrade, we find that the average BAH paid to E-5s with dependents in 2023 is 45 percent higher than what civilian households with the same income-less-housing would spend on rent and utilities, and that it would be 53 percent higher if BAH did not notionally require an out-of-pocket contribution. Continuing along the row, we find that the average BAH paid to E-5s without dependents is 27 percent higher than expenditures of comparable civilians and would be 34 percent higher without the notional out-of-pocket contribution. For all paygrades except W-1 without dependents, and particularly for members with dependents, BAH is on average more than sufficient despite the notional "5 percent out-of-pocket" contribution.[5]

Accuracy: across MHAs

Filtering the publicly available portion of the ACS data by several attributes in specific PUMAs does not produce large enough sample sizes to determine what comparable civilians spend on a particular housing type in a particular MHA. This is because PUMAs are smaller than MHAs and do not uniquely map to them, and public use microdata does not contain the full sample. Therefore, we cannot directly measure how civilian spending compares to BAH for each paygrade-MHA combination. Instead, we sorted MHAs by BAH and PUMAs by the median rent

[5] Average compensation (including tax advantage) for servicemembers varies with family size, so to determine the comparable civilian for members with dependents, we used the average RMC of members with the median number of dependents (among members with dependents) for their paygrade.

and compared BAH in each cost bin of MHAs to rent by comparable civilians in a slightly higher cost bin of PUMAs. In this way, for all but the most expensive 13 percent of MHAs, we can establish an upper bound and be confident that BAH is sufficient if it exceeds that upper bound.

For members with dependents, we can establish that BAH is sufficient in anywhere from 80 percent (for O-2s) to 100 percent (for several paygrades) of MHAs that have a relevant upper bound. By design, BAH is less generous for members without dependents. We can establish that for these members, is it sufficient in anywhere from 38 percent (for W-4s) to 84 percent (for O-1Es or for O-1s with prior enlisted service) of MHAs that have a relevant upper bound.

Although this approach does not allow us to prove the sufficiency of BAH in high-cost MHAs such as San Diego or Hawai'i, these members are the *most* likely to have BAH that exceeds civilian housing expenditures. Members in those high-cost MHAs receive BAH tied to a nationwide housing standard despite the fact that civilians tend to consume less housing in more expensive areas. However, because servicemembers are assigned to a geographic area rather than able to choose where to live, DOD has attempted to maintain these consistent housing standards even in high-cost areas that are generally seen as more desirable. As a result, servicemembers in these areas likely receive more BAH than comparable civilians spend on housing.

Efficiency

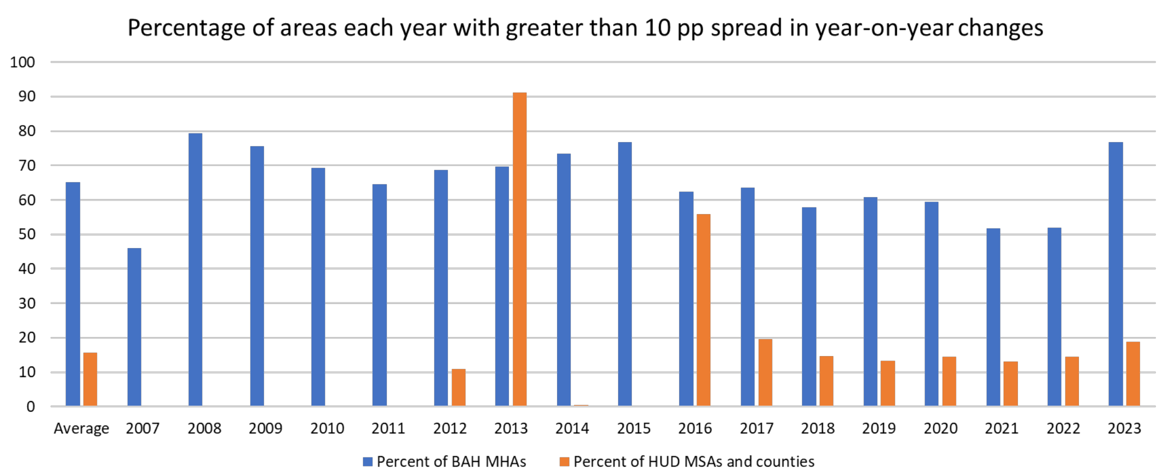
BAH efficiency can be interpreted in multiple ways. An ongoing CNA study will survey BAH recipients about their household finances and housing choices, and the results will provide insights into some definitions of the efficiency of BAH. One interpretation, which we can address with the data we have, is technical. An efficient estimator is characterized as having the smallest possible variance, indicating that a small deviation exists between the estimated value and the "true" value [13]. We interpret *efficiency* using this technical definition: *efficiency* is the "volatility" of BAH's annual changes compared to the housing market. BAH is strikingly volatile. Even within a single MHA, large differences in the increases between various anchor points and paygrades are common. This volatility contrasts with other metrics of housing prices, and it may contribute to servicemembers' frustration and dissatisfaction with BAH.

To measure this BAH volatility, we looked at the percentage increases in the different BAH rates and anchor point rates for each MHA from 2007 through 2023. We considered the MHA rates to be volatile in a specified year if year-on-year changes for different BAH rates or anchor point rates differed by more than 10 percentage points. For example, if the BAH rate for a with-dependents paygrade increased by 8 percentage points from the previous year, but the BAH rate for another paygrade in that same MHA decreased by 3 percentage points that same year, we considered that MHA-year combination to have a volatile change in BAH.

If we define a volatile MHA year as one with a greater than 10 percentage point spread in year-on-year changes, then more than half of the MHAs had volatile BAH rates in any specific year since 2008. Even similar housing categories often showed great volatility within the same MHA and year. For example, the difference in the annual rate changes between one- and two-bedroom apartments varied by up to 55 percentage points.[6]

To put this BAH volatility into context, we compared it to the volatility of the Department of Housing and Urban Development's (HUD's) estimates of 50th percentile housing costs. HUD produces these costs each year for approximately 2,600 metropolitan statistical areas and counties. Using the same volatility metric, we found that the HUD estimates are generally much less volatile than BAH.[7] Figure 2 shows the percentage of volatile areas for each year.

Figure 2. Volatility comparison between BAH MHAs and HUD housing areas



Source: CNA generated from historical BAH rates published at [Basic Housing Allowance | BAH Rate Lookup | Defense Travel Management Office (dod.mil)] and historical HUD estimates at [50th Percentile Rent Estimates | HUD USER.]

[6] We drew this example from Kodiak, Alaska, where the estimated cost of a one-bedroom apartment in 2008 increased by almost 40 percent, but a two-bedroom apartment decreased by more than 15 percent.

[7] The HUD data had high volatility in two outlier years: 2013 and 2016. We enquired about those years and found that they may have been the result of a recalibration of the HUD rates.

Real estate market processes

Residential rental rates are estimated based on a combination of factors that can vary by location and over time in the real estate market. Supply and demand dynamics depend on economic conditions such as inflation, population growth, housing supply, federal interest rates, and other factors. Some of the key factors that landlords or property managers consider when estimating rental rates include the following: location (e.g., safety of the neighborhood, proximity to public services such as public transportation, school districts, employment), the property type, the size and layout of the property (e.g., number of bedrooms, bathrooms), the condition and quality of the property (e.g., age, recent remodel or renovations, amenities), operating costs (e.g., taxes, mortgage payments, utilities, maintenance costs, homeowners association fees, property management costs), historical demand and rent from comparable properties in the neighborhood, and seasonal variation [14].

The supply and demand conditions that drive the residential real estate market do not necessarily align with the assumptions underlying the six housing profiles. The BAH policy that ties profiles to paygrades implicitly assumes that a four-bedroom single family dwelling (SFD, or detached home) is more expensive than a three-bedroom SFD, which is in turn more expensive than a three-bedroom townhouse or duplex, and so forth.

In practice, BAH surveys sometimes produce cost estimates for the various anchor points that do not line up in this order for a given MHA. If left uncorrected, these "inversions" would result in some members receiving less BAH than members in a lower paygrade in the same MHA. BAH policy places all paygrades in an order such that an E-6 with dependents receives more BAH than an O-2 with dependents and less than a W-1 with dependents, and so on.[8] So, if the estimated cost of a three-bedroom townhouse is higher than that of a three-bedroom SFD in an MHA, OUSD (P&R) must adjust these estimates to ensure not only that a W-3 with dependents receives more BAH than an E-6 with dependents but also that enough separation exists between them for the seven intervening grades (W-1, E-7, O-1E, W-2, E-8, O-2E, and O-3) to each receive more BAH than the grade below.

Analysis of ACS data reveals that these inversions are not deviations from the norm but are, in fact, the norm for the private market. Average monthly rent nationwide for a three-bedroom townhouse or duplex ($1,456) is greater than for a three-bedroom detached house ($1,183).[9] In fact, in an area covered by North Dakota, South Dakota, Montana, and Wyoming, it is much

[8] The ordering is different for members without dependents than members with dependents, and E-1 through E-4 all receive equal BAH.

[9] These prices are from 2021.

more expensive even than a four-bedroom detached house ($1,141 versus $774). This is nearly the case in Arkansas, Mississippi, Oklahoma, and Alabama as well. The reason is that townhouses tend to be in more expensive locations that are closer to amenities and more employment opportunities.

We found that government indices, including those produced by HUD and the Bureau of Labor Statistics (BLS), have lags relative to commercial indices. These lags are due to the annual cycle of lease renewals. Since most leases last for a year, a renter's cost stays the same over the course of the year, and it will take a year to have a clearer picture of rental market changes.

Some housing cost indices apply only to apartments or only to SFDs, but the HUD 50th percentile estimate applies to all housing types and breaks them out only by number of bedrooms. Given differences across markets in the relative cost of a detached home and an attached home, an approach using four anchor points instead of six may be more suitable to define BAH profiles and calculate BAH rates.

Responsiveness over time

Over the long term, BAH is very responsive to market trends. BAH did not consistently outpace or lag HUD's 50th percentile growth from 2006 through 2023. The two measures tracked closely for one-bedroom and three-bedroom dwellings, BAH grew more quickly for two-bedroom dwellings, and HUD's estimates of rent grew more quickly for four-bedroom dwellings from 2015 to 2020 (a period in which BAH barely increased at all).

However, these changes reflect long-term trends, and BAH's short-term flexibility is another issue. BAH simply was not designed to account for rapid surges in the housing market, such as the surge in rents that occurred in 2021 and 2022. By statute, BAH rates update when basic pay updates, which occurs once per year in January [5]. As a result, from January through December of a calendar year, BAH payments are based on the prices sampled between March and July of the previous calendar year. As a result, BAH rates have a lag of at least 5 months the day they take effect and of at least 17 months by the end of the year.

Ordinarily, the effect of this lag is small relative to BAH volatility and to the other factors that drive members' housing costs. Between 2006 and 2020, the CPI of primary residence rents rose 53 percent, equivalent to an average compounded rate of about 3 percent per year. However, between 2020 and 2023, this measure grew at an average of 4.8 percent per year, and the increase was much higher in some markets. Therefore, during 2021 and 2022, the BAH lag resulted in its relative changes falling far behind in some markets in the short run. We note that private sector wages also failed to keep up with rising housing costs during those years, so military families were not the only Americans struggling with inflation.

Suitability of housing profiles to family size

We compared the current BAH housing standards for members with dependents to the 2023 family size statistics reported by OUSD (P&R) [11].[10] We considered the implications of these family sizes if each child had their own bedroom or if the number of bedrooms followed on-base housing standards, which allow children under 10 years old to share with a sibling of the same gender and children under 6 to share with a sibling of either gender [15-16].

If we assume that the first dependent is the servicemember's spouse and that it is desirable for children (assumed to be any subsequent dependents) to have separate bedrooms, then these BAH standards have bedroom numbers that are sufficient for between 69 percent and 90 percent of servicemember families for their respective paygrades (94 percent for O-7s, though officers of flag rank typically live on base).[11] There is no simple pattern in the relationship between paygrade and this adequacy metric because as members become more senior, their families tend to grow, and their housing profiles do as well.

As noted above, the military's on-base housing standards do permit children to share bedrooms, depending on age and gender. We estimate that between 82 percent and virtually 100 percent of servicemember families have sufficient bedrooms for their family size based on bedroom-sharing rules.

In the academic literature, we found that within a specific income level, civilian households with more children tend to increase their housing expenses by very little or not at all [18-19]. In examining ACS data, we found a small increase in housing expenses within income levels as household size increases. The average amount was $36 per additional person after the first two people. This increase appears small enough that it may only be due to increased utility costs. Based on these findings, the with-dependents BAH policy of providing one rate regardless of family size appears to be consistent with the civilian population.

Suitability of available housing

We examined whether servicemembers can find housing within their MHA, and we assessed the relative quality of that housing by comparing the average cost in the ZIP code in which they

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[10] We used the annually published Selected Military Compensation Tables, or "Green Book."

[11] This assumes that the spouse is a civilian dependent and not another BAH recipient. A 2020 DOD report confirms that only 6.8 percent of active-duty servicemembers are married to another servicemember [17].

live to the average cost in other ZIP codes in their MHA. By both measures, the answer is yes, most servicemembers can find suitable housing.

We found that 92 percent of servicemember families live within their MHA while 8 percent commute from a neighboring MHA. Of those 8 percent commuting from outside the MHA, about 60 percent reside in an MHA with lower BAH rates (and presumably lower housing costs) than their assigned MHA, so their BAH should be adequate there as well. We cannot observe why some servicemembers choose to live in more expensive MHAs, but the reasons are likely tied to some combination of additional housing budget (because we cannot observe spouses' salaries) and perceived benefit (e.g., higher housing quality, proximity to formal or informal support networks, higher school quality).

The "effective market area" ZIP codes (where most BAH recipients live) typically had higher gross rents than the rest of the ZIP codes within the MHAs. This difference was true for 74 percent of the MHAs. Because rent is an indicator of housing quality and location desirability, this finding suggests that servicemembers are finding available housing in better areas within the MHAs.

This concludes our summary of the companion report on BAH. We now turn to the other allowances we were asked to analyze: BAS and COLAs.

Basic Allowance for Subsistence

Background

BAS is a tax-free allowance meant to offset costs for a uniformed member's meals; it was first set to a uniform rate in 1808 [20-21].[12] This allowance reflects the military's history of providing room and board (or rations) as part of enlistees' pay and is not intended to offset the costs of meals for family members.[13] The military has always provided some form of BAS—ideally in kind (feeding troops directly) but in cash if necessary—to US enlisted servicemembers [21]. In contrast, the military granted officers a cash allowance but required them to arrange for their own subsistence until 1870, and it did not grant officers any allowance for subsistence from 1871 through 1922; even when a version of BAS was in effect for officers, it was updated far less often than for enlistees and therefore was tied far less closely to food costs [21, 23-25]. Reflecting these historic payment patterns, BAS is unique among the RMC components in that it is more generous for enlisted servicemembers (currently $460.25 per month) than it is for officers ($316.98). As a result, BAS is a larger share of enlisted servicemembers' RMC; for an average E-5 with six years of service and a family of four, BAS provides 6.5 percent of RMC, whereas for an O-3 with six years of service and a family of four, the figure is 3 percent [26].

For much of its history, BAS was set at a fixed level; as a result, its connection to the actual price of food was tenuous and brief as food prices changed. Annual updating of BAS levels did not begin until 1951 and was not made permanent until 1953; the methods by which it was updated varied over the next 45 years, but because these methods never explicitly included food cost measures, BAS rates continued to bear little relationship to these costs [21].

The FY 1998 NDAA was the first legislation that tied BAS values to a formal measure of food costs. It established that enlisted servicemembers should be paid a monthly amount equal to the midway point between the prior October values of the USDA's moderate and liberal food plans, which meet nearly all dietary standards based on 58 food categories and expenditures

[12] Although the term "basic allowance for subsistence" was first introduced in the Career Compensation Act of 1949 (along with the term "basic pay"), we refer to its prior analogues as "BAS" for simplicity [22].

[13] From 1922 to 1949, officers with dependents—but not enlisted servicemembers—were offered additional allowances for subsistence; in 1949, the Pay Committee of the Armed Services Personnel Board asserted that the purpose of BAS was to provide subsistence for servicemembers and not for their dependents. This period was the only one during which BAS or analogous payments varied by family structure [21-23].

in the top and next-highest respective quartiles of food spending for men aged 20–50; BAS growth for officers was set to the same rate as for enlisted servicemembers, but they did not have their BAS payments re-leveled [7].[14] However, annual increases were capped at 1 percent until the FY 2001 NDAA established that each year's monthly BAS rate should scale the previous year's monthly BAS rate by the percentage growth between liberal food plan costs in October of the previous year and the October one year prior, using existing BAS levels as a baseline [28].[15] Since then, BAS has grown at an average of 3 percent year. In keeping with the US military's history of providing enlisted servicemembers with a cash allowance *when direct provision of meals is not possible*, single servicemembers assigned to barracks and all servicemembers assigned to ships (whether in port or at sea) have their dining hall or galley cost deducted from BAS, regardless of where they eat [29].[16]

Because basic pay tables are linked to private sector wages, which can grow or fall independently of food costs, annual BAS changes will not necessarily mirror changes in basic pay tables; similarly, annual BAS changes may not reflect BAH changes, which are based on local housing costs.

Issues and approach

To address BAS sufficiency, we answer six questions in this report (four as directed by the QRMC and two as necessary preconditions for doing so):

1. How is BAS currently computed?
2. What purchasing power should BAS provide?
3. How often should BAS be calculated?
4. Should BAS vary by geographic area?
5. How do other measures of food prices compare with the USDA's liberal food plan?

[14] All USDA plans exceed dietary standards for sodium; meeting this recommendation "would require changes in food-manufacturing processes" [27]. The 20–50 age bracket, which was changed to 19–50 in September 2007, covers most servicemembers. Because male dietary needs are higher than female dietary needs on average, using the average of food for men ensures that female servicemembers are compensated sufficiently for food costs. USDA values are preferred over the Bureau of Labor Statistics' CPI for food because the CPI is tied neither to specific nutritional guidelines (e.g., changes in the cost of junk food should be less relevant to the USDA than to the CPI) nor to a specific age group (e.g., the cost of baby food is irrelevant to a servicemember's own diet).

[15] That is, $BAS_{t+1} = BAS_t * (October_t / October_{t-1})$, in which BAS_t is the monthly BAS rate in year *t* and $October_t$ is the cost of the liberal food plan in year *t*.

[16] Because this directive does not apply when servicemembers are on leave, on PCS status, on temporary duty other than sea duty, or in a handful of other contexts, these servicemembers may retain some BAS payments [29].

6. How much would it cost to extend BAS to servicemembers' dependents?

To address the first two questions, we compared BAS values against the cost of the USDA's liberal food plan. When the FY 1998 NDAA defined BAS as the midway point between the USDA's moderate and liberal food plans, this directive seemingly established a clear standard for the needs that BAS should meet. However, BAS values have since diverged from this clear standard. We argue that tethering BAS more closely to the liberal food plan value provides an appropriate, transparent, and sustainable path forward.

To address whether annual BAS updates can sufficiently capture short-term variation in food prices, we used quarterly data from October 1999 through October 2023 on the cost of the USDA's liberal food plan for men aged 19–50 [27].[17] We then looked at how computationally simple methods of quarterly and annual BAS updating would align with actual food costs over time.

To address regional food costs, we used a county-level measure from Feeding America, a not-for-profit organization that links food banks and other food programs across the United States. Its food cost measure maps NeilsenIQ data on local food sales to categories in the USDA's thrifty food plan to compute a market basket appropriate for men aged 20–50. The weekly cost of this basket is then divided into a cost per meal [31]. We then mapped these county values to the 50 MHAs with the highest servicemember populations across all services.[18] Because these measures rely on the thrifty food plan rather than the liberal food plan, they are not directly comparable to BAS values; however, we are unaware of any data sources reporting local variation in the liberal food plan's cost.

The 2022 Status of Forces Survey of Active-Duty Members included questions related to food security (i.e., the state of having reliable access to a sufficient quantity of affordable, nutritious food) as well as the number of dependents and paygrade.[19] Across all pay categories,

[17] In October 2007, the USDA changed its relevant age category from 20–50 to 19–50 to better align its age brackets with those used by Dietary Reference Intakes, from which Recommended Dietary Allowances of different nutrients are drawn; however, this shift in age brackets did not lead to noticeable cost differences [30]. Quarterly data reflect values for January, April, July, and October. Our report does not account for changes to the market baskets used to determine the cost of the liberal food plan, which last occurred in 2006 and 2003 [30].

[18] MHAs are created for the Basic Allowance for Housing but are also used to calculate the Cost-of-Living Allowance (COLA) and theoretically could be used to vary BAS by location as well. Five of the 50 MHAs did not correspond to a single county. For these cases, we selected a county that substantially overlapped with the MHA. These MHAs (and the selected counties) were Norfolk/Portsmouth, Virginia (Norfolk City); Hampton/Newport News, Virginia (Hampton City); Fort Riley, Kansas (Riley County); Fort Campbell, Kentucky (Christian County); and Fort Cavazos (formerly Fort Hood), Texas (Coryell County).

[19] These data are not yet publicly available and were provided to us by RAND, which is conducting a parallel study on food security for the QRMC.

servicemembers with dependents were more likely to report food insecurity issues than were those without dependents. The difference ranges from 17 percentage points among servicemembers in the E-1 through E-4 grades to 1 percentage point among those in the O-4 through O-6 grades. In light of recent concern about food insecurity among military families, OUSD (P&R) was motivated to investigate the cost to expand BAS to include dependents as well.

To this end, we used tabulated data on household size by paygrade published by OUSD (P&R's) Compensation directorate. Unfortunately, these data do not include the ages of dependents, which we would need to map to the age-appropriate USDA food plan data. Therefore, we made assumptions about dependents' ages (and assumed a 50/50 gender mix) based on the members' paygrades.[20] To expand BAS to include dependents, DOD could track the gender and the exact age of each dependent and tailor the BAS for each family accordingly (for example, USDA has a food plan for a 12- to 13-year-old girl), or it could develop BAS rates that average by gender and by six-year age bins, as we do in our calculations. Either approach would result in the same total program cost. The cost of the USDA food plans is estimated for a family of four and involves some economies of scale (i.e., they assume the cost per person is lower in larger families and higher in smaller ones), but we assume—for simplicity of calculation—that DOD would take the published numbers at face value and not adjust them for family size.[21]

Findings

How is BAS *currently* computed?

Table 2 shows monthly BAS values for enlisted servicemembers and officers since the adoption of the current BAS formula in the FY 2001 NDAA. Our first observation is that the actual BAS values differ from those that would occur under strict adherence to the formula required by law. Most noticeably, *falling food costs do not translate into reduced BAS payments*; the USDA

[20] We assumed that the first dependent is a spouse, and the spouse receives BAS tied to the food plan for a woman aged 19 to 50 because the member receives BAS tied to the food plan for a man aged 19–50 (in other words, we are not assuming the member is male, just that the member is getting a male food plan). We assumed that for warrant officers, for enlisted servicemembers in the grade of E-7 and above, and for officers in the grade of O-4 and above, the second dependent is in the 12 to 18 age range, and any subsequent dependents are in the 6 to 11 age range. We assumed that for E-6s and O-3s, the second dependent is in the 6 to 11 age range, and subsequent dependents are younger than 6. For personnel more junior than E-6 or O-2, we assumed that all dependents other than the spouse are under 6. These assumptions align with the age assumptions we made in our previously published BAH report.

[21] Making the adjustment would increase the program's total cost because families of four or fewer are more common than families larger than that.

liberal food plan costs decreased in 2010, 2017, and 2019, but BAS underwent no adjustments.[22] Our second observation is that using the unrounded growth in food costs tends to result in overestimates of BAS (e.g., for each year from 2002 through 2009, actual enlisted BAS was slightly lower than the strict formula predicts). As a result, BAS grew by 98 percent over the period instead of by 87 percent, as based on the value under strict adherence to the formula established in 2001. We identified a formula that better predicts BAS behavior: we round the ratio of the October liberal food plan cost to that of the previous October to three decimal places, and then we multiply the result by the previous BAS and use either this result or the previous BAS, whichever is higher.[23] Table 2 shows that compared to the strict legal formula, our modified formula comes much closer to actual BAS values (diverging by $0.27 from actual enlisted BAS values as of 2024, versus $24.75 under strict implementation of statutory requirements).

Table 2. BAS values by calendar year

Year	Officers			Enlisted			USDA liberal food plan values for prior October
	Actual	Strict formula[a]	Modified formula[b]	Actual	Strict formula[a]	Modified formula[b]	
2024	$316.98	$299.84	$317.07	$460.25	$435.50	$460.52	N/A
2023	$311.68	$294.87	$311.77	$452.56	$428.28	$452.82	$450.70
2022	$280.29	$265.10	$280.37	$406.98	$385.04	$407.21	$405.20
2021	$266.18	$251.75	$266.25	$386.50	$365.65	$386.72	$384.80
2020	$256.68	$242.72	$256.75	$372.71	$352.54	$372.92	$371.00
2019	$254.39	$240.56	$254.46	$369.39	$349.40	$369.59	$367.70
2018	$254.39	$241.87	$254.46	$369.39	$351.31	$369.59	$369.70
2017	$253.63	$241.09	$253.70	$368.29	$350.17	$368.49	$368.50
2016	$253.63	$245.99	$253.70	$368.29	$357.29	$368.49	$376.00
2015	$253.38	$245.73	$253.45	$367.92	$356.91	$368.12	$375.60
2014	$246.24	$238.80	$246.31	$357.55	$346.84	$357.74	$365.00
2013	$242.60	$235.20	$242.67	$352.27	$341.61	$352.46	$359.50

[22] It is not clear whether this lack of adjustment is consistent with the law's intent. Section 402 of Title 37, United States Code, is worded in a way that implicitly assumes food prices increase rather than decrease.

[23] That is, as written in law, the formula for updating BAS appears to be:

$$BAS_{t+1} = BAS_t * \frac{Oct_t}{Oct_{t-1}}$$

However, in practice, it appears to be:

$$BAS_{t+1} = \max\left\{BAS_t, \quad BAS_t * round\left(\frac{Oct_t}{Oct_{t-1}}, 3\right)\right\}$$

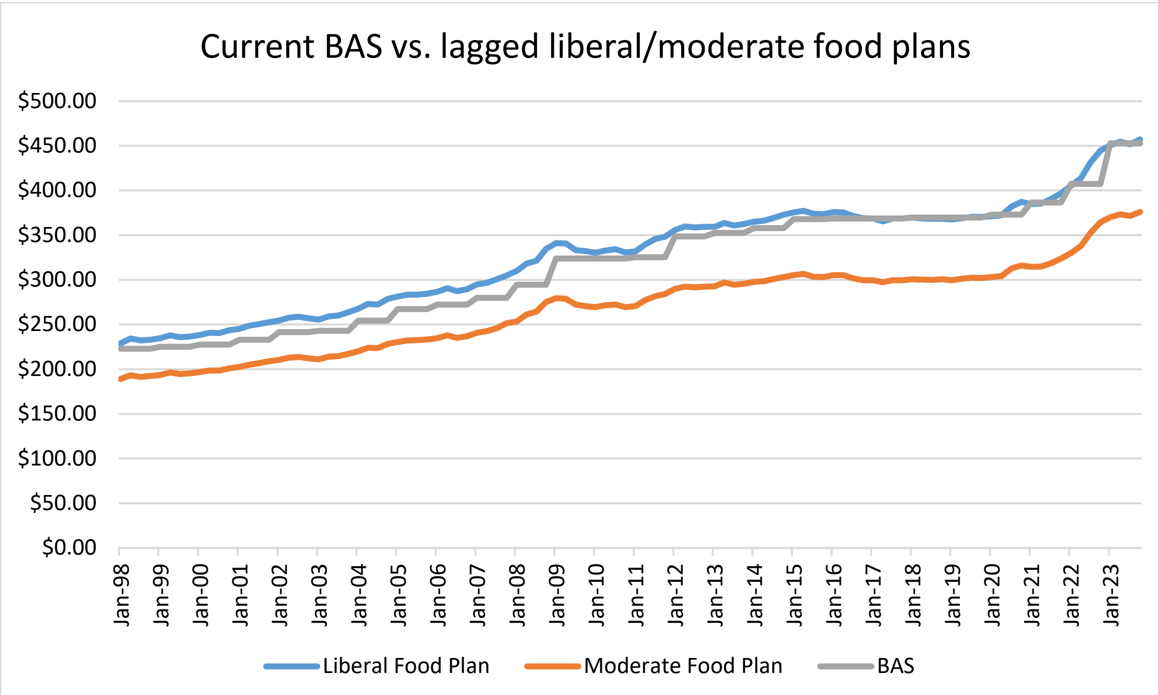
In which BAS_i provides the BAS level for calendar year i, Oct_j provides the value of the liberal food plan in calendar year j, and $round(x, k)$ is a function rounding real number x to k decimal places.

Year	Officers			Enlisted			USDA liberal food plan values for prior October
	Actual	Strict formula[a]	Modified formula[b]	Actual	Strict formula[a]	Modified formula[b]	
2012	$239.96	$232.65	$240.03	$348.44	$337.91	$348.62	$355.60
2011	$223.84	$216.95	$223.90	$325.04	$315.10	$325.21	$331.60
2010	$223.04	$216.16	$223.01	$323.87	$313.96	$323.91	$330.40
2009	$223.04	$223.23	$223.01	$323.87	$324.22	$323.91	$341.20
2008	$202.76	$202.88	$202.74	$294.43	$294.67	$294.47	$310.10
2007	$192.74	$192.87	$192.72	$279.88	$280.13	$279.91	$294.80
2006	$187.49	$187.57	$187.47	$272.26	$272.44	$272.29	$286.70
2005	$183.99	$184.04	$183.97	$267.18	$267.30	$267.21	$281.30
2004	$175.23	$175.21	$175.21	$254.46	$254.48	$254.48	$267.80
2003	$167.20	$167.22	$167.19	$242.81	$242.88	$242.83	$255.60
2002	$166.37	$166.37	$166.36	$241.60	$241.65	$241.62	$254.30
2001	$160.42	$160.42	$160.42	$233.00	$233.00	$233.00	$245.20

Source: [27, 32].

Because Table 2 shows that BAS values rise with the cost of the liberal food plan but do not fall when these costs do, we can reasonably speculate about the extent to which BAS's purchasing power has increased over time. We show this increase in Figure 3, which graphs enlisted BAS values as well as the previous October's moderate and liberal food plan costs. We focused on enlisted BAS rather than officer BAS and the previous October rather than current-year food prices because both are directly referenced in the BAS determination formula. We can see that BAS was always closer to the liberal food plan than to the moderate food plan, grew closer to the liberal food plan in 2010, and caught up to it by 2018.

Figure 3. Current year's monthly enlisted BAS and previous quarter's moderate and liberal food plan costs



Source: CNA analysis of [27, 32].

Figure 3 shows that at the outset of every calendar year since 2017, enlisted BAS costs have exceeded the cost of the prior quarter's liberal food plan (because January BAS values are based on October food plan costs) and will likely continue growing relative to this baseline.[24] This outcome is the cumulative effect of two decades of BAS rising when food prices rise but not falling when food prices fall. As a result, BAS has become untethered from the standard Congress initially intended for it and will continue to grow in purchasing power relative to any standard.

What purchasing power should BAS provide?

Two clear arguments exist for rethinking how BAS values are set. First, as shown above, without a change in policy, BAS values will continue to rise in real terms whenever food costs

[24] Due to falling food costs, BAS values for all of 2018 exceeded the prior quarter's liberal food plan costs.

fall. Anchoring BAS to a fixed reference point will ensure that it can provide a consistent value into the future. Second, by setting BAS equal to the midpoint of the moderate and liberal food plans in 1998 but then having its growth mirror only that of the liberal food plan starting in 2001, Congress set up BAS in a way that prevents it from having an obvious or easily interpretable benchmark. Although actual growth patterns and unwritten policies have led BAS to converge with liberal food plan values, one can easily imagine a scenario in which flat liberal food plan values and rising moderate food plan values eventually would cause the moderate food plan's value to exceed the congressional BAS formula.[25] Although this scenario obviously has not occurred, it illustrates that the statutory text could yield a wide range of outcomes—not all of which could logically match Congress's intent.

Therefore, we recommend that BAS values be defined to explicitly recenter on liberal food plan values whenever BAS is updated. By doing so, Congress would prevent upward creep in purchasing power by referencing the values of the liberal food plan as well as its growth. The law would then provide a clear standard that servicemembers could easily understand, and servicemembers could even see the precise values used in computing BAS, increasing trust in the military compensation system.[26] And this recommendation does not reduce servicemembers' overall compensation. It should be possible to implement this recommendation while maintaining the rule that BAS values cannot fall; if liberal food plan values fall, DOD could delay BAS increases until after the cost of the liberal food plan once again exceeds BAS payments. [27]

To analyze how often DOD should calculate BAS, we must define a standard against which to compare different updating methods. Therefore, we evaluated BAS against the cost of the current year's liberal food plan, as we describe in the next section.

How often should BAS be calculated?

In this section, we examine four sets of BAS values against actual USDA liberal food plan values:

1. Actual BAS values

[25] In this scenario, BAS values would have remained stable to match the stability of the liberal food plan. Because moderate food plan values do not affect BAS values under the congressional formula, they could in theory converge with liberal food plan values whereas BAS values would remain unchanged.

[26] If BAS continues to be updated annually, there also would be a brief period at the end of each calendar year during which servicemembers could compute the upcoming year's BAS values.

[27] Doing so might require rewriting statute to allow BAS to remain constant in these cases, rather than mandating it increase; alternatively, it may be worth investigating whether holding BAS constant while its benchmark value falls could be considered an up-front increase for when the benchmark value eventually rises again. Or aligning BAS values with liberal food plan values *whenever BAS is updated* might accomplish this intent.

2. Quarterly updating that projects the prior quarter's growth in food plan values on top of that quarter's food plan value (i.e., January 2001 uses October 2000 as a starting point and then adds the difference between the October 2000 and July 2000 values)
3. Annual updating under a hypothetical scenario in which we can perfectly predict the average liberal food plan value over the course of each year
4. Annual updating that projects 25 percent of the previous year's October-to-October growth in the liberal food plan values on top of the previous October's food plan value (i.e., January 2001 uses October 2000 as a starting point and then adds 25 percent of the difference between the October 2000 and October 1999 values)

For formulas 2–4, we mirrored current policy by adding the restriction that BAS cannot fall; if the formula is lower than the previous year's BAS, BAS will remain at the previous year's value. Formula 3 presents a best case scenario for annual updating to both illustrate the challenges in actual BAS projection and demonstrate the degree of quarter-to-quarter error inherent in even a perfect annual projection (because liberal food plan values vary over the course of the year, but BAS would remain fixed). There are many other possible ways to update BAS values; we focus on these four as representative examples for conciseness, and we discuss several more in Appendix A: Weighting Schemes for Annual BAS Updating.

Importantly, whenever formulas 2–4 are updated, they reference the *level* of the liberal food plan, not just its growth. In this way, these formulas ensure that BAS values track food plan values and cannot continue to drift upward in purchasing power.

Evaluating BAS formulas requires weighing tradeoffs among three priorities: (1) ensuring long-term accuracy on average, (2) ensuring month-to-month accuracy, and (3) not falling below the target value (i.e., the liberal food plan).[28] Table 3 presents three illustrative scenarios to compare these three priorities. Although the scenarios themselves are unrealistic, they illustrate how pursuing each priority might conflict with the other two.

[28] Priority 3 may be relevant for both substantive and messaging reasons, depending on the degree of shortfall and the target chosen.

Table 3. Examples of competing priorities for BAS forecasting

Scenario	Long-term average accuracy	Month-to-month accuracy	Meets or exceeds target
BAS overshoots liberal food plan by $100 half the time and undershoots by $100 half the time	Best (perfect on average)	Worst (off by $100)	Middle (half the time)
BAS is always $5 below liberal food plan	Middle (off by $5)	Best (off by $5)	Worst (never)
BAS is always $20 above liberal food plan	Worst (off by $20)	Middle (off by $20)	Best (always)

Source: CNA.

To evaluate these priorities, columns in Table 4 show the total net error (i.e., multiplying the month's error by 3 to obtain the quarterly error and then summing across quarters), the mean quarterly error, and the standard deviation of the quarterly error. *Net error* means that positive errors (BAS is higher than the liberal food plan) and negative errors (BAS is lower than the liberal food plan) cancel each other out, so it is theoretically possible for the total net error over the 23-year span to be zero even if there is an error each quarter. The mean quarterly error is equal to the total net error divided by 76 (the number of quarters in 2001 through 2019) or 92 (the number of quarters in 2001 through 2023). Even if the net total error and average error are both zero because of positive and negative errors canceling over time, the standard deviation will capture how much they swung back and forth. We also include the total number of "positive quarters" (i.e., in which BAS exceeded the value of the liberal food plan). This column is difficult to interpret without context. As illustrated in Table 3, the degree of overshooting or undershooting must also be considered; however, if BAS frequently undershoots its target value, then servicemembers might understandably begin to doubt how important this target value actually is. By contrast, servicemembers are likely to view equal frequency of overshooting and undershooting as a proxy for fairness—even if it does not produce optimal outcomes in other metrics.

Table 4. Accuracy of food cost projections

	2001–2019 (76 quarters)				2001–2023 (92 quarters)			
	Total net error	Mean error	Std. dev.	Pos. qtrs	Total net error	Mean error	Std. dev.	Pos. qtrs
Historic BAS	-$3,052.62	-$40.17	$29.10	6	-$3,628.32	-$39.44	$31.00	9
Quarterly[a]	$1,089.30	$14.33	$16.38	58	$1,209.00	$13.14	$16.11	69
Perfect annual[b]	$293.10	$3.86	$12.72	46	$293.10	$3.19	$15.83	53
Actual annual[c]	$333.90	$4.39	$25.83	43	-$0.30	$0.00	$30.98	49

Source: CNA analysis of [27].

[a] For example, the predicted value for January 2001 would be $\max\{BAS_{2001}, Oct_{2001} + (Oct_{2001} - Jul_{2001})\}$.

[b] Computed as the greater of last year's BAS and the upcoming year's average value.

[c] For example, the predicted values for all of 2001 would be $\max\{BAS_{2001}, Oct_{2001} + 0.25 * (Oct_{2001} - Oct_{2000})\}$.

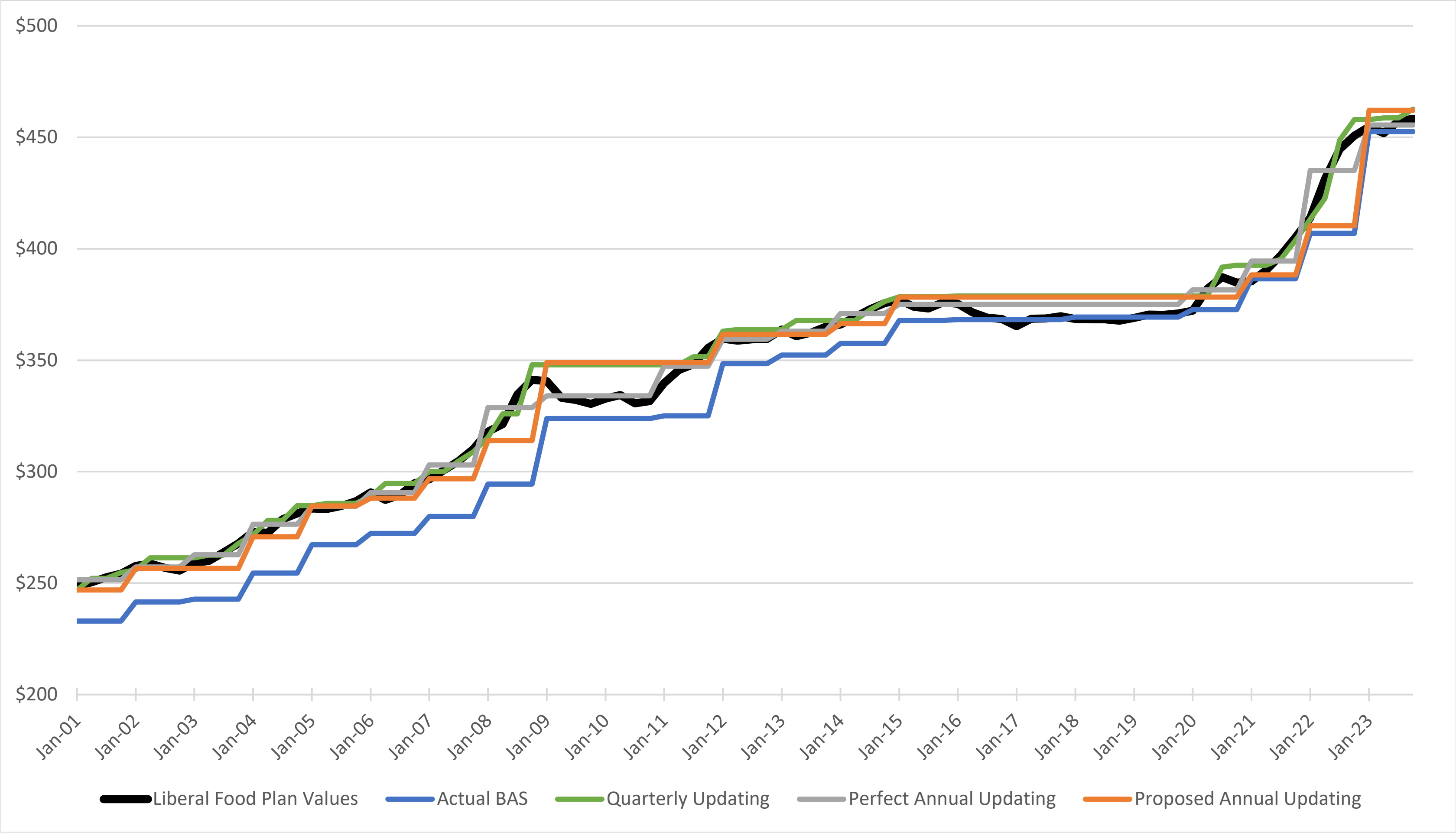
In Table 4, we show the results for two time periods. First, we show the results for the 2001–2023 period to take advantage of all available data. Second, we show the 2001–2019 period because the COVID-19 pandemic, rising inflation, and the subsequent price stabilization produced unusually large swings in BAS predictions for the 2021–2023 period and unusually large errors for 2022 and 2023 (restricting predictions to pre-COVID years may therefore better illustrate their accuracy going forward).

Table 4 shows, unsurprisingly, that actual BAS values have underpaid on average relative to the liberal food plan; however, both our quarterly and annual updating metrics would have overpaid in 2001–2019, and annual updating would have nearly perfectly matched liberal food plan costs in 2001–2023. We found this outcome because both options index directly to the liberal food plan and do not allow BAS rates to fall. When food costs fall, the floor on BAS values means that BAS will be unable to fall to meet the new target value and will consequently overpay; this fact introduces (positive) error when there otherwise might not have been any.

The most surprising element of Table 4 may be that perfect annual updating has a smaller amount of both overall and quarter-to-quarter error than quarterly updating (as illustrated by its smaller standard deviation). This finding chiefly reflects that under quarterly updating with a BAS floor, very few BAS values will be below their target (and those that are will be only slightly below), meaning that quarterly updates will have many positive errors and very few negative ones. Perfect annual updating instead allows for a mix of positive and negative errors and does not have to respond to every quarterly price change if any of these cancel out over the year. However, we note that the advantage in quarter-to-quarter error practically disappears when accounting for 2020–2023. When food prices rise drastically over the year, paying the average value means overpaying substantially at the beginning and underpaying at the end (or vice versa when prices fall). Figure 4 illustrates this outcome and shows that perfect annual updating is more accurate than quarterly updating when food prices are relatively stable (such as 2015 through 2019), but they are less accurate when food prices are rapidly increasing (such as 2021 and 2022).

Therefore, annual updating *can in theory* be preferable to quarterly updating. Row four of Table 4 and the orange line of Figure 4 show that annual updating *in practice* can perform considerably better than quarterly updating at achieving priority 1 (ensuring long-term accuracy on average) but performs worse at achieving priority 2 (ensuring month-to-month accuracy) and priority 3 (not falling below the target value). Annual updating comes close to actual liberal food plan values on average, but it does so through a combination of overshooting and undershooting its target values—in particular, it tends to undershoot actual liberal food plan values during periods of sustained growth (such as 2007–2008 or 2021–2022) and then overshoot once this growth comes to an end (such as 2009–2011 or 2023).

Figure 4. Accuracy of food cost projections



Source: CNA analysis of [27].

It is possible that other methods of annual updating may be preferable to the ones we present here. Identifying an optimal weight on the previous year's liberal food plan growth requires consensus on the relative importance of priorities 1 through 3, which is a political decision that CNA cannot make on its own; however, we discuss in Appendix A why a weight of 0.25 on the previous year's growth in liberal food plan costs could be preferable to a weight of 0, 0.50, or 1. Additional guidance on DOD or congressional objectives in setting BAS values would allow us to better determine an optimal weight. Alternatively, examining growth over multiple years or using non-linear projection might increase the accuracy of BAS relative to current food costs; however, because any gains are likely to be marginal and would come at the cost of computational simplicity and transparency, we recommend against taking these steps.

We are therefore left with the following initial findings (assuming that BAS values cannot fall):

- **In theory**, annual updating can be much more accurate than quarterly updating both in the long run and from quarter to quarter—but only if the USDA-published liberal food plan costs could be known perfectly in advance.
- In practice, **annual updating can be more accurate than quarterly updating** in the long run.
- Annual updating is considerably **less accurate from quarter to quarter**, especially during prolonged periods of increasing or decreasing food costs.
- Annual updating will **underpay more often and by larger amounts** than quarterly updating.

When evaluating quarterly versus annual BAS updating, DOD and Congress also should consider a variety of challenges associated with more frequent updates. In particular, there may be costs associated with more frequently publishing updated BAS values, updating the costs of any goods or services indexed to these values, and incorporating new BAS values into paychecks. Although servicemembers would require instruction regarding why their pay is updated more frequently (and perhaps reassurance that it will not decrease as a result of shifting to quarterly updating), some instruction would be necessary for any BAS reform.

Should BAS vary by geographic area?

Figure 5 shows county-level variation in the cost per meal for food-secure individuals across the 50 MHAs containing the most servicemembers, using data on the county to which each MHA belongs (or selecting one county if an MHA overlaps multiple counties).[29]

Figure 5 shows wide geographic variation in food costs. Food costs in the most expensive MHA (Honolulu County, Hawai'i) are 50 percent higher than those in the least expensive MHA (Fort Cavazos, Texas); even focusing on CONUS locations, food costs in the Washington, DC, Metro Area are still 50 percent higher than those at Fort Cavazos, and costs at Fort Riley (Kansas) are more than 36 percent higher. Even omitting the 10 most expensive and 10 least expensive MHAs, the 11th-most expensive MHA (Fort Meade, Maryland) has costs more than 14 percent higher than in the 40th-most expensive MHA (Fort Johnson, Louisiana). These findings demonstrate meaningful variation in food costs that cannot be fully explained away as OCONUS costs or as distortions caused by a handful of disproportionately inexpensive or expensive MHAs.

Nevertheless, we urge caution in interpreting these findings. We found variation in food costs based on the lowest cost USDA food plan (i.e., the thrifty food plan), whereas BAS values nearly approximate the highest cost plan (i.e., the liberal food plan). Although the methodologies for creating the two baskets are not perfectly comparable, the food types in each plan are quite different:

- Both plans have similar total amounts of vegetables, but the thrifty plan has more starchy, red, or orange vegetables and fewer dark green and "other" vegetables.[30]
- The liberal food plan contains nearly a pound more fruit per week than the thrifty food plan, and far more of this amount comes from whole fruits (versus fruit juices) than in the thrifty food plan.
- Almost all of the grain in the thrifty food plan comes from whole and refined staple grains (such as bread, rice, and tortillas), whereas the liberal food plan allows for more whole grain cereals and whole grain snacks.

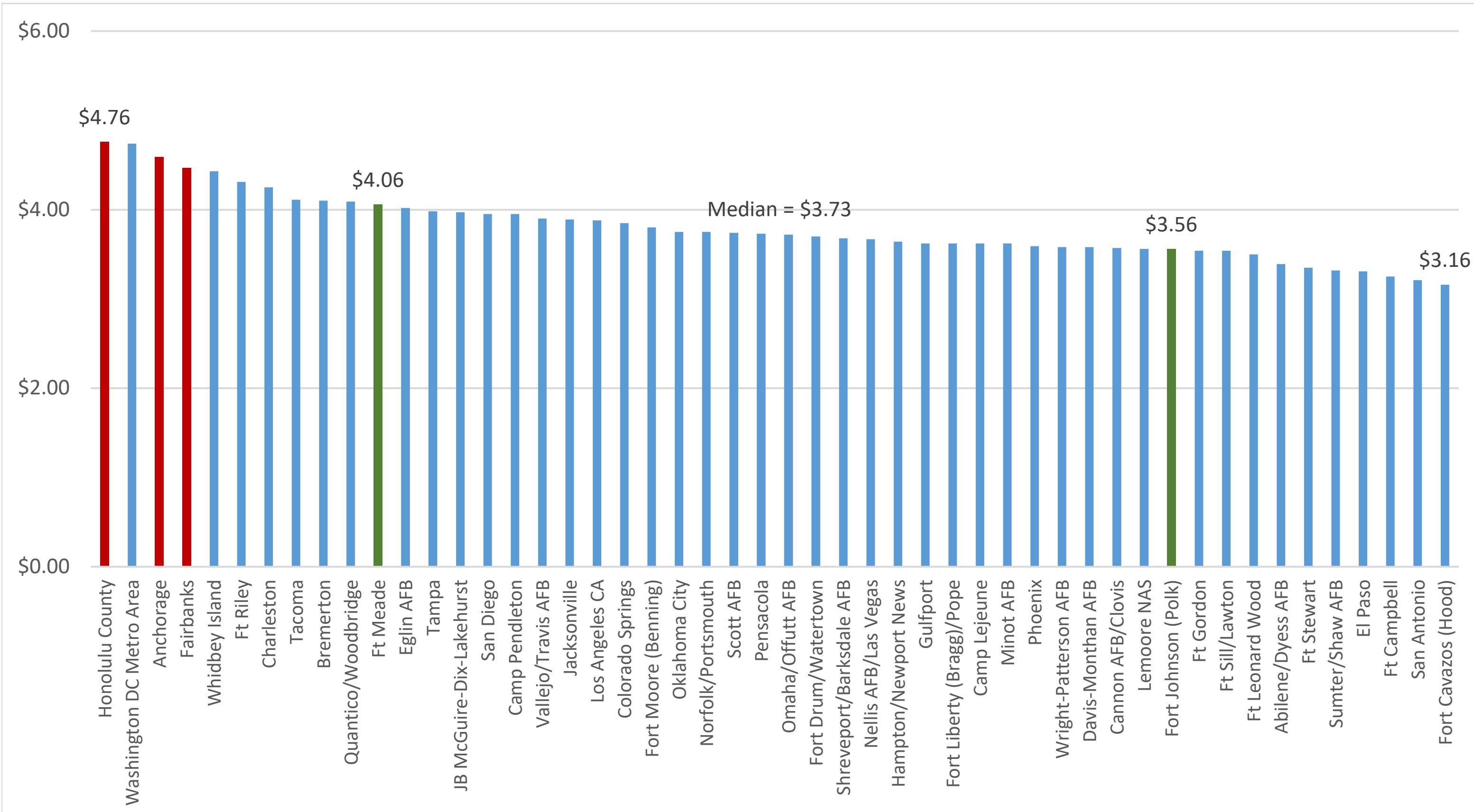
[29] We selected the county to align with the *name* of the MHA or maximized spatial overlap using Google Maps. Because San Diego County contains both the San Diego MHA and Camp Pendleton, these 50 MHAs cover only 49 counties. If results were presented for 50 counties rather than 50 MHAs, the 50th county would be Lowndes County, Georgia, which contains Moody Air Force Base. Lowndes County had a 2021 food-secure cost per meal of $3.72 and weighted monthly need of $93.87.

[30] The thrifty plan contains "red and orange vegetables" and "starchy vegetables," whereas the corresponding categories in the liberal plan are "orange vegetables" and "all potato products."

- Most of the dairy in the liberal food plan is low fat, whereas the dairy in the thrifty food plan is evenly split between low-fat and high-fat milk and yogurt.
- The liberal plan has approximately twice as much red meat and a quarter as many eggs as the thrifty plan.
- The liberal food plan allows for far more soft drink consumption than the thrifty food plan.[31]

[31] The liberal plan allows for 3.3 pounds per week of "soft drinks, sodas, fruit drinks, and ades (including rice beverages)," whereas the thrifty plan allows for 0.42 pounds of "other foods and beverages (e.g., soft drinks, fruit drinks, ice cream, pudding, cookies, candy bars)."

Figure 5. 2021 food-secure people's costs per meal in the 50 largest MHAs



Source: CNA analysis of [31].

Note: Red values represent OCONUS MHAs. Green values represent the 11th and 40th most expensive MHAs (i.e., omitting outliers to focus on the middle 60 percent of MHAs).

Because the liberal food plan contains very different food *types* than the thrifty food plan, it is reasonable to assume that geographic variation in the liberal food plan's costs will not perfectly mirror those of the thrifty food plan. As a result, we cannot simply scale up the food quantity in the thrifty food plan or use more expensive versions of similar groceries. Although the costs of the liberal food plan surely reflect some local variation, we cannot do more than theorize about whether it is larger or smaller than the variation of the costs of the thrifty food plan without undertaking a large-scale data collection effort.

Even if the cost variation in the liberal food plan was identical to that in the thrifty food plan, it would not necessarily imply that changing BAS values would be the proper response. Servicemembers with convenient access to mess halls or wardrooms have the cost of these meals indexed to BAS, and they therefore have a degree of insulation from local food costs. Commissaries also can provide a cheaper source of groceries in more expensive areas, providing another degree of insulation from local food costs for food consumed outside of mess halls. As a result, variation in local food costs is likely to be the most relevant for servicemembers who do not have convenient access to these sorts of on-base amenities (or who are stationed at smaller bases where they may have reduced hours or offerings).

Unfortunately, because we cannot separately identify servicemembers who use on-base amenities out of convenience, those who use them out of financial necessity, those who are unable to use them, and those who choose not to use them, we cannot say exactly how many servicemembers are negatively affected by cost variation or to what extent.[32] However, although the precise scale is unclear, most servicemembers in high-population MHAs are unlikely to have to fully bear the cost of higher local food prices.

Variation in food costs *would* have to be borne by any accompanying dependents in high food cost areas. However, dependents are accounted for in CONUS COLA, which considers the overall cost of living (of which food is one component), but not in BAS. In areas with particularly high food costs, then, either COLA will be available or other costs of living (such as

[32] We also would need to assess whether appropriate remedies differ for each. For example, a servicemember whose schedule or job duties do not allow access to on-base amenities, a second who lives off base but can afford to shop and eat only on-base, and a third who chooses to live far off base to enroll their children in a high-quality school are all negatively affected by high local food prices. However, the degree of unavoidable and avoidable harm is different for each, and policy-makers may be differently sympathetic to each. In particular, servicemembers who *choose to pay more* for food off base do so because they wish to get access to some other amenity, such as cheaper housing, a shorter commuting distance for their spouse, or high quality public schooling; servicemembers who *have to pay more* for food off base because their job duties or duty station do not allow access to food on base do not necessarily have a specific benefit that outweighs these higher prices.

personal care or transportation) will be sufficiently low that overall costs will be below the COLA threshold.[33]

As a result, we can make the following claims:

- The minimum food cost necessary to meet nutritional requirements varies substantially by MHA. Although it is unclear how this variation translates to the food baskets that determine BAS values, some notable local variation almost certainly remains.
- Even if the food costs for a comparable civilian drastically vary across MHAs, it is unclear how much of this cost difference gets passed on to servicemembers (or whether every dollar of additional cost is equally harmful).
- To the extent that local variation in food costs affects dependents, this variation is better addressed through COLA than through BAS.

How do other measures of food prices compare with the USDA liberal food plan?

To accurately index BAS to food costs, DOD will need an appropriate measure of food costs. Although the liberal food plan is the most appropriate reference point that the USDA offers, other organizations that track food costs may compute a market basket that better matches servicemembers' nutritional needs.

We examined two potentially relevant market baskets: the Retail Price Schedule (RPS), which is used as a component in determining OCOLA, and the CPI, which is used to compute overall US inflation.[34] In practice, these two indices are the same—both were designed by BLS, collect data on the prices of the same food types, and use the same quantity of each item in computing the basket's cost.

We believe the USDA's construction to be superior to the BLS's construction used in OCOLA and in the CPI in part because the USDA's costs are tailored specifically to the 19–50 age group. Because it is not designed with a specific age group in mind, the BLS construct contains baby food and formula—which may be relevant to military families but not to servicemembers themselves. In addition, it is reasonable to assume that the composition of the market basket reflects the nutritional needs of children, adolescents, and senior citizens, all of whom have

[33] We discuss both the costs of expanding BAS to dependents and also the overall sufficiency of COLA and whether its threshold is set appropriately later in this report.

[34] Other countries may develop their own baskets based on what they consider an ideal or representative diet, but they do not provide a good comparison point for the US.

different total and relative needs for different food groups (e.g., within the USDA's liberal food plan, children require far less food overall than adult men, but a much larger share of their diet is recommended to be dairy products).

In addition, the BLS construct contains four categories of alcoholic beverages that are arguably necessary for computing overall food costs but that DOD may not wish to factor into servicemembers' daily lives, let alone be seen as subsidizing.[35] Finally, several food categories reflect corporate costs or convenience categories rather than a distinct nutritional need, and therefore these categories do not have an analogue in the USDA's food plans.[36] These consumption forms are either less relevant to servicemembers or may be expense types that DOD does not wish to factor into basic pay (though under different reasoning than alcohol).

How much would it cost to extend BAS to servicemembers' dependents?

The cost of extending BAS to families depends on whether the dependents receive the liberal food plan or the moderate food plan, which is still based on the second-highest quartile of household incomes. In the former case, we estimate that the annual cost of BAS for dependents would be $6.2 billion.[37] The moderate food plan for dependents would cost $5 billion.[38] To put these costs in perspective, applying the 2024 BAS rate to the reported number of servicemembers would generate a current program cost of $6.6 billion, so extending BAS to dependents would almost double BAS costs.

Based on the data available for this study, we were unable to determine the number of dual-military households in which both servicemembers receive BAS. As a result, our cost estimates of extending BAS to dependents overstate the actual cost. Our cost estimates also assume that officers' dependents would rate the same BAS as enlisted servicemembers' dependents; if officers' dependents received less, the program cost would go down.

[35] These categories are "distilled spirits at home," "wine at home," "alcoholic beverages away from home," and "beer, ale, and other malt beverages at home."

[36] These categories are "full service meals and snacks," "limited service meals and snacks," "food at employee sites and schools," "food from vending machines and mobile vendors," and "board, catered events, and other food away from home."

[37] We applied an average annual cost of $2,823 per child under age 6, $4,330 per child aged 6–11, $4,902 per child aged 12–18, and $4,870 per spouse to counts of dependents in each paygrade.

[38] We applied an average annual cost of $2,330 per child under age 6, $3,710 per child aged 6–11, $4,087 per child aged 12–18, and $3,818 per spouse to counts of dependents in each paygrade.

To be clear, CNA advises against expanding BAS to dependents on both philosophical and practical grounds. On a philosophical level, BAS reflects DOD's commitment to individual servicemembers rather than to their families as a whole; BAS has never been extended to enlisted servicemembers' families, and the 27 years during which it was extended to officers' families ended with an explicit statement that it was intended only for servicemembers. Expanding BAS to all servicemembers' dependents would be expanding benefits far beyond their original intent.[39] Practically speaking, both sides of Congress might balk at an additional $5–7 billion in annual military spending—especially when there may be alternatives that appeal to both sides. Expanding BAS would provide a fixed benefit to *all* servicemembers' families, regardless of need, rather than targeting those who are facing food insecurity. To the extent that some servicemembers' families do face food insecurity, it would be more effective to identify where and how this need arises and to target it directly through narrower tools, such as expanded COLAs or expanded access to on-base amenities (or through measures that apply to civilians and servicemembers alike, such as expanding the Supplemental Nutrition Assistance Program).

Having considered relevant planning factors that would inform possible BAS reforms, we now pivot to COLAs.

[39] In theory, providing benefits on a per-dependent basis could lead to unintended consequences among both existing servicemembers (e.g., incentivizing servicemembers to have additional children because the cost of raising a child has fallen) and prospective servicemembers (e.g., making military service more attractive to individuals with more dependents or who plan to have larger families). We were not able as part of this study to evaluate the extent to which these benefits would lead to altered behavior, let alone make a value judgement about any changes in behavior. The cost of having and raising a child is far higher than any amount BAS would pay, and non-monetary considerations mean that having children is not strictly a cost-benefit exercise. However, it is important to note that these incentives exist, if only to note that any back-of-the-envelope calculations presented here would likely represent the lower bounds of the cost of expanding BAS to cover dependents.

CONUS Cost-of-Living Allowance

Background

CONUS COLA is a taxable, supplemental allowance designed to help offset expenses for servicemembers assigned to expensive CONUS areas. The rate varies by geographic location and by "spendable income," which is a function of rank, years of service, and number of dependents.[40] The QRMC director asked us to determine whether changes to the current methodology for calculating CONUS COLA are needed.

Because the cost of living varies across the US, the military has developed allowances to help offset the inequity that servicemembers experience if they must live in more expensive locations. Although BAH is designed to compensate servicemembers for higher housing costs in expensive locations, COLA is designed to assist with higher expenses in other categories, such as food, clothing, and transportation. Unlike BAH, COLA is provided to servicemembers whose official quarters are government owned, such as barracks or ships.

DOD employs a contractor who provides cost-of-living differentials for non-housing expenditures for a given family size and income level. The contractor develops a "standard city" that represents the average expenditures for a particular market basket of goods and services for a typical civilian household. To calculate the COLA indices, the contractor also collects costs for the same market basket in at least 300 locations nationwide where servicemembers are stationed. The contractor then develops an index representing the amount of income needed to purchase the same items in each location relative to the cost for the standard city.

According to a government facility savings metric computed as part of CONUS COLA, if military commissaries or exchanges are available near a member's place of duty, that member's expenditures will be lower than those of a comparable civilian. The presence or absence of facilities has a major effect on the CONUS COLA's calculation. Even without these facilities, most locations do not qualify for CONUS COLA because the average expenses do not meet the established threshold index of 108 when compared to the baseline (national average) cost-of-living index, which is normalized to 100. That is, non-housing costs in most locations are not

[40] Specifically, the rate comes from a table in which the row is determined by the range in which the member's RMC falls and the column is determined by number of dependents. The spendable income in the selected cell has been calculated from BLS data indicating how much a household with a given income has left to spend after taxes, insurance, housing expenses, gifts and cash contributions, and savings. The amount is increasing in number of dependents because on average larger families are taxed less, save less, and receive more subsidies.

greater than 8 percent above the standard city for the standard market basket of goods and services. For example, an area with a COLA index of 115 would be eligible for a COLA payment of 7 percent. An area with a COLA index of 107.9 would not receive CONUS COLA. The rationale for this threshold is that servicemembers are stationed in lower cost areas at some times and higher cost areas at other times, so the costs will balance out over the course of a career, unless at some point they are stationed in an area that is a true high-cost outlier.

The FY 2024 NDAA authorized DOD to lower the CONUS COLA threshold from 108 to as low as 105, and DOD has chosen to lower it to 107. In what follows, we consider the cost implications of further reductions.

Approach

To advise on the suitability of the current methodology for setting CONUS COLA, we first needed to understand the methodology. After a thorough review of documentation sent by OUSD (P&R), CNA arranged for several meetings with OUSD (P&R) to clarify the material. We also met with the Defense Commissary Agency (DeCA) to clarify how commissary prices and commissary savings are computed.

Finally, we met with the DOD contractor who collects the RPS data for the 150-item market basket of goods and services to clarify how these prices are collected.

The triennial Living Pattern Survey (LPS) measures where servicemembers shop and the proportion of shopping that occurs on military installations (such as at commissaries and exchanges), at local community outlets, and online. CNA looked at the total sales to active-duty servicemembers and their dependents at individual commissaries to see whether those data support the LPS results with respect to the percentage of items bought at commissaries versus off-base retail stores.

We found that 300 MHAs and about 150 ZIP codes not in an MHA have a computed COLA index. We were able to uniquely match 39 MHAs with 1 of 17 core-based statistical areas (CBSAs) in CONUS for which the Federal Reserve Economic Data (FRED) publishes the CPI-less-shelter series.[41] Two other CBSAs with a published CPI-less-shelter series are OCONUS. Comparing the COLA index for these MHAs to the CPI-less-shelter ratio for the corresponding CBSAs requires a crosswalk, which we provided to OUSD (P&R).

[41] Some of these price index series are monthly, some are bimonthly, and some are annual. Any of the above are suitable for COLA because it is updated annually.

FRED publishes each of these series indexed to a historical baseline for that series, so they reveal the cumulative change in costs in that area since the early 1980s. Since not every area had the same costs then either, it is not obvious whether these CBSA cost indices relative to the national average CPI-less-shelter ratio would be strongly correlated with COLA indices for the corresponding MHAs. We ran a linear regression model to test whether these CBSA CPI-less-shelter indices have predictive power for COLA indices despite this caveat.

$$Y_{it} = a + d_1 D2022_t + d_2 D2023_t + d_3 D2024_t + bX_{it} + e_{it}$$

for i = 1 to 39 and t = 2021, 2022, 2023, or 2024,

in which Y_{it} is the CONUS COLA index for MHA i in time period t, X_{it} is the CPI-less-shelter ratio for the CBSA that contains MHA i in time period t, D2022 it is an indicator variable equal to 1 if t = 2022 and zero otherwise, D2023 is an indicator variable equal to 1 if t = 2023 and zero otherwise, D2024 is an indicator variable = to 1 if t is 2024 and zero otherwise, and e_{it} is a random error term. The terms a, b, d_1, d_2, and d_3 are coefficients to be estimated. If the estimate of coefficient b is positive and statistically significantly different from zero, then it strongly suggests there is a positive relationship between the CBSA CPI-less-shelter ratio and the CONUS COLA indices, providing evidence that the CONUS COLA index is valid. We also can use this regression to identify "outlier" MHAs by removing a suspected MHA-year outlier from the model and comparing the actual COLA index for that MHA in that year to what the model would have predicted it to be.

Using 2023 COLA data available from OUSD (P&R) at the time, we estimated the added cost to reduce the CONUS COLA threshold from 108 to lower levels (i.e., 107, 106, 105). We later reviewed an OUSD (P&R) analysis that calculated the increased costs using 2024 CONUS COLA data.

We found that the procedure OUSD (P&R) used was very close to the methodology we had used, and we believe that the OUSD (P&R) calculations represent a reasonable estimate of the increased costs when the CONUS COLA threshold is reduced.

The OUSD (P&R) analysis used personnel data for BAH recipients. One difference in our analyses was that we added an additional number of personnel based on an estimate of the number living in barracks who do not receive BAH. If a future cost analysis is needed, we recommend adding personnel who are not drawing BAH to the calculation's numbers.

The following information is needed to compute the cost of lowering the threshold:

1. The number of servicemembers stationed at each of the COLA-eligible locations
2. The dollar amount each servicemember receives per COLA point (e.g., the amount their COLA rate increases if their MHA's COLA index increases from 109 to 110)

A count of eligible members in an MHA would include both those who receive BAH and those in government housing. OUSD (P&R) provided us with the data on the number of servicemembers who receive BAH at each eligible location.

To estimate the number of servicemembers assigned to barracks at each eligible location, we made the following assumptions:

1. 22.9 percent of total military are E-1 to E-3 (2021 Demographic Report).
2. 71.2 percent of E-1 to E-4 are unmarried (2021 Demographic Report).
3. 85 percent of E-1 to E-3 are unmarried (assumption based on 2).

Applying the first and third assumptions, we estimate that approximately 20 percent (0.229 x 0.85) of all servicemembers are unmarried E-1 to E-3 who live in the barracks. If we assume for simplicity that the other 80 percent of servicemembers receive BAH, we can estimate the total number of servicemembers in an MHA as the number of BAH recipients x 1.25 (that is, divided by 0.8).

The dollar amount each servicemember receives per COLA point depends on their income and number of dependents. We estimated it using planning factors provided by OUSD (P&R) because the actual mix of paygrades and family size varies across MHAs. These planning factors indicate that servicemembers with dependents receive $33 to $59 per COLA point and that servicemembers without dependents receive $22 to $45 per COLA point.

Because the dollar amount per COLA point depends on paygrade, marital status, years of service, and number of dependents, we divided the population of servicemembers at each eligible location into four categories and assigned each category a dollar amount per COLA point:

1. Single enlisted: $34.00 (approximate midpoint of without-dependents range)
2. Married enlisted: $46.00 (midpoint of with-dependents range)
3. Single officer: $45.00 (top of without-dependents range)
4. Married officer: $59.00 (top of with-dependents range)

Findings

Although the current process used to collect prices and calculate the CONUS COLA index for each CONUS MHA is detailed and thoroughly documented, its output is not well understood.

Living Pattern Survey and commissary sales

The LPS at different locations shows large differences in the percentage of goods purchased at on-base commissaries. Differences may be due to commissary savings relative to local off-base prices, the size of the commissary and available selection there, and the relative accessibility of the commissary and of off-base shopping options. OUSD (P&R) could verify the LPS results by looking at commissary sales per servicemember.

We requested active-duty commissary sales data from DeCA (which specifically tracks which sales are to active-duty personnel) for four CONUS installations: two with unusually low commissary usage (less than 20 percent) reported by the LPS and two with unusually high usage (greater than 40 percent) reported by the LPS.[42]

The two CONUS installation groups are as follows:

1. Bases where groceries on base are less than 20 percent of goods purchased:
   - TX275 Corpus Christi (11 percent)
   - TX286 Fort Cavazos (19 percent)
2. Bases where groceries on base are more than 40 percent of goods purchased:
   - MO163 Fort Leonard Wood (45 percent)
   - NJ204 Joint Base (JB) McGuire-Dix-Lakehurst (41 percent)

We compared the sales per active-duty military member to approximate the amount of shopping at their local commissary to see whether the on-base shopping percentages aligned with the LPS percentages. Table 5 reports commissary sales to active-duty servicemembers and their dependents for these four CONUS miliary installations.

[42] We found more extreme outliers at small installations, but we focused on installations with at least 2,000 active-duty personnel.

Table 5. CONUS commissary sales to active-duty servicemembers and their dependents for four installations

Military installation	MHA	FY23 commissary sales	Active-duty personnel[a]	Sales per servicemember in FY23	LPS commissary usage[b]
NAS Corpus Christi	TX275	$1,228,816	2,301	$534	7–11%
Fort Cavazos	TX286	$17,872,757	33,522	$533	16–20%
Fort Leonard Wood	MO163	$14,240,117	9,663	$1,474	40–45%
McGuire AFB – Lakehurst NAES	NJ204	$19,120,668	7,655	$2,498	39–41%

Source: Installation personnel numbers provided by OUSD (P&R) on "eligibles" per MHA, January 2024. Commissary sales provided by DeCA. LPS defense commissary usage from OUSD (P&R).

[a] MHA "eligible" personnel numbers from OUSD (P&R).

[b] Average percentage of meat, poultry, dairy, and groceries purchased at the commissary, as reported in the LPS.

Table 5 shows that both Naval Air Station (NAS) Corpus Christi and Fort Cavazos have low sales per servicemember and low commissary usage according to the LPS. McGuire Air Force Base (AFB) – Lakehurst Maxfield Field has the highest sales per servicemember but lower commissary usage than Fort Leonard Wood according to the LPS. This finding suggests that some correlation exists between LPS-reported commissary usage and actual commissary usage, but because the correlation is not perfect and actual commissary usage is verifiable, it probably makes more sense to use the actual commissary usage.

Comparing the Retail Price Schedule with some readily available non-housing cost indices

Table 6 lists the 17 CBSAs in CONUS for which the FRED publishes the CPI-less-shelter series. We found that if the ratio of the CPI-less-shelter index for a CBSA to the CPI-less-shelter index for the nation rises by 1, the CONUS COLA index for the corresponding MHA will rise by 0.29 on average, with high statistical confidence that the true value of this coefficient is not zero. However, this CPI-less-shelter ratio explains only 19 percent of the variation in CONUS COLA indices. We also found that the COLA indices for San Diego in 2023 and Detroit in 2023 were outliers: San Diego was 2.25 COLA points lower (105.13) than the model predicted it should have been (107.38), and Detroit was 6.1 COLA points higher (109.42 versus a predicted 103.32).

Table 6. **Core-based statistical areas (with published CPI-less-shelter indices)**

Number	CBSA location
1	New York-Newark-Jersey City, NY-NJ-PA
2	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
3	Boston-Cambridge-Newton, MA-NH
4	Chicago-Naperville-Elgin, IL-IN-WI
5	Detroit-Warren-Dearborn, MI
6	Dallas-Fort Worth-Arlington, TX
7	Houston-The Woodlands-Sugar Land, TX
8	Atlanta-Sandy Springs-Roswell, GA
9	Miami-Fort Lauderdale-West Palm Beach, FL
10	San Francisco-Oakland-Hayward, CA
11	Seattle-Tacoma-Bellevue, WA
12	St. Louis, MO-IL
13	San Diego-Carlsbad, CA
14	Phoenix-Mesa-Scottsdale, AZ
15	Denver-Aurora-Lakewood, CO
16	Minneapolis-St. Paul-Bloomington, MN-WI
17	Tampa-St. Petersburg-Clearwater, FL

Source: FRED, St. Louis Fed.

Because the indices do not all have a common baseline, these results represent a lower bound on the potential predictive power of the CPI-less-shelter series for CONUS COLA indices. The relationship is likely to become stronger if the CONUS COLA process becomes more consistent and if OUSD (P&R) partners with the BLS or the FRED to directly compare the BLS cost estimate in a given CBSA with the BLS estimate of national average cost (rather than comparing their cumulative growth rates).[43] These CPI-less-shelter indices cannot currently replace the CONUS COLA process because they are not available for the majority of MHAs, but they provide supporting evidence.

[43] This would be analogous to a current arrangement between the Department of Housing and Urban Development (HUD) and the US Census Bureau, whereby HUD pays the US Census Bureau to use its proprietary data to calculate fair market rates for each local area.

Overseas Cost-of-Living Allowance

Background

OCOLA is a nontaxable allowance designed to ensure servicemembers assigned to an OCONUS permanent duty station (i.e., foreign countries, US territories, Alaska, and Hawai'i) maintain a level of purchasing power equivalent to servicemembers stationed in CONUS. It differs from CONUS COLA because the latter is taxable, OCOLA can update more frequently due to currency exchange rate changes, and OCOLA has no minimum threshold analogous to CONUS COLA.

DOD updates OCOLA rates based on assessment of three primary data points: the triennial LPS, the annual RPS, and, for foreign locations, currency exchange rate fluctuations. The triennial LPS measures where servicemembers shop and the proportion of shopping that occurs on a military installation (such as at commissaries and exchanges), at local community outlets, and online. The RPS measures the cost of a 150-item market basket of non-housing goods and services (e.g., groceries and clothing) from the outlets where servicemembers indicate they shop. The RPS does not include utilities or housing costs, which are accounted for separately through housing allowances (BAH or the Overseas Housing Allowance (OHA)). Currency fluctuations measure the relative purchasing power in the foreign currency as compared to the US dollar.

Annually, DOD compares LPS and RPS data collected overseas to similar data collected in CONUS (average CONUS baseline) to establish the OCOLA index for the OCONUS location. These price differences account for the relevant currency exchange rate, and OCOLA can be updated throughout the year to reflect exchange rate fluctuations. The OCOLA rate pays a differential to servicemembers in OCONUS locations for the increased cost of buying the same CONUS baseline non-housing goods and services at the OCONUS location. Based on changes in the underlying data, OCOLA rates may increase or decrease over time; thus, the potential for OCOLA to fluctuate should be considered in household budgeting.

One factor of the underlying data that affects the OCOLA variation for a location over time is inflation. If CONUS prices rise at a greater rate than OCONUS prices, OCOLA may decrease—which has been a primary cause of OCOLA decreases for several OCONUS installations in recent years. Conversely, OCOLA may increase if OCONUS prices rise at a greater rate than CONUS prices.

In addition, as the US dollar strengthens against a foreign currency, OCOLA may decrease to maintain purchasing power in the local currency. OCOLA may increase if the foreign currency strengthens against the US dollar.

Approach

To check the LPS's accuracy in overseas locations, we looked at per capita sales to servicemembers and their dependents at six overseas bases and compared the results to commissary use stated in the LPS. We chose German locations for the foreign examples because using multiple sites in one country allowed us to make useful comparisons between them and because a large number of US servicemembers are stationed in Germany.

Germany variability:

- Volgelweh (Kaiserslautern)
- Ramstein
- Wiesbaden

US OCONUS COLA sites:

- Pearl Harbor, Hawai'i
- Hickam, Hawai'i
- Elmendorf-Richardson, Alaska

We compared the sales per active-duty military member to see whether the on-base shopping percentages align with the LPS percentages.

We attempted to decompose the OCOLA changes over time to determine how much they were driven by local price changes, CONUS price changes, and (when applicable) exchange rate fluctuations. For this purpose, OUSD (P&R) provided us with copies of the DOD Overseas COLA Survey Analysis Summaries for Oahu in July 2021 and June 2022 as well as for Kaiserslautern in December 2021 and December 2022. We used these data to analyze OCOLA index changes for these two locations between 2021 and 2022.

DOD determines OCOLA payment to servicemembers by comparing the cost of living in military locations overseas to living in CONUS. Overseas military locations get OCOLA when their local living costs exceed those of CONUS locations. As currently structured, if the average CONUS cost of living rises faster than that of an overseas location, an OCOLA decrease is justified. Even if overseas living costs were rising, OCOLAs would be reduced because CONUS costs rose more. We examined OCOLA changes over time in a given location to understand how they may affect servicemembers.

Findings

Living Pattern Survey

Table 7 displays commissary sales to active-duty servicemembers and their dependents for four OCONUS miliary installations.

Table 7. OCONUS commissary sales to active-duty servicemembers and their dependents

Military installation	MHA	FY23 commissary sales	Active-duty personnel	FY23 sales per active-duty servicemember	LPS commissary usage[c]
Kaiserslautern	N/A	$51,325,479[a]	12,715[a]	$4,037	34–35%
Wiesbaden	N/A	$10,544,619	2,452	$4,300	27–30%
JB Pearl Harbor/ Hickam	HI408	$70,715,311[b]	41,768[b]	$1,693	45–51%
Anchorage area	AK404	$19,015,878	13,419	$1,417	15–18%

Source: Sales data from DeCA. LPS data for Kaiserslautern from OUSD (P&R). Personnel numbers for Kaiserslautern and Wiesbaden are from OUSD (P&R) "OCOLA Notice, 27 June 2023". Personnel numbers for JB Pearl Harbor/Hickam and Anchorage are from OUSD (P&R) MHA "eligibles" data.

[a] Kaiserslautern commissary sales are combined sales for the Vogelweh and Ramstein commissaries. Kaiserslautern personnel numbers are the total for that military complex.

[b] JB Pearl Harbor/Hickam commissary sales are the combined sales for Pearl Harbor and Hickam commissaries. Personnel numbers are for JB Pearl Harbor/Hickam.

[c] LPS data for meat, poultry, dairy, and groceries categories.

From Table 7, we see that the Kaiserslautern and Wiesbaden commissaries have approximately the same relatively high sales per servicemember, but we were told Wiesbaden had a much higher OCOLA index than Kaiserslautern in part because the LPS reported that servicemembers use the commissary in Wiesbaden less than the commissary in Kaiserslautern.

For example, a June 27, 2023, memo from the Assistant Secretary of Defense for Manpower and Reserve Affairs shows large differences in some market basket categories between Kaiserslautern and Wiesbaden [1]. These two sites are only about 60 miles apart, but in Table 8, we see that the 2022 OCOLA category analyses for these sites show significant differences in several market basket categories.

Table 8. 2022 OCOLA indices for Kaiserslautern and Wiesbaden

OCOLA category	Kaiserslautern	Wiesbaden	Difference
Meat and dairy	122	151	29
Groceries	99	105	6
Fruits and vegetables	111	106	-5
Personal care	118	130	12
Alcohol and tobacco[44]	100	96	-4
Household furnishings	116	159	43
Household operations	116	144	28
Clothing	123	110	-13
Medical care	94	102	8
Recreation	112	149	37
Transportation	118	133	15
Food away from home	111	114	3
Miscellaneous	100	100	0

Source: [1].

The meat and dairy category is 29 COLA points higher in Wiesbaden than it is Kaiserslautern, and the household furnishings category is 43 COLA points higher in Wiesbaden than it is in Kaiserslautern. The Alaska and Hawai'i data also provide cause for skepticism about the LPS because self-reported commissary use is three times higher in Hawai'i than in Alaska, but the actual commissary expenditures are only 20 percent higher. Using commissary and exchange sales data to estimate on-base savings would be more reliable than using the LPS.

OCOLA variation over time

We were unable to determine how much local prices changed between 2021 and 2022 in Oahu or Kaiserslautern because the market baskets changed dramatically in both locations. These changes came in the form of removing items from the 2021 market basket and adding new ones (e.g., Oahu dropped 7 of its 14 grocery items and added 19 new ones) and in the form of

[44] We offer three arguments for why alcohol could reasonably be included in OCOLA but not in BAS. First, one could argue that alcohol functions more as a form of recreation than as a way to meet nutritional needs—particularly when served at sporting events, concerts, restaurants, bars, or other locations outside the home (recall also that BAS is not meant to cover local differences in restaurant costs)—and that OCOLA intentionally captures differences in the cost of recreation without taking a stance on the nature of the recreation. Second, including alcohol in BAS might imply that alcohol is a daily need rather than a way people can choose to spend their budgets. Third, BAS is computed using a cost-effective basket of goods to meet nutritional needs at a given income level; because alcohol has little nutritional value beyond calories (and is far from the most cost-effective way of getting empty calories), very little alcohol would appear in this basket even if it were allowed to do so.

changing the weights across categories (e.g., the share of the Kaiserslautern basket that was not estimated and instead set to a default value of parity grew from 12.4 percent to 28 percent). Unless OUSD (P&R) can apply market baskets more consistently from year to year, it will be difficult to analyze how much local prices are actually changing from year to year.

OCOLA payments can vary substantially year to year. For example, the OCOLA payment for servicemembers living in Yokota, Japan, went from a biweekly payment of $421 in 2021 to $0 in 2024 (see Table 9). Some commands do not understand the OCOLA process and incorrectly inform their servicemembers about how their pay will change [2].

Table 9. Monthly OCOLA payments for an E-6 with three dependents, 2019 through 2024

Location	2019	2020	2021	2022	2023	2024
Kaiserslautern	$333	$345	$491	$416	$232	$239
Yokota	$333	$311	$421	$277	$116	$0
Okinawa	$267	$276	$351	$243	$116	$40
Guam	$267	$311	$316	$312	$347	$278
Naples	$700	$656	$807	$693	$579	$636
Oahu	$300	$276	$281	$277	$309	$199

Source: Defense Travel Management Office, https://www.travel.dod.mil/Allowances/Overseas-Cost-of-Living-Allowance/Overseas-COLA-Rate-Lookup/.
Note: Assumes 10 years of service. Dollars shown are for January of each year.

In the FY 2024 NDAA, Congress implemented changes to the frequency and amount of reductions allowed for OCOLA payments. Reductions unrelated to the exchange rate may not be announced more than twice a year (they may be phased in across multiple pay periods), and each announced reduction must be a difference of 10 COLA points or fewer. These changes still allow large OCOLA payment reductions. We estimate that these revisions in OCOLA reduction procedures would not have had any effect on the examples in Table 9.

However, the FY 2024 NDAA also restored OUSD's ability to employ its exchange rate accumulator to adjust OCOLA rates in the military's biweekly pay periods to account for 5 percent or larger swings in exchange rates. We endorse this accumulator as intuitive and fair. We provide details of how the accumulator works in Appendix B.

OCOLA rate protection

One possible solution to the problem of OCOLA variation would be for OUSD (P&R) to develop a process to stabilize OCOLA payments. As one method, OUSD (P&R) could follow a procedure similar to BAH, meaning that the OCOLA payment cannot decease below the amount the servicemember receives when they first arrive at their new OCONUS duty station, but it can increase. Another possibility is launching a new messaging campaign to better manage servicemembers' expectations of OCOLA and better assist local commands in communicating about it.

Rate protection might offer several advantages, but two benefits are particularly notable. First, it can improve servicemembers' financial planning while they are assigned to a particular duty station, allowing them to better budget for their expenses. OCOLA rate protection could shield servicemembers from fluctuations in their expected income. Ensuring that OCOLA moves in only one direction—upward—would improve servicemembers' budgeting and financial planning. Furthermore, research shows that households more acutely react to unexpected income declines, which is how servicemembers are likely to perceive OCOLA rate adjustments [33].

Second, rate protection can improve perceptions of fairness by addressing the psychological bias that may make servicemembers more sensitive to losses than to gains [34].[45] Individuals tend to evaluate outcomes relative to a reference point (their expectation), which in this instance would be their original OCOLA. Individuals assess gains and losses relative to this reference point, and because losses may be more acutely noticed, losses can lead to resentment and loss of morale, which creates potential retention concerns. Research suggests that economic shocks causing civilian pay reductions are associated with lower satisfaction and job commitment [35].[46] Thus, in addition to improving the financial health of individual servicemembers, OCOLA rate protection could provide a secondary effect of improving the long-term health of the services.

Issues associated with how to compensate employees relocated overseas and how to fairly manage volatility are not unique to DOD, and the private sector does not appear to have all the answers either. When US firms temporarily relocate their workers overseas, they may compensate their employees using a menu of options, including, but not limited to, the following: a base-pay adjustment, cost-of-living adjustments, housing allowances, and premium pay. Cost-of-living adjustments may be implemented in several ways, but historically, American firms have most commonly used a balance-sheet approach for temporary assignments (under five years) [37-38]. This method adjusts the employee's home-base salary to equalize purchasing power in the country where they work. However, like OCOLA, these adjustments are sensitive to local currency fluctuations, creating employee uncertainty and stress. A survey of expatriate employees identified currency exchange rate risks as a common

[45] This notion is based on what is called prospect theory, or loss aversion theory, in behavioral economics.

[46] Additional research suggests that civilian pay penalties increase employee turnover, especially of skilled or high-quality workers [36]. However, there is no way to disentangle the pay reduction effect from the penalty's punishment effect.

relocation issue; employees were particularly concerned about the financial planning and savings implications [39].

We do not have the data on current aggregate OCOLA costs needed to estimate the funds required to implement this guarantee. We have prepared a calculation process that could be used to estimate this amount (described below).

Assume:

- Overseas tours are 1, 2, or 3 years in length. If there are longer tours, then they can be added to the formula.
- OCOLA payments fall 50 percent of the time and rise 50 percent of the time. This assumption can be modified to fit experience.

Define:

- TC = annual total cost of OCOLA program
- A = percent of overseas tours that are 1 year
- B = percent of overseas tours that are 2 years
- C= percent of overseas tours that are 3 years
- D1 = typical (or worst case, as desired for planning factors) percentage drop in OCOLA payment from last year (this formula assumes the payment is lower than last year 50 percent of the time)
- D2 = typical (or worst case, as desired for planning factors) percentage drop in OCOLA payment from two years ago (this formula assumes the payment is lower than two years ago 50 percent of the time)

Formula:

Cost = annual cost of guaranteeing payment does not go lower than initial payment

- Cost = 0.5[.5*B*TC*D1 + 0.33*C*TC*D1 + 0.33*C*TC*D2]

Eliminating "miscellaneous" category

OUSD (P&R) plans to eliminate the "miscellaneous" category from the OCOLA market basket of goods and services.[47] The miscellaneous category is the second largest category and contains 17 percent of the market basket's overall weight, as indicated in the BLS Consumer Expenditure Survey (CES). Miscellaneous consists of the combination of new and used

[47] The staff intend for this step to take effect on May 16, 2024, but it does not yet have final approval.

automobile purchases. In the current OCOLA calculation, miscellaneous (automobile purchase) is a constant in the calculation and is set to assume that the cost of a vehicle overseas is the same as in CONUS. The reasoning behind this assumption is that servicemembers often purchase automobiles at the car lots on base at the beginning of their overseas tour and then sell them back to the lot at the end of their tours.

The Department of State's Office of Allowances, which prescribes civilian COLA for US government employees working abroad, does not include this category at all; rather, it moves that category's weight to other category items. Therefore, OUSD (P&R) decided to remove the category, redistribute that weight to the other overseas categories, and reduce the "spendable income" amount used in COLA calculations by the net annual cost of an automobile. As a result, the total effect on OCOLA payments is small (the weighted average that drives the index is higher, but the base it is multiplied by is smaller). For example, we found that if miscellaneous had been eliminated in 2022, the OCOLA index for Kaiserslautern would have been 112 instead of 110, and for Wiesbaden it would have been 128 instead of 124.

CNA concurs with OUSD's decision to eliminate the miscellaneous category that accounted for an automobile purchase in the OCOLA market basket of goods and services because doing so aligns with the practices of another government department, is more intuitive (i.e., eliminating a category is simpler to explain than leaving it in with an artificial value), and has limited effect on cost.

This completes our analyses of existing BAH, BAS, and COLA processes. We now propose possible courses of action (COAs) for reforming BAH. We did not include these in our separate BAH report because we structured that document to directly conform with the 2023 NDAA tasking, which did not include any questions about these reforms.

Courses of Action for BAH Reform

Although BAH is high relative to civilian housing expenditures, it may be lower than servicemembers' expectations. This issue is related to the statistical problem of accurately setting the rate for each MHA, which can lead to BAH being far more generous for some MHAs than others, and to significant differences in BAH changes across paygrades. BAH recipients may find that BAH relative to local civilian spending is lower in their current MHA than in their previous one, or they may learn it is lower than the MHA and paygrade combination of someone else they know. As a result, they may conclude that their BAH is insufficient.

We also note two likely causes of frustration with BAH that our COAs cannot address. First, on-base housing standards are more generous than BAH standards (a three-bedroom townhouse is the de facto minimum on base and houses larger than four bedrooms exist there). Second, some members are stationed in high-cost urban areas where they can trade a longer commute for lower rent or a larger home (e.g., stationed at the Pentagon and commuting approximately 40 miles from Stafford, Virginia), and they may be dissatisfied if they are next stationed somewhere without that trade-off option.

We propose three possible COAs to help improve BAH's predictability and perceived fairness. Because publicly available indices of housing costs do not align with MHAs or with DOD standards, they cannot simply replace the current BAH process. However, a common feature of our three COAs is that they use government-produced data on the housing market. The COAs differ in the degree to which they retain unique features of the current process. Thus, at one extreme, the tweak COA is the most similar to what is familiar and would be perceived as the least risky by stakeholders who are generally averse to change. At the other extreme, the overhaul COA would be the boldest change but would go the furthest toward smoothing BAH's relative generosity. We assume that DOD would apply any of these three approaches in a cost-neutral manner, so each of them would create winners and losers in the short run (and to a greater degree the more the COA differs from the current approach).

Tweak BAH: smooth BAH updates using HUD data

The most modest BAH reform would keep the current six housing profiles: one-bedroom apartment, two-bedroom apartment, two-bedroom townhouse or duplex, three-bedroom townhouse or duplex, three-bedroom SFD, and four-bedroom SFD. It would, however, reduce

BAH's volatility by reducing the frequency of DOD-specific BAH surveys for each MHA and by filling in the intervening years with percentage changes tied to HUD's median rent estimates.

Specifically, a contractor would conduct BAH surveys for a quarter of all MHAs annually so that each MHA received a new BAH survey once every four years. These periodic BAH surveys still would be necessary to account for the fact that housing in suitable neighborhoods for DOD may not follow the same cost trajectory as housing in the civilian market overall over time. OUSD (P&R) could arrange this four-year cycle of BAH surveys in such a way that MHAs that tend to create the most controversy or require the most adjustments to the raw data are spread across the four cohorts, thus evening out the staff effort across years. We also note that the same contractor who conducts annual BAH surveys currently conducts less frequent housing requirements market analyses for each MHA.[48] With BAH surveys on a four-year cycle, it would make sense to align these market analyses so that the contractor conducts both in a given MHA at the same time.

For the off-year adjustments, the one-bedroom profile would be updated according to the percentage change in the HUD one-bedroom median rent estimate (and so on for the other profiles). These year-on-year changes in the HUD estimate are much more consistent across the number of bedrooms than are BAH rates under the current process, as we showed previously in Figure 2.

This approach requires a crosswalk from HUD areas to MHAs, which we have provided to OUSD (P&R). Servicemembers not assigned to an MHA would, as now, have the county of their duty station tied to an MHA with similar median rents (as reported by HUD). Three out of every four years, BAH for that county would be updated with the same percentage change as the HUD median rent for that county (for the number of bedrooms that corresponds to each anchor point), and once every four years, the BAH would be reset to match an MHA with comparable median rents.

OUSD (P&R) also asked us to update the interpolation table, even though the six profiles remain the same. Our proposed interpolation tables smooth BAH as a share of RMC across paygrades, while keeping the total BAH cost within half a percent of its current value. They also align the paygrade order so that they are the same for with-dependent BAH and without-dependent BAH (though within each grade, members with dependents still receive higher BAH). Table 11 shows how we have adjusted the order, the interpolations for each grade, and the resulting expected average BAH change for members with dependents. Table 12 does the same for members without dependents.

[48] The purpose of these analyses is to determine whether more on-base housing is required because the private housing market off base does not provide enough suitable rentals.

Table 10. Proposed BAH interpolation table for members with dependents (tweak COA)

Current grade order	New grade order	Housing type	New interpolation	Expected BAH	Percentage change (expected BAH)
E-1	E-1	2 BR TH/APT	95% (of E-5)	$2,125	1%
E-2	E-2	2 BR TH/APT	95% (of E-5)	$2,125	1%
E-3	E-3	2 BR TH/APT	95% (of E-5)	$2,125	1%
E-4	E-4	2 BR TH/APT	95% (of E-5)	$2,125	1%
E-5	E-5	2 BR TH	Anchor	$2,237	0%
O-1	O-1	2 BR TH	8%	$2,259	0%
O-2	E-6	3 BR TH	Anchor	$2,497	0%
E-6	W-1	3 BR TH	19%	$2,543	2%
W-1	O-2	3 BR TH	25%	$2,555	3%
E-7	O-1E	3 BR TH	28%	$2,562	-1%
O-1E	E-7	3 BR TH	32%	$2,571	0%
W-2	W-2	3 BR TH	51%	$2,617	0%
E-8	E-8	3 BR TH	63%	$2,644	-1%
O-2E	O-2E	3 BR TH	67%	$2,653	-2%
O-3	O-3	3 BR TH	82%	$2,689	-1%
W-3	W-3	3 BR SFD	Anchor	$2,731	0%
E-9	E-9	3 BR SFD	22%	$2,872	1%
W-4	O-3E	3 BR SFD	25%	$2,894	0%
O-3E	W-4	3 BR SFD	44%	$3,017	5%
W-5	O-4	3 BR SFD	49%	$3,049	-2%
O-4	W-5	3 BR SFD	84%	$3,277	8%
O-5	O-5	4 BR SFD	Anchor	$3,378	0%
O-6	O-6	4 BR SFD	1% above O-5	$3,412	0%
O-7	O-7	4 BR SFD	2% above O-5	$3,446	0%

Source: CNA. Expected BAH calculated from current average BAH payments for each anchor point paygrade as reported in Selected Military Compensation Tables [26].

Table 11. **Proposed BAH interpolation table for members without dependents (tweak COA)**

Current grade order	New grade order	Housing type	New interpolation	Expected BAH	Percentage change (expected BAH)
E-1	E-1	1 BR APT		$1,623	0%
E-2	E-2	1 BR APT	Same as E-4	$1,623	0%
E-3	E-3	1 BR APT		$1,623	0%
E-4	E-4	1 BR APT	Anchor	$1,623	0%
E-5	E-5	1 BR APT	86%	$1,786	2%
O-1	O-1	2 BR APT	Anchor	$1,813	0%
E-6	E-6	2 BR APT	44%	$2,033	10%
W-1	W-1	2 BR APT	78%	$2,199	12%
E-7	O-2	2 BR APT	93%	$2,275	2%
O-2	O-1E	2 BR TH	Anchor	$2,309	0%
O-1E	E-7	2 BR TH	3%	$2,317	12%
W-2	W-2	2 BR TH	22%	$2,375	0%
E-8	E-8	2 BR TH	36%	$2,417	2%
O-2E	O-2E	2 BR TH	40%	$2,427	-1%
E-9	O-3	2 BR TH	55%	$2,472	-1%
W-3	W-3	2 BR TH	70%	$2,518	2%
O-3	E-9	2 BR TH	96%	$2,593	5%
O-3E	O-3E	3 BR TH	Anchor	$2,606	0%
W-4	W-4	3 BR TH	12%	$2,671	1%
O-4	O-4	3 BR TH	15%	$2,686	-5%
W-5	W-5	3 BR TH	39%	$2,813	-1%
O-5	O-5	3 BR TH	48%	$2,859	-3%
O-6	O-6	3 BR SFD	Anchor	$3,137	0%
O-7	O-7	3 BR SFD	2% above O6	$3,200	0%

Source: CNA. Expected BAH calculated from current average BAH payments for each anchor point paygrade as reported in Selected Military Compensation Tables [26].

As we show in the tables, although several paygrades would see a *slight* BAH reduction, only O-4s without dependents would see their average BAH decline by more than 3 percentage points. Of course, the rate protection policy would remain in place, so until a servicemember has a PCS, their BAH would not fall below its value at the time they arrived at that duty station. That said, we recommend an additional protection. For the first two years of implementation of this approach, O-4s without dependents who have a PCS to a new MHA would receive a BAH halfway between its calculated value according to the new table and the higher value it would have had under the legacy table.

Consolidate BAH: consolidate profiles to align with market reality

As we reported in our BAH findings, the current six housing profiles lead to frequent "inversions" that OUSD (P&R) must correct because the inversions would otherwise lead to a higher paygrade receiving less BAH than a lower paygrade in the same MHA. These inversions are partly due to idiosyncrasies in local markets; for example, servicemembers might be trying to find apartments in an MHA with mostly SFDs or trying to find SFDs in an MHA with mostly townhouses and apartments. But these inversions also are due to a nationwide trend: three-bedroom townhouses are more expensive on average than three-bedroom SFDs because they are in more expensive locations closer to amenities and jobs.

DOD can correct for both problems by consolidating the six current housing profiles into four: one bedroom, two bedroom, three bedroom, and four bedroom. This consolidation aligns with how HUD reports median rents, and it accepts the composition of housing types that the market provides rather than trying to impose assumptions about the relative value of an apartment, townhouse, and SFD. Table 13 shows an interpolation table compatible with these four profiles, and it shows our estimate of how the average BAH would change for each of these paygrades for members with dependents. Table 14 does the same for members without dependents.

Table 12. Proposed BAH interpolation table for members with dependents (consolidate COA)

Current grade order	New grade order	Housing type	New interpolation	Expected BAH	Percentage change (expected BAH)
E-1	E-1	2 BR		$2,101	0%
E-2	E-2	2 BR	Same as E-4	$2,101	0%
E-3	E-3	2 BR		$2,101	0%
E-4	E-4	2 BR	Anchor	$2,101	0%
E-5	E-5	2 BR	46%	$2,283	2%
O-1	O-1	2 BR	51%	$2,301	2%
O-2	E-6	3 BR	Anchor	$2,497	0%
E-6	W-1	3 BR	9%	$2,573	3%
W-1	O-2	3 BR	11%	$2,593	4%
E-7	O-1E	3 BR	12%	$2,605	0%
O-1E	E-7	3 BR	14%	$2,620	2%

Current grade order	New grade order	Housing type	New interpolation	Expected BAH	Percentage change (expected BAH)
W-2	W-2	3 BR	22%	$2,695	3%
E-8	E-8	3 BR	28%	$2,740	3%
O-2E	O-2E	3 BR	29%	$2,756	2%
O-3	O-3	3 BR	36%	$2,816	3%
W-3	W-3	3 BR	44%	$2,885	6%
E-9	E-9	3 BR	56%	$2,992	6%
W-4	O-3E	3 BR	62%	$3,046	5%
O-3E	W-4	3 BR	69%	$3,103	8%
W-5	O-4	3 BR	71%	$3,127	1%
O-4	W-5	3 BR	86%	$3,252	7%
O-5	O-5	4 BR	Anchor	$3,378	0%
O-6	O-6	4 BR	1% above O-5	$3,412	0%
O-7	O-7	4 BR	2% above O-5	$3,446	0%

Source: CNA. Expected BAH calculated from current average BAH payments for each anchor point paygrade as reported in Selected Military Compensation Tables [26].

Table 13. Proposed BAH interpolation table for members without dependents (consolidate COA)

Current grade order	New grade order	Housing type	New interpolation	Expected BAH	Percentage change (expected BAH)
E-1	E-1	1 BR		$1,623	0%
E-2	E-2	1 BR	Same as E-4	$1,623	0%
E-3	E-3	1 BR		$1,623	0%
E-4	E-4	1 BR	Anchor	$1,623	0%
E-5	E-5	1 BR	86%	$1,786	2%
O-1	O-1	2 BR	Anchor	$1,813	0%
E-6	E-6	2 BR	17%	$1,950	5%
W-1	W-1	2 BR	30%	$2,053	4%
E-7	O-2	2 BR	36%	$2,100	-6%
O-2	O-1E	2 BR	39%	$2,120	-8%
O-1E	E-7	2 BR	41%	$2,135	3%
W-2	W-2	2 BR	52%	$2,229	-6%
E-8	E-8	2 BR	61%	$2,297	-3%
O-2E	O-2E	2 BR	63%	$2,313	-5%
E-9	O-3	2 BR	72%	$2,387	-4%
W-3	W-3	2 BR	82%	$2,462	0%

Current grade order	New grade order	Housing type	New interpolation	Expected BAH	Percentage change (expected BAH)
O-3	E-9	2 BR	97%	$2,585	5%
O-3E	O-3E	3 BR	Anchor	$2,606	0%
W-4	W-4	3 BR	3% above W-4	$2,684	1%
O-4	O-4	3 BR	6% above W-4	$2,762	-2%
W-5	W-5	3 BR	9% above W-4	$2,840	0%
O-5	O-5	3 BR	12% above W-4	$2,919	-1%
O-6	O-6	3 BR	15% above W-4	$2,997	-4%
O-7	O-7	3 BR	18% above W-4	$3,075	-4%

Source: CNA. Expected BAH calculated from current average BAH payments for each anchor point paygrade as reported in Selected Military Compensation Tables [26].

Because we cannot foresee exactly how the sampling will work with the redefined profiles, we based our cost estimates of the new profiles on existing BAH profiles. We tied our one-bedroom average cost to the current one-bedroom apartment, our three-bedroom average cost to the current three-bedroom townhouse, and our four-bedroom average cost to the current four-bedroom SFD. For the two-bedroom profile, we applied different approaches for members with and without dependents to attempt to keep E-1 through E-4 compensation comparable to what it is now. We tied our estimate of the two-bedroom unit for with dependents to the average cost of the current midpoint between a two-bedroom apartment and a two-bedroom townhouse, whereas we tied our estimate for members without dependents to the current two-bedroom apartment profile.

These new broader profiles would contain some home types that do not match any current BAH profile but that are available for members to rent using BAH. ACS data reveal that 10 percent of one-bedroom rentals are townhouses or SFDs, 21 percent of two-bedroom rentals are SFDs, 25 percent of three-bedroom rentals are apartments, and 18 percent of four-bedroom rentals are apartments or townhouses. Therefore, the sampling approach for these new anchor points could (and perhaps should) place some weight on these home types not currently included in BAH profiles. In fact, we note that two of the current six profiles are not that common nationwide: fewer than 9 percent of two-bedroom rentals are townhouses or duplexes, and only 12 percent of three-bedroom rentals are.

Because these new profiles are more broadly defined, the contractor who conducts BAH surveys and the military housing offices at installations will have more discretion in determining which properties to sample. This approach would enable them to tailor the sample to the local market conditions, but it would also carry the risk of them not selecting the sample in accordance with the intent of OUSD (P&R). Because surveys would be conducted for only a quarter of MHAs each year, OUSD (P&R) would be able to provide more oversight and guidance to the process, which may include mandating the apartment, townhouse, and SFD mix for a profile and MHA. If OUSD (P&R) had data from the concurrent housing requirements market analyses, it would be able to provide more informed oversight. However, we note that the apartment vs. townhouse vs. SFD distinction is just one of many features that differentiate two dwellings with the same number of bedrooms (they also differ in distance to base, school zoning, etc.), so there always has been discretion in which homes are sampled for BAH surveys.

As shown above in table 14, servicemembers without dependents in the paygrades O-2, O-1E, W-2, and O-2E would see a BAH reduction of 5 percent or more on average relative to the current process. In addition to the current rate protection policy, we recommend an additional protection. For the first two years of implementation of this approach, members of those paygrades who have a PCS to a new MHA would receive a BAH halfway between its calculated value according to the new table and the higher value it would have had under the legacy table.

As with the tweak COA, surveys would take place every four years for each MHA, and intervening annual BAH updates would be tied to the percentage change in the HUD median rent for that number of bedrooms, using the crosswalk of HUD areas to MHAs that we provided. Duty stations without an MHA also would be addressed in the same way as in the tweak COA. This COA would reduce volatility and increase predictability more than the tweak COA because the consolidated profiles would yield larger sample sizes and be more stable.

Overhaul BAH: tie directly to statutory requirement

The statutory requirement for BAH does not mention housing profiles at all, and the current approach of trying to tie BAH to the same set of profiles across all MHAs fundamentally differs from how civilians approach housing decisions. The law says that the rate must be based on the cost of adequate housing for civilians of comparable incomes in the same area, and civilians of comparable incomes consume less housing when they live in higher cost areas and vice versa. Therefore, one approach to calculate BAH would be to directly tie it to civilian incomes and housing expenditures rather than to a common set of profiles.

If DOD took this approach in a cost-neutral manner, it could cause a significant reallocation from higher cost MHAs to lower cost MHAs. For example, currently the average BAH for an E-5 with dependents across the most expensive third of MHAs is 106 percent higher than the average BAH for an E-5 with dependents across the least expensive third of MHAs. Civilians with the same income-less-housing as an E-5 with dependents spend only 87 percent more in the most expensive third of areas than in the least expensive third. By this logic, we would expect BAH in high-cost MHAs such as San Diego or Washington, DC, to go down and BAH in low-cost MHAs such as Fort Sill and Fort Polk to increase. However, the current process has its own approach to increasing BAH relative to civilian spending in low-cost MHAs by excluding neighborhoods as unsuitable. Therefore, it is not obvious that this overhauled approach would necessarily increase BAH in lower cost areas.

We note that unlike civilians, servicemembers do not choose where to live, and they may not value the amenities or climate associated with higher cost areas as much as civilians who choose to live in those areas. For example, one driver of higher cost is civilian employment opportunities, but employment options for servicemembers' civilian spouses may be more tied to military infrastructure and not closely related to the broader civilian labor market. Also, military families may not place as much weight as civilians on some forms of urban entertainment, and they have similar on-base services available to them at any large installation regardless of the cost of living in the area.

Why, then, would DOD implement this overhaul? Because the statutory requirement for BAH is defined in terms of comparable civilians, it would make sense for it to be generous relative to civilian spending by a roughly consistent amount. Such consistency can be accomplished through periodic updates to the interpolation table, but doing away with the profiles and interpolation tables simplifies the message. BAH is cash that servicemembers are free to spend as they choose, which may or may not be on a home that fits the profile to which their grade is tied. Tying BAH directly to the requirement would focus attention on its relative generosity (a positive message), acknowledge the reality that the government is not dictating what type of home the member will choose, and smooth the degree to which it is generous relative to the standard.

To implement this COA, the US Census Bureau would identify households in each MHA that have income-less-housing in a range that corresponds to a military paygrade and determine the average amount that these households spend on rent and utilities. It would restrict the sample to exclude respondents living in group homes, mobile homes, trailers, vans, recreational vehicles, and boats. It also could exclude those sharing a rental with roommates other than relatives or an intimate partner (though unmarried servicemembers do sometimes pool their BAH and rent a home together). This average civilian spending then would be multiplied by a factor greater than 1 (and higher for members with dependents than members without dependents) to determine their BAH rates. This multiplier would be set such that the total BAH cost is the same as under the current system.

OUSD (P&R) and the US Census Bureau currently are exploring how to implement this arrangement. The US Census Bureau has confirmed its ability to create custom results tables based on MHA boundaries.

Because survey data are lagged, this COA would require OUSD (P&R) to inflate the estimated rents in a manner similar to the process HUD currently uses. HUD reports that it first calculates a CPI rent change using the CPI Rent of Primary Residence Series. Then, it calculates a rent change based on private sector data by looking at six commercial sources of rent data and averaging available sources.[49] Next, it calculates a *gross* rent change by combining the CPI rent and private rent changes with the CPI Fuels and Utilities Series. Finally, it takes a weighted average of the CPI and private gross rent changes. OUSD (P&R) could follow an approach similar to HUD's.

Two issues would require a separate solution. First, in some MHAs, civilians with incomes comparable to servicemembers may be almost nonexistent because the military is the primary driver of the local economy. For paygrade-MHA combinations with this problem, BAH could be tied to comparable civilians in another MHA with similar overall costs. Second, this approach may result in a significant revenue loss for privatized housing partners that already have built large homes in high-cost MHAs. The solution would have to involve separating compensation for privatized housing partners from BAH and directly compensating them through another mechanism, which would require offering them a new deal sufficiently attractive that all of them agree to terminate their existing contracts with the government and switch to the new system.

The current approach to privatized on-base housing is designed to meet specific requirements with the expectation that the owners can charge servicemembers rent up to a rent ceiling of BAH. This ceiling functions as a form of rent control, which limits how much landlords can increase rents for existing tenants. The overhaul COA will inevitably result in reductions to BAH generosity in certain locations, which means that BAH, or the maximum rent that may be charged, may be lower than the costs associated with building and maintaining the current on-base privatized housing stock. Although rent control policies are intended to protect tenants by ensuring access to stable, affordable housing, the economic literature has documented some harmful long-term outcomes associated with these types of policies.[50] The consequences most pertinent to on-base privatized housing include reductions in the quality and supply of rental housing. If companies are forced to reduce the rent they may charge for a unit, they may reduce their investment in and maintenance of the existing housing stock [41]. Furthermore, rent ceilings may inhibit new construction (because of lower return on investment or fear of lower return on investment if additional BAH adjustments were to occur), affecting the overall supply

[49] The six sources HUD currently uses are Zillow, Apartment List, CoreLogic, RealPage, REIS, and CoStar.

[50] Rent control is associated with several adverse outcomes that may not apply to the military housing stock, such as distortions in the market due to reductions in the mobility of tenants [40], racial or social inequities [41], and the conversion of rental properties into owner-occupied units [40].

of available rental housing and potentially inflating the rental costs of off-base housing because of limited supply.

Messaging the reforms

We include fliers to inform servicemembers and their families about each of these BAH reform COAs, if DOD were to select one to implement, as an enclosure to this report.

Conclusion

The statutory definition of BAS is unclear and has led to BAS drifting upward over time relative to the USDA's estimates of the cost of food. We recommend redefining it to directly tie its level, not rate of change, to the cost of the USDA liberal food plan for adult men. It may be optimal to build a forecast into BAS to address its lag because food prices rise more often than they fall. Differences in the cost of food across MHAs make more sense to address through CONUS COLA than through BAS. We estimate that extending BAS to dependents would almost double the cost of the program, and this approach would be inefficient for addressing food security concerns for military families.

Because members have access to savings on base that help offset differences in local cost of living, both CONUS COLA and OCOLA attempt to account for how much members use these savings through an LPS. However, more frequent and directly verifiable data are available about how much shopping members do on base. Some MHAs align with metropolitan areas for which the FRED publishes CPI-less-shelter indices, and these data series are correlated with the CONUS COLA indices computed by OUSD (P&R), suggesting that OUSD (P&R) can continue to check this correlation in the future to confirm its approach and can use the comparison to identify outliers that merit further exploration.

DOD can improve the transparency and predictability of BAH by tying its rate of change to publicly available data estimated by the US Census Bureau and published by HUD. Because the statutory requirement for BAH does not include the housing profiles that DOD currently uses to calculate BAH, it could go further and tie BAH directly to the requirement by partnering with the US Census Bureau to observe civilian incomes and housing expenditures in each MHA.

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Appendix A: Weighting Schemes for Annual BAS Updating

This appendix examines how forecasting the previous year's BAS growth helps BAS to better align with the values of the liberal food plan. In the body of this report, we projected half of the prior year's October-to-October growth to predict BAS values during the upcoming year. In theory, we could scale the prior year's growth in food costs by any number we choose (though practically speaking, this amount should be between 0 and 1), so it is worth examining how using different weights best aligns with policy-makers' potential objectives.

We focus on five possible weights on the previous year's growth: 0.00, 0.25, 0.50, 0.75, and 1.00. Table 15 includes the same outcomes for these weights as were shown in Table 4; note that the second row is identical to the final row in Table 4.

Table 14. Comparing weights on prior year growth in food costs

	2001–2019 (76 quarters)				2001–2023 (92 quarters)			
	Total net error	Mean error	Std. dev.	Pos. qtrs	Total net error	Mean error	Std. sev.	Pos. qtrs
Weight = 0.00[a]	-$422.70	-$5.56	$23.77	27	-$1,023.00	-$11.12	$29.87	28
Weight = 0.25[b]	$333.90	$4.39	$25.83	43	-$0.30	$0.00	$30.98	49
Weight = 0.50[c]	$1,172.10	$15.42	$29.09	53	$1,108.80	$12.05	$33.87	61
Weight = 0.75[d]	$2,072.10	$27.26	$32.67	63	$2,279.70	$24.78	$37.67	72
Weight = 1.00[e]	$2,990.10	$39.34	$36.81	66	$3,468.60	$37.70	$42.31	77

Source: CNA analysis of [27].

[a] For example, predicted values for all of 2002 would be $\max\{BAS_{2001}, Oct_{2001}\}$.

[b] For example, predicted values for all of 2002 would be $\max\{BAS_{2001}, Oct_{2001} + 0.25 * (Oct_{2001} - Oct_{2000})\}$.

[c] For example, predicted values for all of 2002 would be $\max\{BAS_{2001}, Oct_{2001} + 0.5 * (Oct_{2001} - Oct_{2000})\}$.

[d] For example, predicted values for all of 2002 would be $\max\{BAS_{2001}, Oct_{2001} + 0.75 * (Oct_{2001} - Oct_{2000})\}$.

[e] For example, predicted values for all of 2002 would be $\max\{BAS_{2001}, Oct_{2001} + (Oct_{2001} - Oct_{2000})\}$.

Using different weights on the prior year's October-to-October growth in food prices would effectively assume that food price trends from the prior year will persist into the current year (the larger this weight, the more persistent the growth from one year to the next). Because food prices are generally rising, putting a higher weight on the prior year's growth often will result in a higher BAS level, and because BAS is constrained not to fall, putting a greater weight on the prior year's growth will have no effect during periods of falling food prices. Taken together, higher weighting should always result in BAS values at least as high as under lower weighting.[51] As a result, lower rows in Table 15 have more positive total errors and mean quarterly errors. However, higher weights also mean that BAS overshoots the value of the liberal food plan more frequently and by larger amounts, resulting in larger standard errors in lower rows. Both patterns—more positive total and mean errors and larger standard deviations—hold whether looking at 2001–2019 or 2001–2023. We show these results graphically in Figure 8 (omitting a weight of 0.75 to allow closer viewing of the other four).

We now can consider the competing priorities illustrated in Table 3 as applied to Table 15. A weight of 0.00, corresponding to the top-right graph in Figure 8, is the best at month-to-month accuracy—its low standard deviations mean that it typically comes closest to the actual food. However, it is the worst of the four at the other two priorities because failing to project forward the food cost ensures that BAS will frequently (though not always) pay less than the liberal food plan. By contrast, a weight of 1.00, corresponding to the bottom-right graph in Figure 8, is the best at meeting or exceeding the liberal food plan because it always sets the highest BAS value; however, it also results in long stretches during which BAS is set far above the value of the liberal food plan and must wait for food prices to catch up. We view a weight of 0.25, corresponding to the top-right graph in Figure 8, as the most attractive of these options because it does the best at balancing multiple objectives—it has the lowest total net and mean errors, it has the second-lowest standard errors, and it comes the closest to having equal numbers of quarters in which BAS overshoots and undershoots the values of the liberal food plan.

[51] If BAS were allowed to fall from year to year, higher weights would carry some downside risk because they would result in lower BAS projections after a year of falling prices.

Figure 6. Comparing weights on prior year growth in food costs

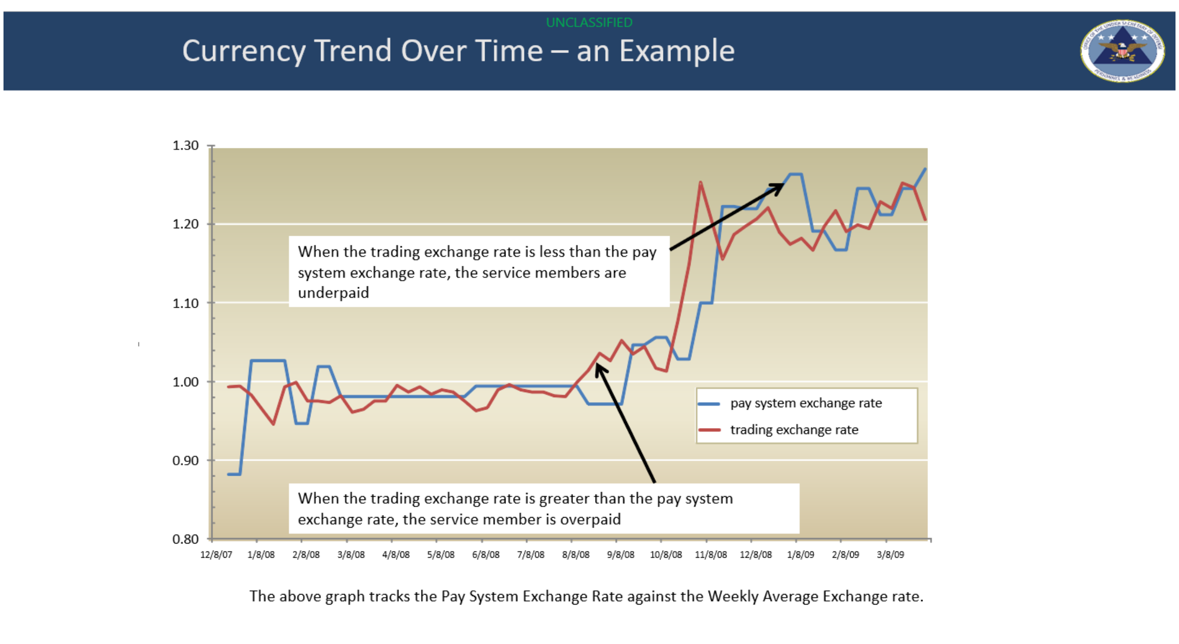
Source: CNA analysis of [27].

Appendix B: The Exchange Rate Accumulator

In this appendix, we describe the exchange rate accumulator DOD uses to adjust OCOLA rates to account for large exchange rate fluctuations that occur in the time between the annual retail price data collections.

Currency fluctuations can affect both OCOLA and OHA payments. Military finance centers pay all allowances in US dollars, but many expenses for OCONUS servicemembers are in the local currency. When exchange rates fluctuate, DOD adjusts overseas allowance payments to ensure that the servicemember has the same purchasing power as before the change. When the trading exchange rate is less than the exchange rate in the pay system, servicemembers are underpaid. When the trading rate is greater than the pay system exchange rate, servicemembers are overpaid (see Figure 9).

Figure 7. Currency trend over time—an example



Source: PowerPoint slides by Jon Loewer of OUSD (P&R) sent on February 27, 2024.

DOD monitors and analyzes daily exchange rates using a Currency Adjustment model. The model compares the current pay system exchange rate used by military finance centers to the currency exchange rate. DOD reviews exchange rates twice a month to adjust the pay system exchange rate. This method ensures that over time, fluctuating exchange rates do not disadvantage either the servicemember or the government.

When DOD makes a currency adjustment servicemembers see the changes in their next paycheck. Currency adjustments may result in an increase, a decrease, or no change to the OCONUS COLA and OHA. Adjustments are made the same way whether the dollar is increasing or decreasing in value. The allowance changes are posted one day prior to the effective date. Because DOD makes adjustments only once per pay period based on past data, the pay system exchange rate will generally not be the same as the exchange rate at the bank window.

The 5 percent exchange rate accumulator ensures that the actual exchange rate is not more than 5 percent different than the pay system's exchange rate. Note that this is an accumulated plus-or-minus 5 percent, meaning that the algorithm is designed to buy back the difference between the exchange rate over the 8 weeks when the calculated difference is an accumulated +/- 5 percent difference. This calculation method is valuable because, for example, if an exchange rate continues to be 1.5 percent less than the pay system's exchange rate for a long period, once the accumulated difference surpasses 5 percent, the algorithm will provide the exchange rate that will buy back the difference and ensure that the servicemember is neither systematically overpaid nor underpaid relative to the exchange rate.

Figures

Tables

Abbreviations

ACS	American Community Survey
BAH	Basic Allowance for Housing
BAS	Basic Allowance for Subsistence
BLS	Bureau of Labor Statistics
CBSA	core-based statistical area
CES	Consumer Expenditure Survey
COA	course of action
COLA	Cost-of-Living Allowance
CONUS	contiguous United States
CPI	consumer price index
DeCA	Defense Commissary Agency
DOD	Department of Defense
FRED	Federal Reserve Economic Data
FY	fiscal year
HUD	Department of Housing and Urban Development
LPS	Living Pattern Survey
MHA	military housing area
NDAA	National Defense Authorization Act
OCOLA	overseas COLA
OHA	Overseas Housing Allowance
OUSD	Office of the Undersecretary of Defense
PCS	permanent change of station
PUMA	public use microdata area
P&R	Personnel and Readiness
QRMC	Quadrennial Review of Military Compensation
RMC	regular military compensation
RPS	Retail Price Schedule
SFD	single family dwelling
USDA	US Department of Agriculture

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Research Report

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About This Report

With an estimated military food insecurity rate of 25 percent, according to 2018 and 2020 survey data, policymakers are interested in whether levels and components of military compensation affect food insecurity. The analysis in this report responds to a request from the 14th Quadrennial Review of Military Compensation (QRMC) to (1) provide an assessment of whether and to what degree military compensation explains military food insecurity and (2) analyze why food insecurity rates are higher among military personnel than among civilians. The White House charter for the 14th QRMC includes a mandate to consider military compensation from the standpoint of strengthening members' economic security.

The research reported here was completed in July 2024 and underwent security review with the sponsor and the Defense Office of Prepublication and Security Review before public release.

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For more information on the RAND Personnel, Readiness, and Health Program, see www.rand.org/nsrd/prh or contact the director (contact information is provided on the webpage).

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Summary

Prior analysis of U.S. Department of Defense (DoD) Status of Forces of Active Duty Members (SOFS-A) survey data for years 2018 and 2020 show that the estimated food insecurity rate for active-duty service members is about 25 percent (Asch et al., 2023), higher than the 2020 food insecurity rate of 11 percent for U.S. households overall (Coleman-Jensen et al., 2021), despite research consistently finding that average military pay significantly exceeds the average pay of civilians with similar ages and education. Food insecurity in SOFS-A and in the U.S. Census Current Population Survey (CPS) is determined using questionnaires designed by the U.S. Department of Agriculture (USDA). The surveys ask about access to food over the prior 12 months.[1] SOFS-A data are intended to be a representative sample of the active-duty population.

In addition to the disparity between military food insecurity rates and average military pay, analysis of food insecurity in the military has raised questions about why reported food insecurity rates are so high in the military, what the root causes are, and why SOFS-A data reveal other puzzling results, such as a high rate of savings among those who report being food insecure (Asch et al., 2023). Analysis of military food insecurity has also raised questions about the role of military compensation in explaining food insecurity. Furthermore, as of summer 2024, Congress was contemplating an increase in junior enlisted pay to address recent recruiting challenges and concerns about food insecurity specifically among junior enlisted members, especially. Because of interest in military compensation as a policy lever, the 14th QRMC requested that RAND National Defense Research Institute assess how much military compensation explains food insecurity in the military relative to other factors.

Using study data, we estimated how food insecure members differ from food secure members in terms of levels of pay while holding constant such factors as family size, demographic characteristics, service, and deployment status.[2] We also estimated the extent to which financial knowledge, financial well-being, and financial management skills affect the relationship between compensation and food insecurity. In addition, we examined the extent to which variability in military pay was related to the likelihood of food insecurity, because research

[1] The questions do not enable an assessment of whether those who report being food insecure are chronically food insecure or whether they experienced a temporary period of food insecurity. Moreover, those who are deemed food insecure may or may not have experienced a reduced intake of food (USDA, 2023b).

[2] The focus of our study was on the relationship between military compensation and food insecurity. Our models do not include household income as an additional covariate. Household income is reported as bins in the SOFS-A rather than level for each respondent. Further, the income bins are measured over a different time period than the food insecurity questions (e.g., 2022 SOFS-A asks about 2021 income, but food insecurity questions ask about experiences 12 months prior to filling out the survey in July 2022) and rely on respondent recall, which may be subject to error. Moreover, including household income would result in a double count of service member compensation in the covariates. For all of these reasons, we exclude household income from our models.

from the civilian sector shows that household income variability is positively related to food insecurity (Wolf and Morrisey, 2017).

To conduct these analyses, we linked 2022 SOFS-A data with the pay records of military personnel included in the survey, provided by the Defense Manpower Data Center (DMDC). As part of our exploration of the data, we examined the response rates in the 2018, 2020, and 2022 SOFS-A and found the response rates were between 10 percent and 13 percent.[3] As part of this project, we also learned that there is a 10-month lag between when members are selected to be in the SOFS-A sample and when they respond to the survey, meaning that their characteristics may change during this lag (e.g., pay grade).[4] We found the match rate between SOFS-A data and the DMDC data was about 94 percent. We used the matched data to estimate regressions of the association between military cash compensation, as measured by DMDC pay data, and the likelihood of food insecurity, as measured in SOFS-A, holding constant other variables drawn from either the DMDC or SOFS-A data. Cash compensation encompasses all elements of military compensation the member received in a month, including basic pay, allowances, and special and incentive pays.

We also estimated correlations between food insecurity and the degree of variability of monthly cash compensation, where variability captures fluctuations in monthly pay over the 24 months before the survey. These variations could be the result of changes in duty location, experience, responsibilities, or other factors that can affect the receipt of basic pay and elements of cash compensation, although we do not specifically know the circumstances that caused these elements to change. Importantly, we were unable with the data available to us to investigate how delays in receipt of certain pays or errors in receipt of different pays would affect variability and food insecurity.

In addition, we further investigated why military and civilian food insecurity rates differ. Specifically, we examined whether the differences in food insecurity rates were explained by demographic differences between military personnel and civilians, differences in how the surveys determine which respondents are asked the food insecurity questions, and differences in questions used to determine food insecurity. Finally, we examined how food insecure members respond to questions about their financial condition (because many of the questions to determine food insecurity involved having enough money to afford food) to see if those questions could provide insight into reasons for the disparity between military and civilian food insecurity rates.

We did not conduct an in-depth analysis of the root causes of food insecurity beyond our examination of the role of compensation. We also did not focus on resolving the other data limitations in the surveys (e.g., low response rates, 10-month time lag), and we leave it to future research to examine these issues further. We also did not focus on resolving the other data

[3] Response rates were calculated using the unweighted data and do not match the Office of People Analytics (OPA)'s response rates, which are were calculated using weighted data, but were also low.

[4] For the 2022 SOFS-A, members were selected in September 2021 and responded to the survey in July 2022.

limitations in the surveys (e.g., low response rates, 10-month time lag), and we leave it to future research to examine these issues further. Furthermore, we did not conduct an in-depth analysis of why the food insecurity rate increased substantially in 2022, why the rates were already high in 2018 and 2020, or, as we will describe further, why large shares of food insecure members in the 2022 SOFS-A also reported having good financial circumstances.[5] Consequently, an important caveat of our analysis is that it relies on survey data that are still being investigated for reliability and robustness in measuring food insecurity in the overall active-duty population, and our results pertaining to food insecurity and financial circumstances may not necessarily be generalizable beyond the survey samples.[6] It is also important to note that our regression analysis was not a causal analysis and only shows associations between variables.

Findings and Implications

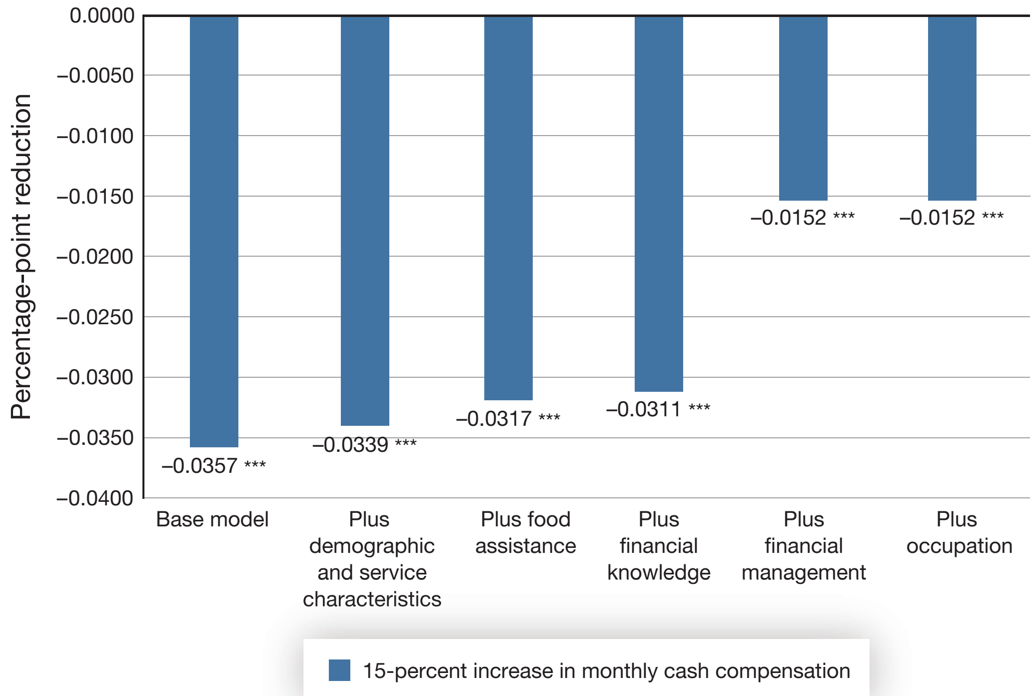
We found that increasing the level of monthly cash compensation is associated with a statistically significant reduced likelihood of food insecurity among all active-duty military personnel in the 2022 survey, including all enlisted personnel and officers in the sample. However, the estimated effect is relatively small, and we did not find a statistically significant association when we considered only junior personnel. As shown in Figure S.1, in the baseline model that includes all enlisted members and officers in the sample and includes no other control variables, a 15-percent increase in monthly cash compensation is associated with a 3.57–percentage point reduction in the food insecurity rate, which is equivalent to almost a 9-percent decline. This estimated relationship is even smaller once we also accounted for members' financial well-being, ability to save and other financial management skills; estimates fell from 3.57 to 1.5 percentage points.

We also found that higher levels of financial well-being and financial behaviors are associated with lower levels of food insecurity, and the magnitude of these relationships are large. As shown in Chapter 3, each of five questions designed to measure financial well-being had a statistically significant relationship with food insecurity. Respondents who reported being able to save something each month were 17 percentage points less likely to be food insecure,

[5] We note that a systematic review of other surveys besides the SOFS-A and U.S. Census CPS that measure food insecurity was beyond the scope of this study. Other surveys may have similar issues to those identified for the SOFS-A.

[6] We discussed concerns about the generalizability of the responses to the SOFS-A food insecurity questions with OPA, the administrator of the SOFS-A survey. OPA recognized the issues raised and will investigate further, but, based on its statistical analysis completed so far, OPA does not agree with our assessment that the food insecurity results may not be generalizable to the overall active-duty population. Furthermore, DoD informed us that it has suspended use of the USDA six-item household food security measure in its OPA-led surveillance surveys but is exploring alternative measures to understand how food insecurity manifests in the military population. We note that our SOFS-A analysis uses the survey weights, although the weighted analysis on food insecurity may not be generalizable to the overall active-duty member population.

FIGURE S.1
Estimated Percentage Point Change in Likelihood of Food Insecurity Associated with a 15-Percent Increase in Monthly Cash Compensation

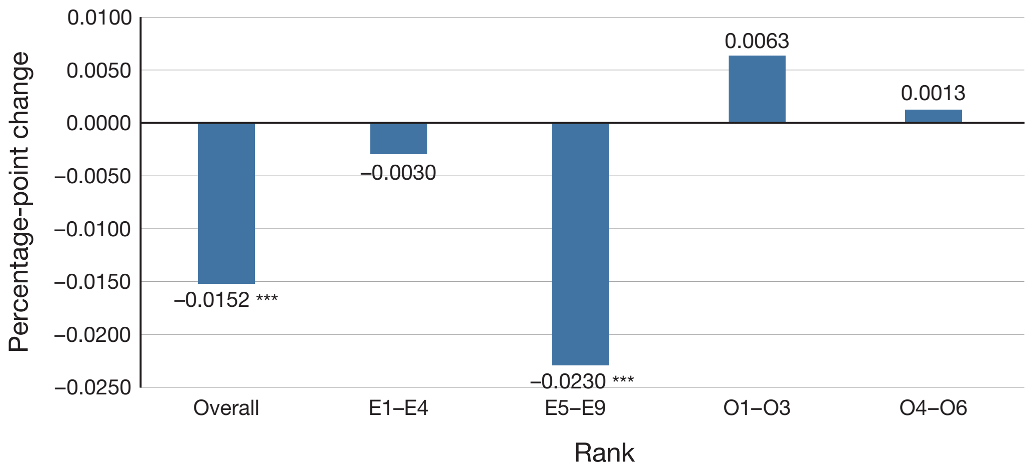


SOURCE: Produced using SOFS-A 2022 data matched to DMDC data.
NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. *** denotes that result is statistically significant at the 1-percent level.

while respondents who reported providing financial assistance to family members outside of the household were 6 percentage points more likely to be food insecure. The model did not demonstrate a statistically significant relationship between having an emergency savings fund and food insecurity, likely because this measure is so highly correlated with being able to save each month. On the other hand, we did not find a significant association between financial knowledge (as measured by responses to a quiz on financial topics) and food insecurity.

Because junior enlisted members are more likely to be food insecure, policymakers are particularly interested in whether higher compensation could help mitigate food insecurity among these personnel. To investigate this question, we conducted a regression analysis by seniority group focusing specifically on junior enlisted (E1 to E4), career enlisted (E5 to E9), junior officer (O1 to O3), and career officer (O4 and above). For junior enlisted respondents, we did not find a statistically significant relationship between compensation and likelihood of food insecurity in the 2022 data, including a full set of control variables, and the magnitude of the estimate is small (Figure S.2). There is a statistically significant asso-

FIGURE S.2
Estimated Percentage Point Change in Likelihood of Food Insecurity Associated with a 15-Percent Increase in Cash Compensation for Subsamples Defined by Grade Grouping, 2022



SOURCE: Produced using SOFS-A 2022 matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. *** denotes that result is statistically significant at the 1-percent level. Results shown for each group are the coefficient estimate on the logarithm of monthly cash compensation where the sample was restricted to each grade range. Regression included controls for individual demographics, service characteristics, receipt of food assistance, financial knowledge, financial well-being, financial management, and occupation.

ciation for more-senior enlisted respondents in grades E5 to E9: A 15-percent pay increase is associated with a 2–percentage point decline in the likelihood of food insecurity for this group. However, these results are not robust across survey years. We replicated our analysis in the 2018 and 2020 SOFS-A surveys and found no robust relationship between compensation and food insecurity across all years for any specific subgroup of grades, including junior enlisted personnel. Career enlisted personnel in grades E5 to E9 show the strongest possible relationship, where we estimated a negative association between compensation and food insecurity in two of the three survey years (2018 and 2022). Thus, we did not find evidence that the high rate of food insecurity reported among junior enlisted members in the survey would be lower if compensation were higher.

Although we did not find a robust relationship between cash compensation and food insecurity among junior enlisted members when we controlled for other factors across the three surveys—2018, 2020, and 2022—we still predicted how significantly the rate of food insecurity might fall if Congress increased cash compensation for junior enlisted members by 15 percent and how much cost would increase if, counter to our findings, we assumed our estimates for junior enlisted respondents were robust. The number of E1 to E4 service members across the services in 2023 with at most ten years of service is 553,445. We estimated that a 15-percent pay raise would reduce the number of food insecure E1 to E4 service members by 1,685 using our 2022 estimates and 6,210 using the 2020 estimates. We estimated that the annual increase in cost to DoD in 2023 dollars would be $3.71 billion, or $2.2 million per reduction in food insecure member ($3.71 billion/1,685) based on 2022 estimates or $597,100 based on the 2020 estimates.[7] The implication is that, even if we had found a robust relationship between pay and food insecurity, using a pay increase to address food insecurity among junior enlisted members would be disproportionately expensive because the estimated relationship is so small.

We also estimated the relationship between variability of cash compensation—how much pay varies over the previous 24 months for a given individual—and the likelihood of food insecurity in the 2022 survey. We found that an increase in variability is associated with an increase in the likelihood of food insecurity in the model that includes all enlisted members and officers in the survey. For example, in the model with the full set of controls, we estimated that a 30-percent decrease in variability (not shown) is associated with a reduction in the food insecurity rate by 4.9 percentage points.

In our investigation of why we observed higher food insecurity rates among military personnel than civilians in the survey data, we found that controlling for age, gender, education, presence of children, marital status, spouse unemployment status, and household income does not explain why military food insecurity rates are so much higher than civilian food insecurity rates. We also found that differences in the way the surveys screen the food insecurity questionnaire (i.e., determine which respondents are given the food insecurity questionnaire) and the use of the USDA six-question short form used to identify food insecure respondents in the SOFS-A versus the USDA long form used in the CPS do not explain the higher reported food insecurity rates among military personnel versus civilians. On the other hand, in the 2022 SOFS-A data, we found that large shares of food insecure military members reported being in good financial condition, reported saving or investing, and reported that they had emergency savings. It is unclear how these two conflicting circumstances, food insecurity and good financial status, can both be true.

The implication is that the disparity in reported food insecurity rates between military members in the survey and civilians is not explained by differences in observable characteristics or differences in how people are screened in the different surveys. Instead, the different food insecurity rates could be the result of differences in unobservable characteristics between military and civilian populations. For example, military and civilian populations might have a different propensity to send or receive financial or in-kind assistance from family and friends or have different levels of financial knowledge and different financial

[7] The $3.71 billion estimate assumes that the targeted pay raise involved only an increase in basic pay for E1 to E4 service members, and the cost estimate reflects the increase in basic pay costs in 2023 given the grade and year of service distribution of E1 to E4 service members in 2023, as well as the increase in retirement accrual costs to DoD given that accrual costs are a multiple of the basic pay bill. This estimate understates the total cost because it ignores other elements of cost that depend on the basic pay bill, such as Federal Insurance Contributions Act taxes, and ignores how costs are affected in future years given that a pay raise is built into future costs.

management skills. Other possible explanations are differences in survey response rates, a need for a different time horizon over which food insecurity is measured, different ways military and civilians access food, and different methods for data collection.[8] Asking about food insecurity over the previous 12 months might not be the best way to measure food insecurity in military populations; a focus on 12 months could overestimate food insecurity that was short-lived and temporary.

Future data collection efforts on food insecurity in the military should consider including questions that better capture why some members who report being in good financial condition or report saving and investing are also food insecure. Data collection should also capture temporary or short-lived incidents of food insecurity and the possible reasons for why these incidents occur.

8 SOFS-A is web-based versus the CPS, which is interview-based.

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CHAPTER 1

Introduction

Prior analysis of data from surveys of active-duty personnel from the 2018 and 2020 U.S. Department of Defense (DoD) Status of Forces Surveys of Active Duty Members (SOFS-A) indicate that the estimated food insecurity rate for active-duty service members is higher than the civilian food insecurity rate, despite research showing that the average military pay significantly exceeds the average pay of civilians with similar ages and education (Asch et al., 2023). Food insecurity in SOFS-A is determined using a questionnaire designed by the U.S. Department of Agriculture (USDA). The questionnaire asks about access to food over the prior 12 months.[1] SOFS-A data are intended to be a representative sample of the active-duty population.

Analyses of food insecurity in the military have raised several questions that call for additional data collection and analyses into why reported food insecurity rates are so high in the military, the root causes of food insecurity, and why certain puzzling findings emerge (Asch et al., 2023). For example, prior studies found the rate of military food insecurity in the survey data substantially exceeded the rate of food insecurity among civilians with similar characteristics, (Asch et al., 2023; Heissel and Schanzenbach, 2023; Rabbitt and Beymer, 2024). Prior research also found that nearly 30 percent of food insecure members reported in the 2018 survey that they felt financially secure or were able to make ends meet without much difficulty and that about 70 percent of food insecure members reported having access to emergency savings (Asch et al., 2023) Furthermore, military personnel earned more than comparable civilians on average but experienced a greater rate of food insecurity (Asch et al., 2023).

A critical question for policymakers that has yet to be answered is the extent to which the levels and components of military compensation play a role in causing food insecurity. The July 2022 DoD roadmap and strategy for strengthening food security in the military called for a review of military pays and benefits and noted the need for more data and analysis to better understand the scope and contributing factors of military food insecurity (Office of the Under Secretary for Personnel and Readiness [OUSD(P&R)], 2022). Furthermore, the

[1] The questions do not enable an assessment of whether those who report being food insecure are chronically food insecure or whether they experienced a temporary period of food insecurity. Moreover, those who are deemed food insecure may or may not have experienced a reduced intake of food (USDA, 2023b). The U.S. Census Current Population Survey (CPS) also asks food insecurity questions that use a 30-day lookback period in addition to the questions that ask about the previous 12 months.

January 2023 White House charter for the 14th Quadrennial Review of Military Compensation (QRMC) required a review of military allowances, including the basic allowance for subsistence and the basic needs allowance (BNA) created in the National Defense Authorization Act (NDAA) of 2022 to ensure members are not food insecure (White House, 2023). Finally, as of summer 2024, Congress was contemplating an increase in junior enlisted pay to address recent recruiting challenges and concerns about food insecurity specifically among junior enlisted members.

Research on civilians indicates that compensation is related to food insecurity and, specifically, that those with higher income are less likely to be food insecure. But, as stated by Gunderson and Ziliak (2018) in their review of the literature:

> Households with lower incomes are consistently found to be more likely to be food insecure. The importance of current income, however, is diminished once assets are considered (e.g., lower financial management skills . . . and lower education levels), physical assets (e.g., renting rather than owning a home), and financial assets (e.g., limited savings, lack of access to credit . . . sharp changes in asset levels). (Gundersen and Ziliak, 2018, pp. 122–123)

In contrast to the civilian sector, the relationship between compensation and food insecurity in the military is not well understood. Tabulations from the 2018 and 2020 SOFS-A surveys indicate that members who experience greater financial difficulties are more likely to experience food insecurity, but the results described above suggest that the relationship between compensation and food insecurity could be more nuanced than only a lack of funds.

The 14th QRMC requested that RAND National Defense Research Institute (NDRI) provide analytic support for pursuing its charter of setting military compensation to ensure food security. This report summarizes the analysis. We sought to estimate the extent to which military compensation could explain food insecurity in the military relative to other factors. We examined how food insecure members differ from food secure members in the data in terms of levels of pay, holding constant such factors as family size, demographic characteristics, service, and deployment status. We also estimated the extent to which financial knowledge—as revealed by several financial literacy–related questions in SOFS-A data and variables that capture financial well-being and financial management skills—affect the estimated relationship between compensation and food insecurity.

To conduct these analyses, we linked SOFS-A data with the pay records of military personnel included in the survey, provided by the Defense Manpower Data Center (DMDC). We then estimated regressions of the association between military cash compensation, as measured by DMDC pay data, and the likelihood of food insecurity, as measured in SOFS-A, holding constant other variables drawn from either the DMDC or SOFS-A data. Cash compensation encompassed all elements of military compensation the member received in a month, including basic pay, allowances, and special and incentive pays, but does not include the tax advantage of receiving some of these elements tax-free.

We also estimated correlations between food insecurity and the degree of variability of monthly cash compensation, where variability captures fluctuations in monthly pay over the 24 months before the survey. These variations could be the result of changes in duty location, experience, assignments, or other factors that can affect the receipt of basic pay and elements of cash compensation, although we do not specifically know the circumstances that caused these elements to change. Importantly, with the data available to us, we were unable to investigate how delays in receipt of certain pays or errors in receipt of different pays would affect variability and food insecurity.

We also sought to better understand why military food insecurity rates in the survey data are higher than the rates for comparable civilians despite analyses that show that average military pay exceeds average civilian pay (Asch et al., 2023). Asch et al. (2023) estimated that the 2018 food insecurity rate for comparable civilians was 9 percent, which is almost one-third the food insecurity rate estimated by the 2018 SOFS-A (26 percent). We examined whether the differences in food insecurity rates were explained by demographic differences between military personnel and civilians, differences in how the surveys determine which respondents are asked the food insecurity questions, and differences in questions used to determine food insecurity. Finally, we examined how food insecure members respond to questions about their financial condition (because many of the questions to determine food insecurity involve having enough money to afford food) to see if those questions could provide insight into reasons for the disparity between military and civilian food insecurity rates.

The focus of our study was on the role of military compensation in explaining food insecurity, and we took the 2022 SOFS-A data used in our analysis as given. Our review of the SOFS-A data showed that the survey has low response rates and a long time lag between when members are sampled and when they fill out the survey, meaning that characteristics such as pay grade, which could be correlated with propensity to be food insecure, can change between sampling and response.[2] Similar to Asch et al. (2023), we found that large shares of food insecure members also reported having good financial circumstances, and it is unclear how both can be true. Consequently, an important caveat of our analysis is that it relies on survey data that are still being investigated for reliability and robustness in measuring food insecurity and financial circumstances in the overall active-duty population, and our results pertaining to food insecurity and financial circumstances should not necessarily be considered generalizable beyond the survey sample.[3] It is also important to note that our regression analysis is not a causal analysis and only shows associations between variables.

[2] We note that a systematic review of other surveys besides the SOFS-A and U.S. Census CPS that measure food insecurity was beyond the scope of this study. Other surveys may have similar issues to those identified for the SOFS-A.

[3] We discussed concerns about the generalizability of the responses to the SOFS-A food insecurity questions with the Office of People Analytics (OPA), the administrator of the SOFS-A survey. OPA recognized the issues raised and will investigate further, but, based on its statistical analysis completed so far, OPA does not agree with our assessment that the food insecurity results may not be generalizable to the overall active-duty population. Furthermore, the USDA questionnaire to assess food insecurity has been dropped from

Organization of This Report

Chapter 2 describes SOFS-A data and DMDC pay data, describes how we merged the two, and provides descriptive statistics of the merged data that underlie our analysis in Chapter 3. In Chapter 3, we describe our regression analysis correlating pay with food insecurity and present the regression results. In Chapter 4, we describe the results of our investigation of why military food insecurity rates might be higher than the rates for comparable civilians. We present our conclusions in Chapter 5.

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future SOFS-A surveys, and DoD is considering adding different questions to better capture the prevalence of food insecurity in the active-duty population.

CHAPTER 2

Overview of the Status of Forces Survey Data and DMDC Pay Data and Description of Analysis Sample

To conduct the analysis summarized in this report, we used data from three recent waves of SOFS-A: 2018, 2020, and 2022. To analyze the relationship between food insecurity and military compensation, we linked the survey data to administrative pay and personnel records from DMDC. In this chapter, we provide information on these two key data sources and provide descriptive statistics of the population used in the regression analysis discussed in Chapter 3.

Overview of SOFS-A

SOFS-A, which is administered by DoD's OPA, is intended to be a representative sample of active-duty personnel at a point in time. The survey includes survey weights that allow the analyst to weight the data to be representative of the active-duty force, including the U.S. Coast Guard. The data include rich information on many aspects of military life, including members' views on satisfaction with the military, retention expectations, stress, family life, and deployments. The survey also contains information about member demographics and their families. In several recent waves, SOFS-A collected information on food insecurity and use of food assistance. Since 2018, the survey has included the USDA's six-item short form for measuring food insecurity. We followed the USDA's proposed methodology for classifying members as food insecure based on responses to these six questions. (See Table A.1 for the questions and USDA [2012] and Asch et al. [2023] for more information on the six-item short form.) Although the six-item short form has been shown to be as effective for capturing food insecurity as the long form for nonmilitary populations (Blumberg et al., 1999; Gulliford, Mahabir, and Rocke, 2004; Sun et al., 2011; USDA, 2012), it is unclear whether these questions are effective at capturing food insecurity in military populations or whether they provide sufficient detail on how military members experience food insecurity to enable DoD policymakers to develop effective policies to mitigate it. More broadly, an expert panel convened by the Committee on National Statistics of the National Academies in 2006 found that the USDA's general methodology used to measure food insecurity was appropriate but noted that measuring hunger is a separate concept from food insecurity (USDA, 2023b).

SOFS-A also asks a series of questions designed to measure financial knowledge. Prior research shows that financial knowledge has an independent and significant correlation with food insecurity in the civilian sector, even after controlling for income and other demographics (Carman and Zamarro, 2016),[1] demonstrating the potential importance of accounting for financial knowledge. The questions on financial knowledge in SOFS-A cover topics related to saving and investment strategies, insurance, inflation, and retirement. Some of the questions in SOFS-A are related to aspects of financial knowledge unique to DoD, and others have been used in surveys to measure more general financial knowledge and literacy. In particular, SOFS-A includes three questions known as the *Big Three*, which are a common metric used to gauge the financial literacy of survey respondents (Lusardi and Mitchell, 2023). These three questions, which have been fielded in other such surveys as the Health and Retirement Study, National Financial Capability Study, and Survey of Consumer Finances, test people's knowledge of interest rates, inflation, and stock versus mutual fund investment (the full text of the questions is included in Table A.1). Although service members' answers to these questions do not necessarily reflect their actual financial behavior (e.g., how they spend and manage their money) or knowledge related to managing food insecurity, the questions are widely used and thus comparable with other surveys and populations. We used a summary measure indicating whether respondents answered all three of the Big Three correctly as our measure of financial knowledge in our analysis.

SOFS-A also includes a module called "financial well-being" that provides information on overall financial health, spending habits, strategies for managing finances, and use of resources to learn about financial management. The surveys also include five questions that are an abbreviated version of a Consumer Financial Protection Bureau (CFPB) scale designed to measure financial well-being (CFPB, 2017). The full text of the questions is included in Table A.1. It is important to note that financial well-being itself is likely related to compensation; external factors, such as inflation; as well as the types of behaviors in which the household engages to manage their spending and finances (e.g., saving, managing a household budget). As discussed below, we explored the interrelationships between compensation, financial well-being, and financial behaviors or management and ultimately opted to include the five questions from the well-being scale, as well as measures related to saving, in our analysis to measure financial well-being and management. It is difficult to distinguish between financial knowledge or skills and observed behaviors; behavior might reflect some degree of knowledge or skill. Thus, although we describe certain variables as behavioral or

[1] Carman and Zamarro (2016) used RAND American Life Panel survey data that were collected in 2014 that measured food security using the USDA's 18-question food security questionnaire, and financial knowledge was determined using ten questions that assess knowledge about inflation, interest rates, compound interest, returns versus risk, and diversification.

management variables that reflect how people manage their money, these variables can also reflect skill, knowledge, and external factors.

Response Rates and Sample Sizes

SOFS-A response rates were low in the 2018, 2020, and 2022 surveys, ranging from 10 percent to 13 percent (unweighted) as shown in Table 2.1.[2] The response rates were calculated using SOFS-A data, which contain all members who are sampled and receive the survey, and was equal to the count of survey respondents divided by the count of sampled members. Note that the SOFS-A sampled over 100,000 members each year for the survey. Response rates were lower among enlisted populations, especially junior enlisted personnel. Specifically, the response rates were only 4–5 percent for enlisted members in the E1 to E4 pay grades and 13–16 percent for enlisted members in the E5 to E9 pay grades. For officers in the O1 to O3 pay grades, the response rates ranged between 19 percent and 23 percent, and for officers in the O4 to O6 pay grades, the response rates were 34–38 percent. Response rates for warrant officers ranged from 21–27 percent.

SOFS-A samples members based on different stratum, and the sampling frame for SOFS-A is set months before the data are collected. For the 2022 SOFS-A, OPA used DMDC personnel records from September 2021 to construct the frame, but the survey was not sent into the field until July 2022. This lag can result in very few respondents being in certain pay grades at the time of data collection. Table 2.2 shows the unweighted counts of members in the sampling month and survey month by pay grade. The lag between sampling and survey months means that, due to promotions, there are few E1s and E2s in the final survey sample: only seven E1s

TABLE 2.1
SOFS-A 2018, 2020, and 2022 Response Rates, Overall and by Grade

Pay Grade	2018	2020	2022
E1 to E4	4%	4%	5%
E5 to E9	16%	13%	14%
O1 to O3	23%	19%	19%
O4 to O6	38%	34%	35%
W1 to W5	27%	21%	24%
Overall	13%	10%	11%

SOURCE: Produced using authors' tabulations of SOFS-A 2018, 2020, and 2022 data.

NOTE: Tabulations include members of the U.S. Coast Guard and are unweighted.

[2] These response rates do not match OPA's response rates, which were calculated using weight data but were also low.

TABLE 2.2
Sample Sizes in the 2022 SOFS-A in Sampling and Survey Months by Pay Grade

Pay Grade	Counts Based on Sampling Month (September 2021)	Counts Based on Survey Month (July 2022)
E1	131	7
E2	306	81
E3	1,117	926
E4	1,339	1,473
E5	1,177	1,266
E6	1,401	1,455
E7	1,005	1,073
E8	348	378
E9	196	217
O1	290	126
O2	423	381
O3	1,320	1,151
O4	1,111	1,022
O5	710	742
O6	309	323

SOURCE: Produced using authors' tabulations of SOFS-A 2022.

NOTE: Sampling month (September 2021) is the month that members were selected to be part of SOFS-A. These members filled out the survey in the survey month of July 2022. Tabulations include members of the U.S. Coast Guard and counts are unweighted.

and 81 E2s compared with 131 E1s and 306 E2s in the sampling month. Similarly, there were 290 O1s in the sampling month but only 126 O1s in the survey month.

Sampling weights are constructed using characteristics in the sampling month. Although weights are constructed by strata in which pay grades are grouped together (e.g., E1 to E4, E5 to E9, O1 to O3, O4 to O6), the groups containing junior grades (i.e., E1 to E4, O1 to O3) will be overrepresented by the higher grades in their groups because of the low response rates and lag between the survey and sampling months, which causes the composition of each survey strata in the survey month to be different from the composition in the sampling month. Further, members can "move" across strata (E4s can promote to E5s and O3s can promote to O4s) between when they are sampled and when they fill out the survey. Therefore, the lag between sampling and filling out the survey could lead to bias if the responses to the food insecurity questions are not representative of how these questions would be answered based on pay grade in the sampling month.[3] Because of the low response rates together with the lag between sampling and response, the results pertaining to food insecurity, the focus of our analysis, may not be generalizable to the active-duty population overall and we characterize our results as pertaining to respondents rather than to the overall active-duty military population.[4]

Matching SOFS-A Data to DMDC Administrative Pay and Personnel Records

To understand the relationship between military compensation and food insecurity, we linked SOFS-A data to administrative data from DMDC. Specifically, we used DMDC data from the Active Duty Master, Active Duty Pay, and Defense Enrollment Eligibility Reporting System records to obtain a 24-month history of military pay for each respondent and information on demographics, pay grade, service, and dependents, which we used to supplement the information provided in SOFS-A. With assistance from DMDC and OPA, we linked this administrative data to 2018, 2020, and 2022 SOFS-A data using a unique identifier for each respondent identification number.

The administrative records, in many cases, had monthly entries, allowing us to match information to the month in which the member responded to SOFS-A. These details provided the most accurate picture of compensation at the time the member was answering the questions related to food insecurity, which can be important if financial circumstances changed over time. Additionally, we supplemented demographic information in SOFS-A with demographic information in the administrative records at the time the data were collected.

[3] We discussed concerns about the generalizability of the responses to the SOFS-A food insecurity questions with OPA. To account for nonresponse bias, OPA used industry standard statistical methods to account for differences in observable characteristics between respondents and nonrespondents, which account for nonresponse bias attributable to the set of observable characteristics included in their weighting methodology and is one of the key methods used to address nonresponse bias stemming from low response rates in surveys. However, bias may still exist when there are observable characteristics correlated with responses to food insecurity questions that are excluded from OPA's weighting methodology or unobservable characteristics that are correlated with responses to the food insecurity questions. Moreover, to test for nonresponse bias stemming from the time lag would require a comparison of food insecurity rates by pay grade subgroups where food insecurity and pay grade are both measured at the time of sample creation (e.g., in September 2021 in the 2022 SOFS-A) and at the time of surveying (e.g., July 2022 in the 2022 SOFS-A). However, we recognize that responses to the food insecurity questions at the time of sampling in existing surveys are unknowable. Future surveys may want to consider including survey screener questions administered at the time of sample, if feasible, to better assess potential nonresponse bias with respect to food insecurity.

[4] OPA recognizes the issues we raised and will investigate further, but, based on its statistical analysis completed so far, OPA does not agree with our assessment that the food insecurity results may not be generalizable to the overall active-duty population. Furthermore, the USDA questionnaire to assess food insecurity has been dropped from future SOFS-A surveys, and DoD is considering adding different questions to better capture the prevalence of food insecurity in the active-duty population.

For characteristics that could change, we used DMDC records to obtain the most accurate measure of the status of these characteristics at the time the survey questions were answered. Specifically, we measured pay grade, marital status, number of dependents, and receipt of basic allowance for housing (BAH) and other pay components from DMDC records in our analysis. All other demographics were pulled from SOFS-A responses.

Overall match rates between DMDC records and SOFS-A were high. In each year, approximately 94 percent of SOFS-A respondents successfully matched to the administrative records. As shown in Table A.2 in the appendix, those who did not match to the administrative records tended to be older, were more likely to be officers, and were more likely to be in the U.S. Air Force. As we show below, these characteristics were all associated with a lower likelihood of being food insecure. Although we could not include unmatched records in our analysis on compensation, we found that food insecurity rates were similar in the matched and unmatched samples (41 percent versus 40 percent).

As noted above, there is a large lag between when respondents are sampled and when they are surveyed. As a result, some characteristics of the population changed in the intervening months. For example, members might have been promoted or changed grades, moved, made changes to marital status and dependents, and or even exited the military. We examined the administrative records to determine whether respondents were still serving in active duty at the time they completed the survey. By examining pay records and status fields in the administrative records, we determined that approximately 2 percent of survey respondents were no longer on active duty. There were few significant differences in the characteristics of respondents who left active duty, although they were, again, more likely to be Air Force and, in 2022, they were slightly older (see Table A.3 in the appendix).

Together, we excluded approximately 8 percent of SOFS-A respondents from the main analysis on compensation, either because the respondents did not have a corresponding match in the pay files or because they were determined to be no longer on active duty. Table 2.3 shows the original SOFS-A respondent sample that was eligible and completed the survey and the number excluded for each of these steps. In total, we obtained an analysis sample size of 14,127 in the 2018 SOFS-A, 11,688 in the 2020 SOFS-A, and 10,568 in the 2022 SOFS-A.

TABLE 2.3
Analysis Sample Sizes in SOFS-A

Description	2018	2020	2022
Original eligible SOFS-A respondent sample	15,423	12,720	11,483
Did not match to DMDC records	854	776	635
Determined not to be active duty at the time of the survey	262	276	280
Final analysis sample (merged DMDC and SOFS-A data)	14,127	11,668	10,568

SOURCES: Produced using SOFS-A 2018, 2020, and 2022 data.

NOTE: Over 100,000 members were originally sampled for the SOFS-A. The statistics in Table 2.3 are limited to the subset of respondents to the survey.

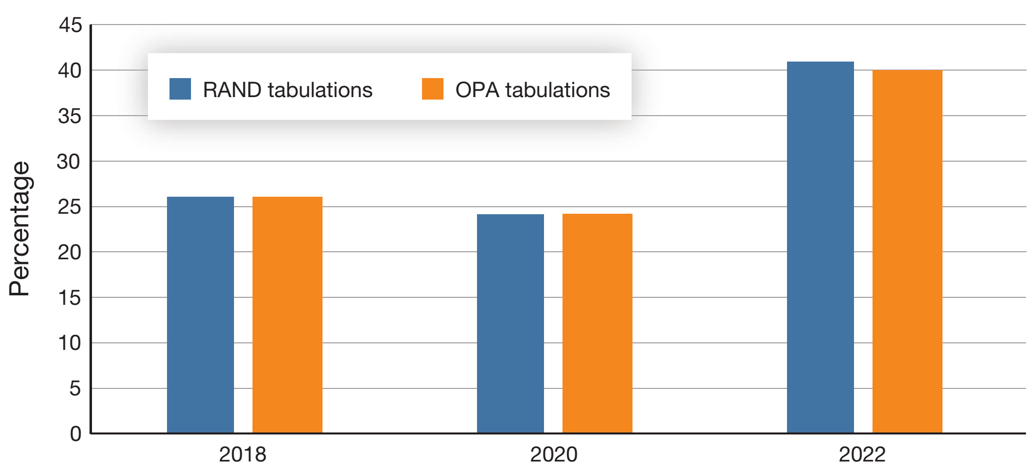
Descriptive Statistics of Analysis Sample

We next describe food insecurity rates in key subgroups of the merged DMDC and SOFS-A analysis sample data. We present statistics from the 2022 SOFS-A final analysis sample shown in Table 2.3, which we used in our primary analyses discussed in Chapter 3.

Overall Food Insecurity Rates in SOFS-A

Figure 2.1 shows estimates of the overall food insecurity rate in SOFS-A data from 2018, 2020, and 2022, using the survey weights so the sample is representative of the active force. To ensure our use of SOFS-A data and our weighting methods were consistent with OPA, the organization that administers the survey, we compared estimated food insecurity rates that we computed with those available from OPA. Because all the subsequent analysis in this report will include members of the U.S. Coast Guard and be restricted to the matched sample as discussed above, we compared our tabulations of the food insecurity rate with published estimates provided by OPA, which does not include the Coast Guard in their analysis and, of course, is not matched to pay records. Despite this difference in the sample, we obtained identical food insecurity rates in 2018 (26 percent) and 2020 (24 percent). In 2022, our estimate including the Coast Guard is one percentage point higher (41 percent) than OPA's estimate

FIGURE 2.1
Comparison of Food Insecurity Rates, OPA Versus RAND Tabulations



SOURCES: Produced using SOFS-A 2018, 2020, and 2022 data matched to DMDC pay records.
NOTE: Tabulations included members of the U.S. Coast Guard and used survey weights. Sample sizes from the three years were 14,127 (2018), 11,688 (2020), and 10,568 (2022).

(40 percent).[5] The near identical rates provide confidence that the merged data are consistent with the overall survey.

It is unclear why the SOFS-A food insecurity rate increased from 24 percent to 40 percent between 2020 and 2022, which is equivalent to a 60-percent increase. The food insecurity rate for U.S. households also increased during this period from 10.5 percent (Coleman-Jensen et al., 2021) to 12.8 percent (USDA, 2023a), which is a 20-percent increase. This is a sizeable increase but not as large as the 60-percent increase in the SOFS-A estimate of the military food insecurity rate. Because both rates increased during this period, this could suggest that national factors, such as high inflation, could be explaining part of the increase in the SOFS-A estimated military food insecurity rate, but we cannot explain why the SOFS-A increased so much more than the rate for U.S. households overall.

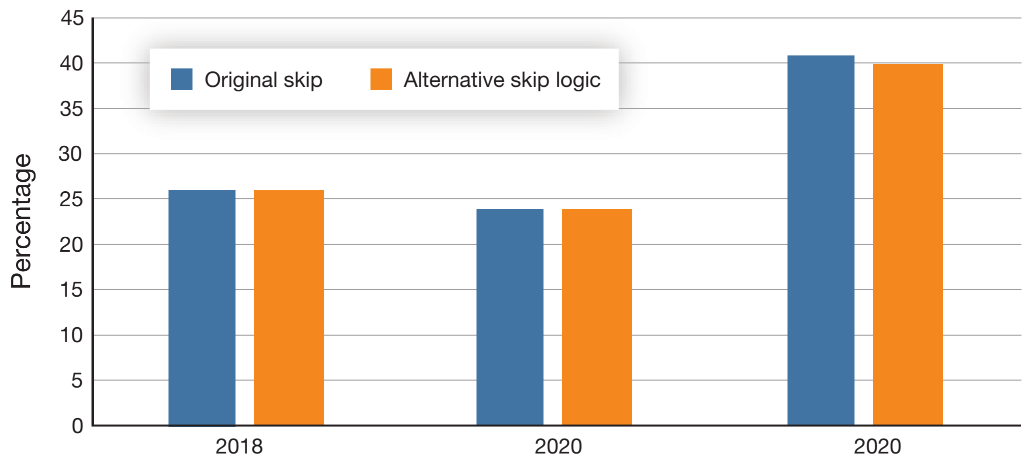
As discussed earlier, SOFS-A includes the USDA's six-item short form. USDA guidance indicates that there is an optional method that could be applied to minimize response burden. If respondents answer "never" to the first two questions and "no" to the third question in the short form, then they could be classified as food secure and not asked the subsequent three questions in the short form (USDA, 2012). Although SOFS-A did not apply this optional method, we generated an alternate measure of food insecurity applying this screener to simulate how the food insecurity rate would change if this screener were applied. Examining responses to each of the six questions, we reclassified all respondents as food secure if their responses met the criteria to be screened out.

Figure 2.2 compares the results from the original food insecurity measure with the alternative measure applying this skip logic. In practice, the skip logic does not meaningfully change the food insecurity rates. We found that the rates from the two measures are identical in 2018 and 2020, and the skip logic only reduces the food insecurity rate by one percentage point in 2022. In practice, this result means that the majority of members who are food insecure are answering "yes" to at least one of the first three questions, meaning they would not be screened out by this skip logic. Table A.4 in the appendix shows the share of members who responded affirmatively to each of the six food insecurity questions.

Together, these tables demonstrate that the base measure of food insecurity used in this report is consistent with other external estimates of the food insecurity rate using SOFS-A and is not sensitive to alternative screening methods. That said, we do not know why the rates of food insecurity are so high over the three surveys or why the rate increased so dramatically in the 2022 survey. Although high food insecurity rates, especially ones that are so much higher than the rates for similar civilians, could result in major retention problems in the military as people exit to escape the conditions that lead to such high rates of food insecurity, overall retention is strong across the services. One possible explanation is that the low response rates in the surveys, as shown in Table 2.1, could mean that the food insecurity rates

[5] See OPA (2020) for published statistics on food insecurity. In addition to matching the overall food insecurity rates, we were able to match food insecurity rates for subgroups (e.g., by grade, service, and family structure) shown in other OPA reports and briefings.

FIGURE 2.2
Food Insecurity Rates with Alternative Skip Logic



SOURCES: Produced using SOFS-A 2018, 2020, and 2022 data matched to DMDC pay records.
NOTE: Tabulations included members of the Coast Guard and used survey weights. Original skip logic flags someone as food insecure if they responded affirmatively to at least two out of the six questions. The alternative skip logic used the USDA logic that skips the last three questions if the respondent answered negatively to the first three questions. Our sample sizes from the three years are 14,127 (2018), 11,688 (2020), and 10,568 (2022).

in the surveys are not generalizable to the overall population. Another possibility is that the six-question food insecurity questionnaire is not well suited for measuring food insecurity in the military.

In our analysis below and in Chapters 3 and 4, we take SOFS-A data as given and we do not further investigate these findings regarding the rates of food insecurity. Consequently, an important caveat to the analysis is that it might not be generalizable to the overall military population. We describe our food insecurity results as pertaining to the survey respondents and not necessarily to the military in general.

Food Insecurity Rates for Key Subgroups of Respondents

We next provide more details on food insecurity rates for specific groups within the 2022 survey. Figure 2.3 shows that food insecurity rates are significantly higher among junior members in the survey: 50 percent of respondents in grades E1-E4 were classified as food insecure, compared with 42 percent among those in grades E5-E9, 27 percent among warrant officers, 13 percent among junior officers (O1–O3), and 7 percent among senior officers O4–O6.

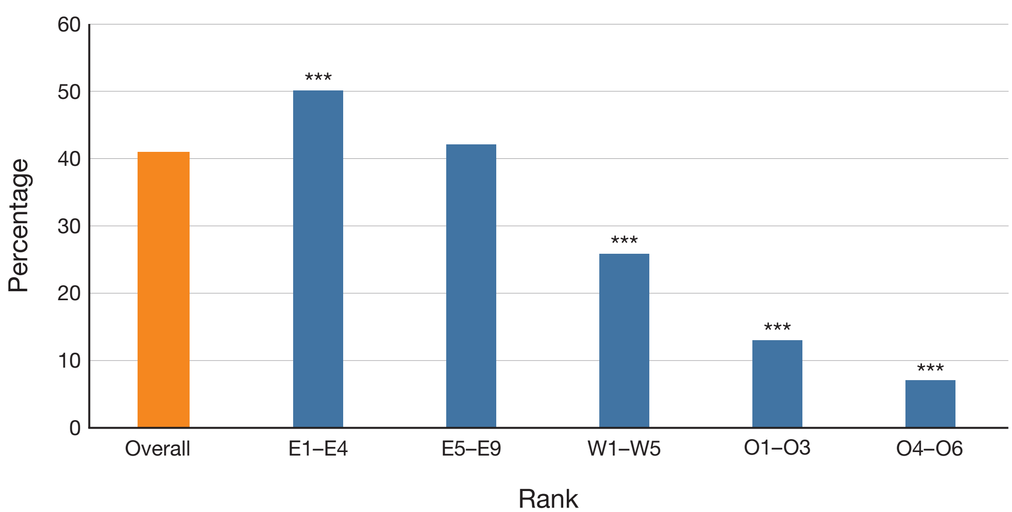
Table 2.4 shows food insecurity rates for other subgroups that exceeded the average level in the overall population in 2022. In addition to junior enlisted members, respondents with an unemployed spouse or spouse not in the labor force, those who identify as a racial minority, and members with dependents under age six had food insecurity rates that were statistically significantly higher than the overall sample rate. By contrast, respondents with a working spouse had significantly lower food insecurity rates than the rate in the overall sample. Food insecurity rates among all married (i.e., regardless of whether the spouse is working) and all single respondents match the overall sample average of 41 percent.

Financial Knowledge, Management and Well-Being Among Respondents

Figure 2.4 shows responses to the CFPB financial well-being questions by food security status. Questions are coded to reflect that the respondent "agreed" or "strongly agreed" with the question posed. Feelings of financial stress are more likely among respondents who were classified as food insecure. We found that 82 percent of food insecure respondents agreed or strongly agreed that they were "just getting by financially" compared with 42 percent of respondents who were food secure. Similarly, 83 percent of respondents who were food insecure agreed or strongly agreed with the statement that they were concerned their money would not last, compared with 45 percent of respondents who are food secure. Seventy-three percent of food insecure respondents agreed or strongly agreed that they felt they would never have the things they want in life because of their money situation, and 78 percent agreed or strongly agreed that finances control their lives. By contrast 33 percent and 43 percent of food secure respondents agreed or strongly agreed with these two respective questions.

FIGURE 2.3

Food Insecurity Rates by Pay Grade, Analysis Sample 2022



SOURCES: Produced using SOFS-A 2022 data matched to DMDC pay records.

NOTE: Tabulations included members of the Coast Guard and used survey weights. *N* = 10,568. *** denotes that the food insecurity rate was significantly different from the overall average at the 1-percent level.

TABLE 2.4

Food Insecurity Rates Among Demographic Subgroups, 2022

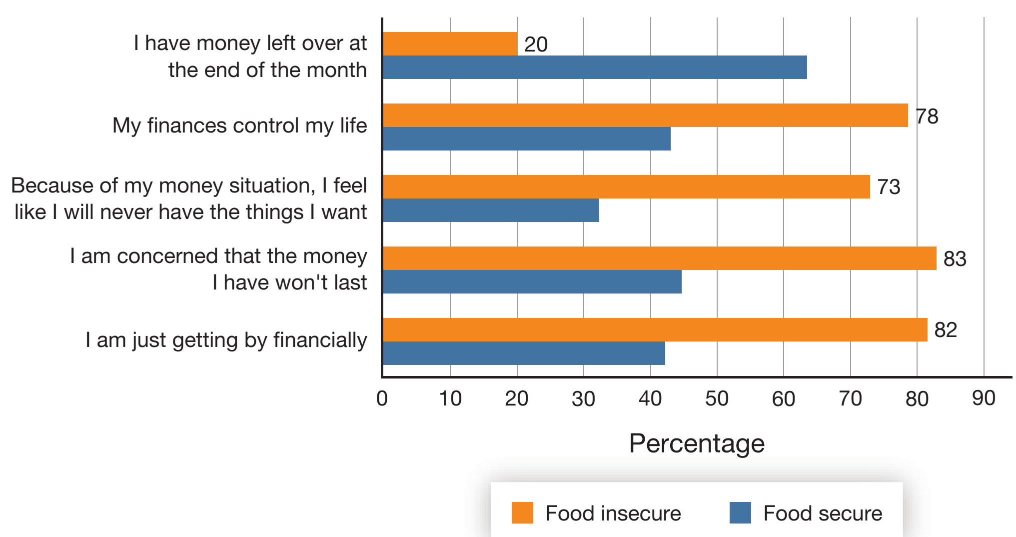
Description	Food Insecurity Rate	Unweighted Sample Size of Subgroup
American Indian/Alaska Native	55%	405
E1 to E4	50%	2,767
Spouse is unemployed	48%	420
Native Hawaiian or Pacific Islander	46%	181
Has dependents aged 0–5	46%	1,804
Asian	45%	890
Spouse is not in the labor force	45%	2,435
Black	45%	1,423
Spouse is working	37%	3,192

SOURCES: Produced using SOFS-A 2022 data matched to DMDC pay records.

NOTE: Tabulations included members of the Coast Guard and used survey weights. All differences between food insecurity rates and overall sample were significantly different from the overall average at the 1-percent level. *N* = 10,568.

FIGURE 2.4

Percent Respondents Agreeing or Strongly Agreeing on CFPB Financial Well-Being Measures by Food Insecurity Status, 2022



SOURCES: Produced using SOFS-A 2022 data matched to DMDC pay records.

NOTE: Tabulations included members of the Coast Guard and used survey weights. *N* = 10,568. Figure 2.4 shows the percentage of members who agreed or strongly agreed with the statement.

Finally, 20 percent of food insecure members reported having money left over at the end of the month, compared with 63 percent of food secure members.

In addition to these measures of financial well-being, respondents who were classified as food insecure also had lower levels of financial knowledge as measured by the financial literacy quiz included in SOFS-A. We found that 37 percent of food insecure respondents answered the Big Three questions correctly, compared with 48 percent of food secure respondents. The three questions quiz respondents on knowledge of interest rates, inflation, and stock investment strategies—questions that may or may not be immediately relevant to managing budgets or making financial decisions related to household purchases.

Other questions on the survey provide additional information on financial management. For example, we found that 62 percent of food insecure respondents reported being able to save each month, compared with 91 percent of respondents who were classified as food secure.[6] High shares of both groups reported having emergency savings; 80 percent of food insecure respondents reported that they have some emergency savings compared with 93 percent of food secure respondents.

Other questions on the survey reflect recent changes in respondents' financial circumstances. We found that 53 percent of food insecure respondents reported that their financial position was worse than it was 12 months ago, compared with 25 percent of food secure members. On the other hand, 20 percent of food insecure respondents reported their overall financial position had improved over the past 12 months, compared with 34 percent of food secure respondents.

We also explored the relationship between the CFPB financial well-being score, compensation, and several of the other questions in SOFS-A that could capture respondents' behaviors in managing their finances. The direction of the relationship between financial well-being and financial behaviors is unclear; behaviors could change well-being, but behavior could also be a response to overall well-being. Furthermore, some activities, such as saving, could reflect both behavior and a level of compensation (i.e., someone cannot save if they do not have any income).

Table 2.5 explores these relationships in a regression model. We regressed the composite CFPB score on measures of income (including household income, spousal income as a share of household income, and total compensation) and respondent demographics. Then, we subsequently added additional variables related to financial behaviors. The results show some interesting patterns. First, all measures of income are positively related to overall financial well-being, as expected. Second, when we added measures of savings and support for family

[6] The CFPB question asking about whether respondents agree that they have money left over at the end of the month might seem similar to the question about saving each month, but these measures are separate survey questions and respondents could have interpreted them differently (e.g., perhaps some share of respondents thought about money left over after saving a certain amount). Other differences in wording could play a role: For example, the response options to the question about having money left over at the end of the month are a Likert scale (always, sometimes, rarely, never), while the question about being able to save each month asks respondents to best describe their saving habits.

TABLE 2.5

Relationship Between Financial Well-Being, Income, Compensation, and Financial Behaviors

Characteristic	Regression Model 1	Regression Model 2	Regression Model 3	Regression Model 4
2021 Household income > $75k	5.470***	3.432***	3.359***	4.897***
	(0.668)	(0.379)	(0.425)	(0.654)
Spouse income >=50% of household income	2.857***	1.451***	1.525***	2.849***
	(0.480)	(0.412)	(0.397)	(0.458)
Total monthly compensation (log)	3.317***	1.080	0.784	2.764***
	(0.966)	(0.798)	(0.623)	(0.755)
Able to save something each month		9.379***	8.986***	
		(0.480)	(0.421)	
Has emergency savings fund		3.006***	3.070***	
		(0.495)	(0.477)	
Borrowed money from family or friends to pay bills		-5.821***	-4.782***	
		(0.360)	(0.345)	
Provided support to family outside of the household		-1.386***	-1.000***	
		(0.268)	(0.255)	
Did not need to withdraw savings/ stimulus to support spending		8.522***	8.201***	
		(0.418)	(0.470)	
Follow monthly budget			-1.657***	-1.416**
			(0.407)	(0.574)
Monitor credit score			-0.488	-1.021*
			(0.469)	(0.525)
Seek financial advice from military financial training			0.598	0.748*
			(0.377)	(0.424)
Seek financial advice from military financial counseling			-0.628*	-1.334***
			(0.378)	(0.420)
Seek financial advice from unit leadership			-0.286	-0.0756

Characteristic	Regression Model 1	Regression Model 2	Regression Model 3	Regression Model 4
			(0.288)	(0.258)
Seek financial advice from military aid society			-0.350	-0.815
			(0.442)	(0.530)
Seek financial advice from on-base financial institution			-0.197	-0.436
			(0.363)	(0.346)
Seek financial advice from online military resource			0.417	1.059*
			(0.505)	(0.600)
Seek financial advice from off-base financial institution			0.0217	-0.0885
			(0.306)	(0.249)
Seek financial advice from professional financial counselor			0.127	0.218
			(0.536)	(0.573)
Seek financial advice from family/friends/peers			0.475	0.172
			(0.374)	(0.359)
Seek financial advice from online non-military resources			-0.423	-0.689*
			(0.365)	(0.381)
Use overdraft loan/line of credit			-1.569***	-4.301***
			(0.346)	(0.499)
Use overdraft protection			-2.018***	-6.882***
			(0.386)	(0.649)
Use cash advance on credit card			-3.045**	-6.921***
			(1.245)	(1.561)

SOURCES: Produced using SOFS-A 2022 data matched to DMDC pay records.

NOTE: This table shows results from four separate regressions where the dependent variable was the CFPB financial well-being composite score, which ranges from 0–100. Each column is a separate regression model. All regression additionally controlled for respondent demographics: service, gender, race and ethnicity, enlisted status, marital status, dependents, receipt of BAH, deployment status, and recent permanent change of station (PCS) moves. *N* = 9,348. *** denotes that result is statistically significant at the 1-percent level.

members outside the household, the relationships between income and financial well-being are mitigated (i.e., smaller), and the relationship between compensation and well-being is no longer statistically significant. This finding indicates that savings and compensation are related. Having savings is positively related to financial well-being, while both borrowing money from family and providing support to family outside the household are negatively correlated with financial well-being.

These relationships remained relatively constant when we added additional financial behavior or management variables, such as following a monthly budget; monitoring credit scores; using overdraft loans; and indicators for whether members sought financial advice from a variety of sources, such as military financial training, counseling, or unit leadership. Some of these measures—such as monitoring a credit score or following a monthly budget—have a negative correlation with financial well-being, suggesting that members might be engaging in these activities when they are less satisfied with their financial situation.

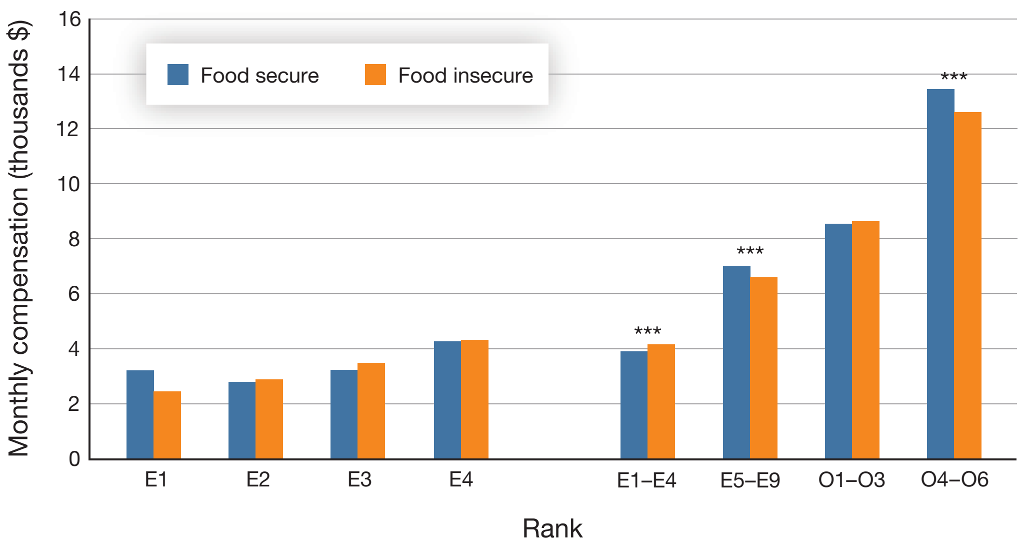
The regression results show that financial well-being is related to overall income levels, financial behaviors, and other factors but does not allow us to disentangle how respondents understand these questions when responding. These complex interrelationships led us to include only a parsimonious set of financial measures in the main analysis: the five financial well-being questions and select measures of saving and providing support to family members.

Cash Compensation and Household Income

Finally, we compared monthly cash compensation and household income by food insecurity status in the 2022 analysis file. Information on cash compensation came from DMDC pay files, and SOFS-A data resulted from a question about household income. Figure 2.5 shows that average total monthly cash compensation between members who are food secure and insecure is similar within the junior grades of E1 to E4. Monthly compensation is the sum of basic pay, allowances, and any special and incentive pays received in that month. We found that average total monthly compensation is higher among food secure E5 to E9s and food secure O4 to O6s compared with members in the same grades who are food insecure, although the magnitude of the difference is small (roughly 6–7 percent of monthly compensation). Additional analysis found that compensation is similar between food insecure and food secure members in the same grades even after controlling for whether members have dependents.

Our definition of *monthly cash compensation* summed the elements of compensation that the member received in the survey month. If a member did not receive a certain element that month, it is excluded. Some members receive in-kind compensation rather than cash. For example, members in government-provided (on-post or on-ship) housing do not receive BAH, and members who receive food in-kind (such as recruits in bootcamp) do not receive the basic allowance for subsistence (BAS). An alternative definition of cash compensation to the one we used would put those who receive in-kind housing and food on an equal footing as those who receive BAH and BAS and impute the value of housing and food equal to the BAH or BAS rates that they would have received had they not received the in-kind benefits.

FIGURE 2.5
Average Monthly Cash Compensation Between Food Insecure and Food Secure Members, by Grade 2022



SOURCE: Produced using SOFS-A 2022 data matched to DMDC pay records.
NOTE: Tabulations included members of the Coast Guard and used survey weights. *N* = 10,568. *** denotes that food insecurity rate is significantly different from the overall average at the 1-percent level.

We opted to not take this approach for two reasons. First, the 2022 SOFS-A data (not shown) indicate that virtually all respondents received BAS. Consequently, imputing BAS would make little difference. Second, analysis in Asch et al. (2023) showed that receipt of BAH was less a predictor of food insecurity than whether those who received BAH lived on- or off-post. Specifically, the analysis shows that those who lived on-post and did not receive BAH in the 2018 SOFS-A had about the same food insecurity rate as those who lived off-post and received BAH. However, those who lived on-post and received BAH, because they lived in privatized housing on-base, had a higher rate of food insecurity than either those who lived off-post or those who lived on-post and did not receive BAH. Although our regression analysis in Chapter 3 does not include whether a respondent lived on- or off-post, we included factors that the earlier study found were correlated with living on- or off-post and receiving BAH, including service branch, dependents status, and deployment status.

We also examined the relationship between total annual household income and food insecurity where household income was pulled from SOFS-A data rather than DMDC data. We found a negative relationship between household income and food insecurity, as is reflected in the rates by pay grade shown in Figure 2.5 (see Figure A.2 in the appendix). In our analysis of the relationship between compensation and food insecurity, we did not rely on the SOFS-A measure of household income in the main analysis for several reasons. First, the question asks members to recall their total household income from the prior calendar year (2021), which does not align exactly with the food insecurity questions that ask about the past 12 months. Second, recall bias has been shown to lead survey respondents to misreport and often underreport their income (e.g., Bound and Mathiowetz, 2001; Kapetyn and Ypma, 2007; Meyer, Mok, and Sullivan, 2015). Although it is true that administrative pay records do not provide information about other income sources, the objective of this project was to examine the relationship between military pay and food insecurity. Thus, the administrative pay files provide more accurate measures of military pay that do not suffer from misreporting and directly address the purpose of this report.

Discussion

This report discusses the results of an analysis that used SOFS-A to explore the relationship between pay and food insecurity. We show that the response rates to this survey are low in recent waves; overall response rates range from 10 to 13 percent. Response rates are even lower among junior enlisted (4 to 5 percent). Moreover, the large lag between when members are sampled and surveyed results in fewer respondents in certain pay grades when data are collected than when the population is sampled, which means that these small samples are representing much larger populations, particularly among the most junior enlisted and officer pay grades.

SOFS-A data linked to DMDC records provides a rich picture of service members' characteristics, allowing us to identify patterns among characteristics, compensation, and food insecurity. However, because of low response rates and other puzzling findings, the results might not generalize to the whole military population. The data indicate a significant increase in overall food insecurity rates over time, increasing from 24 percent in 2018 to 41 percent by 2022, for unknown reasons. Although the increase in food insecurity is reflected across the entire population in 2022, food insecurity rates are particularly high among junior enlisted respondents, those with spouses unemployed or out of the labor force, those with young dependents, and some racial and ethnic minority groups. Respondents who are food insecure are also less likely to have high levels of financial well-being and have lower levels of baseline financial knowledge. However, total compensation levels are similar between respondents who are food secure and food insecure within the same grade. The data do suggest a pattern between compensation and food insecurity across pay grades: More-senior respondents have both higher pay and lower rates of food insecurity. That being said, many other factors might be related to both seniority and pay in ways that could also contribute to food insecurity. We examine these multivariate factors in the regression analysis in Chapter 3.

CHAPTER 3

Analysis of the Relationship Between Food Insecurity and Military Cash Compensation

In the previous chapter, we showed that the levels of military cash compensation are similar between respondents in the 2022 survey who are food secure and food insecure in the same grade (Figure 2.5). When comparing across grades, however, more-senior respondents are less likely to be food insecure (Figure 2.3). Many other characteristics vary across these groups and could also be correlated with compensation, food insecurity, or both. To investigate how the relationship between food insecurity and military pay changes once we control for other related factors, we estimated a multivariate regression model. This chapter describes the methodology and results of that analysis. We reiterate the caveats to the analysis stated in Chapters 1 and 2. Because of the low response rate; the high reported food insecurity rates in the 2018, 2020, and 2022 surveys; and the dramatic increase in food insecurity rates in the 2022 survey, our results might not generalize to the entire military population or across survey waves. Furthermore, our results are not causal but show associations between pay and food insecurity.

Methodology

We estimated a linear probability regression model of the relationship between food insecurity and military compensation using the merged analysis file described in Chapter 2. The dependent variable in the regression model was an indicator for whether the member was considered food insecure, using SOFS-A responses. We included two compensation-related variables as independent variables in the regression. The first was the current level of monthly military cash compensation in the month the member completed the survey, where cash compensation is the sum of basic pay, allowances, and special pays paid in each month. So that the results could be interpreted in terms of percentage changes, the regression used the logarithm of monthly cash compensation. The second was a measure of the extent of variability in monthly compensation over the 24 months prior to when the member responded to the survey. We describe this variability measure in detail below and why we included it.

The model also included other covariates that might also be associated with both military pay and food insecurity. We included a series of demographic characteristics, such as gender, race and ethnicity, marital status, number of dependents, and education level (having a bachelor's degree or higher). We also included service characteristics, such as branch of service, deployment status (whether currently deployed or deployed in the past 24 months), and indicators for being in enlisted ranks and living in an area with a high cost of living.[1] We also controlled for use of food assistance.[2]

In addition, the regression model included a series of covariates intended to capture various aspects of financial knowledge, management, and well-being. We included a summary measure of financial knowledge, which was an indicator for whether respondents answered the Big Three financial knowledge questions in SOFS-A correctly, and included responses to the abbreviated five-question version of the CFPB Financial Well-Being Scale to measure financial well-being. (See Chapter 2 for more details on the financial knowledge and financial well-being questions.) We included additional measures related to financial management, including indicators for whether the respondent has emergency savings, whether they save regularly, and whether they provide financial assistance to family members outside of the household. When analyzing 2022 survey data we also included a measure for the number of meals eaten in dining facilities each week.[3] Finally, we included indicators for two-digit DoD duty occupations. Because there is little variation in compensation within pay grade, we did not control for individual pay grade in the model.

We conducted our analysis with the 2022 merged analysis file to focus on the most recent period. As a robustness check to assess whether we found a similar pattern of results in the previous surveys, we also conducted supplementary analysis with the 2018 and 2020 data. We refer to the 2022 analysis as our primary or main analysis. For consistency, we only included respondents who had at least 24 months of service at the time the survey was fielded in the analysis. This allowed us to measure variability over a consistent period for all respondents in the analysis. In practice, this restriction excluded approximately 6 percent of matched respondents from the 2022 survey.[4] We also ran the analyses for subgroups by grade (E1 to E4, E5 to E9, O1 to O3, O4 to O6) and repeated these analyses in the 2018 and 2020 SOFS-A surveys for comparison.

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[1] We defined *high cost of living areas* using data from the Department of Housing and Urban Development on small area fair market rents (Office of Policy Development and Research, undated). We linked this data to DMDC records based on unit location zip code and classified zip codes as being in high cost of living areas if the small area fair market rent for a two-bedroom apartment was above the national median.

[2] We interpreted the coefficients on the food assistance variables with caution given the possibility of reverse causality (i.e., someone who is food insecure might be more likely to use food assistance). These models are not intended to be casual, and we were primarily interested in whether controlling for use of food assistance moderates the relationship between pay and food insecurity. Given that the coefficients in Table 3.3 change very little when adding food assistance variables to the model, there also did not appear to be a meaningful association between food assistance and compensation despite compensation being an eligibility criteria for some assistance programs (likely because participation in food assistance programs among service members is quite low [Asch et al. 2023]).

[3] The 2018 and 2020 surveys did not ask about use of the dining facilities.

[4] The 24-month restriction excludes a higher share of E1 to E4s (25 percent) and O1 to O3s (9 percent).

Measuring Variability

One hypothesized underlying cause of food insecurity in the military is that the nature of military service introduces volatility in earnings beyond what civilians experience (Asch et al., 2023). Military personnel are required to move locations and assignments every few years, and such moves can result in changes in BAH, eligibility for and amount of cost-of-living allowance, eligibility for certain special pays if duties change, out-of-pocket child care expenses, and spouse employment and earnings. Furthermore, these moves can involve out-of-pocket moving costs or there could be delays in receipt of pays. It is possible that not all variability in military compensation will necessarily adversely affect the welfare of service members. Some changes in military compensation are, by design, intended to smooth service members' consumption and welfare across changes in their circumstances that occur because of their military service. For example, when members are required to move to new locations, their BAH (or, if they are overseas, their overseas housing allowance) is adjusted to reflect the change in housing costs. These changes could increase volatility, but member welfare will be improved or unchanged if these changes enable members to pay for expenses that change frequently. On the other hand, even when variability is intended to match the needs of changing circumstances, it might create uncertainty and hinder planning, thereby hurting welfare.

Research on the civilian population shows that earnings instability is associated with greater hardship (especially for lower income people), including worse educational and behavioral outcomes for children, worse child health, food insecurity, inability to pay gas or electricity bills, inability to pay rent or mortgage payments, and inability to see a doctor or dentist when needed (Morrissey et al., 2020; Wolf and Morrissey, 2017). Interestingly, the research shows that volatility that increases income or decreases income is associated with higher rates of food insecurity, suggesting that the uncertainty in compensation, regardless of whether it is an increase or decrease, is a factor in explaining food insecurity (Wolf and Morrissey, 2017). In contrast to the civilian labor market, no previous study has examined how volatility in military pay might be related to food insecurity in the military, although Asch and Totten (forthcoming) analyzes earnings volatility in the Army. We included volatility to investigate if a higher rate of food insecurity is correlated with earnings volatility.

We constructed a measure of variability in pay intended to capture fluctuations in monthly income. Some aspects of pay, such as pay increases over time due to promotions, are relatively gradual and expected. Others, such as a change in the value of an allowance or receipt of a one-time bonus, result in larger changes in income from month to month in ways that might not entirely be expected. We used a method to measure variability that is intended to capture fluctuations in pay due to the latter type of change. This method has been used to measure variability in other civilian and military settings (Laitner, 2019; Asch and Totten, forthcoming). Conceptually, this method divides income into a permanent component, a component that trends over time, and a transitory component in which the measure focuses on transitory rather than trends over time or the permanent component.

In addition to real changes in basic pay, allowances, or bonuses, variability could also result from administrative delays or errors in receiving these pays that could result in more hardship for members, but identifying these errors in the DMDC pay records was beyond the scope of our study. As a result, the variability measure captured in this report could reflect both actual changes in pays and errors or delays in receiving pay. We estimated a regression model that allowed us to isolate the transitory component, which we used as our measure of variability.

Technically, we took the pay records of all respondents in our data and estimated a regression of the logarithm of monthly pay on a monthly time trend and an individual fixed effect. The monthly time trend captured the gradual, expected changes in pay over time, and the fixed effect enabled us to examine this variation in pay within each individual over the 24 months of pay history. Any within-person variation in pay that was not accounted for in the time trend was included in the residual. We measured variability as the standard deviation of this residual for each respondent in the survey. Roughly speaking, this variability measure reflected how consistent the transitory component of pay was over time, with higher values indicating larger swings in the transitory component of income. It was interpreted as the percentage change in compensation relative to average earnings during the 24-month window. If a respondent's variability measure was 12 percent, that meant that monthly income deviated (higher or lower) from their average monthly compensation by 12 percent.

Table 3.1 shows the distribution of variability across respondents in our 2022 sample. Overall, mean variability is 12.6 percent, and the interquartile range is 4.5–17.5 percent. Variability is higher for junior members (a mean of 16.3 percent for E1 to E4) and falls for more-senior respondents (a mean of 8.6 percent for O4 to O6). For example, average total monthly compensation in the analysis sample is approximately $7,900, so a 12.6-percent swing (up or down) in monthly income would correspond to $995. Average total monthly compensation for E1 to E4 is approximately $3,900, so a 16.3-percent swing would correspond to $635.

As supplementary analysis, we also more formally explored what factors were associated with greater or lesser variability across respondents using regression analysis, shown in the appendix. As Table A.5 in the appendix shows, variability is positively correlated with receiving special pays and bonuses and negatively correlated with total monthly income. That is, those who are paid more experience less volatility. This negative correlation is consistent with the lower variability for higher grades shown in Table 3.1. We also found a positive correlation between variability and having experienced a PCS move in the past 12 months and between

TABLE 3.1
Distribution of Pay Variability

Statistic	Entire Population	E1 to E4	E5 to E9	O1 to O3	O4 to O6
Mean	0.127	0.163	0.114	0.102	0.086
p25	0.045	0.064	0.043	0.040	0.031
p50	0.084	0.132	0.076	0.069	0.044
p75	0.175	0.239	0.150	0.112	0.082

SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: Calculations included members of the Coast Guard and used survey weights. *N* = 10,568.

variability and being married. Thus, as expected, moving creates more variability in pay for respondents. Somewhat surprisingly, the model showed a negative correlation between variability and the number of dependents. Being in the Army is associated with higher rates of variability, while being in the Coast Guard is associated with lower rates of variability.

Main Results

Table 3.2 presents summary statistics for all the variables included in the regression model and indicates the data source (DMDC or SOFS-A) for each variable. Column 2 shows means for the overall SOFS-A sample, while columns 3 and 4 show the means for the subgroups who are food insecure and food secure, respectively. Column 5 shows *p*-values from *t*-tests comparing whether the differences in means between 3 and 4 are statistically significant.

The summary statistics for the 2022 analysis sample (which includes both officer and enlisted personnel in all grades) show that average pay is lower and pay variability is higher among respondents who are food insecure, although it is important to recall that these tabulations do not control for any other characteristics. Consistent with the patterns shown in

TABLE 3.2
Summary Statistics for Variables Included in the Regression Model

Characteristic	Overall	Food Insecure	Food Secure	*P*-value
Demographic Characteristic				
Food insecurity	0.40	1.00	—	—
Total monthly compensation (log) (DMDC)	8.68	8.57	8.76	0.00
Total monthly compensation (DMDC)	$6,515	$5,673	$7,076	0.00
Pay variability (log) (DMDC)	0.13	0.14	0.12	0.00
Female	0.17	0.17	0.17	0.50
Black	0.19	0.21	0.18	0.02
Asian	0.09	0.10	0.08	0.01
American Indian/Alaska Native	0.05	0.07	0.04	0.00
Native Hawaiian or Pacific Islander	0.02	0.02	0.02	0.31
Hispanic	0.19	0.22	0.17	0.00
Married (DMDC)	0.64	0.65	0.64	0.27
Has any dependents (DMDC)	0.66	0.66	0.65	0.61
Number of dependents (DMDC)	1.56	1.54	1.58	0.36
Army	0.35	0.36	0.34	0.13

Characteristic	Overall	Food Insecure	Food Secure	*P*-value
Navy	0.27	0.29	0.25	0.00
Marine Corps	0.13	0.12	0.14	0.05
Coast Guard	0.03	0.03	0.03	0.11
Education is BA or higher	0.28	0.15	0.36	0.00
Enlisted	0.83	0.95	0.75	0.00
Lives in high cost of living area	0.75	0.77	0.74	0.05
Currently deployed	0.05	0.04	0.05	0.08
Deployed within past 24 months	0.31	0.31	0.31	0.73
Receives WIC	0.04	0.08	0.02	0.00
Receives SNAP	0.01	0.01	0.00	0.00
Answered all Big Three correctly	0.44	0.36	0.49	0.00
I am just getting by financially	0.58	0.83	0.41	0.00
I am concerned that the money I have won't last	0.60	0.83	0.44	0.00
Because of my money situation I don't have the things I want in life	0.48	0.73	0.31	0.00
My finances control my life	0.56	0.78	0.42	0.00
I have money left over at the end of the month	0.46	0.20	0.63	0.00
Able to save something each month	0.80	0.63	0.92	0.00
Has emergency savings fund	0.89	0.81	0.94	0.00
Provides financial assistance to family members outside household	0.17	0.23	0.13	0.00
Meals eaten in dining facilities	1.62	1.60	1.63	0.79
Occupation				
Infantry	0.12	0.14	0.10	0.00
Electronic equipment repairers	0.08	0.09	0.08	0.20
Communications/intelligence specialists	0.11	0.11	0.11	0.79
Healthcare specialists	0.08	0.10	0.07	0.00
Tech/allied specialists	0.02	0.03	0.02	0.71
Functional support/administration	0.15	0.17	0.14	0.00
Electrical/mechanic repairers	0.15	0.17	0.13	0.00
Craftsworkers	0.03	0.03	0.03	0.14

Characteristic	Overall	Food Insecure	Food Secure	*P*-value
Service/supply handlers	0.08	0.10	0.07	0.00
Non-occupational enlisted	0.01	0.01	0.00	0.18
General officers	0.00	0.00	0.01	0.00
Tactical operations officers	0.05	0.01	0.07	0.00
Intelligence officers	0.01	0.00	0.02	0.00
Engineering/maintenance officers	0.02	0.01	0.03	0.00
Scientists and professionals	0.01	0.00	0.02	0.00
Healthcare officers	0.02	0.01	0.04	0.00
Administrators	0.01	0.00	0.02	0.00
Supply, procurement, allied officers	0.01	0.00	0.02	0.00
Non-occupational officer	0.01	0.00	0.01	0.00

SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. N = 9,135. Calculations included members of the Coast Guard and used survey weights. *P*-values are from a ***t***-test of whether the difference in the means between members who were food secure and food insecure were statistically significant. Variables with (DMDC) were taken from the administrative DMDC data. All other variables came from SOFS-A. BA = bachelor's degree; SNAP = Supplemental Nutrition Assistance Program; WIC = Special Supplemental Nutrition Program for Somen, Infants, and Children.

Chapter 2, food insecure respondents are more likely to be Black, Asian, Hispanic, enlisted or in the U.S. Navy. They are less likely to have a bachelor's degree and report lower levels of financial knowledge and well-being. However, there are no statistically significant differences in rates of marriage or the presence or number of dependents.

The regression analysis allowed us to control for additional factors when estimating the relationship between food insecurity and cash compensation among the 2022 survey respondents. Table 3.3 shows the regression coefficients from our primary model, where additional controls were added with each subsequent column. Column 2 shows only our measures of the level and variability of pay as independent variables. Column 3 subsequently adds demographic and service characteristics, Column 4 adds indicators for use of food assistance, Column 5 adds the summary measure of financial knowledge, Column 6 adds measures of financial well-being and financial management, and Column 7 adds occupation indicators.

The results show a negative association between the level of monthly pay and the likelihood of food insecurity in the data. The association is small and falls in size as we add more controls, especially those related to financial knowledge and management. Conversely, the positive coefficients on variability imply that higher monthly variability in pay is associated with a higher likelihood of food insecurity. Below, we add further interpretation of the relationships with key covariates in the model.

TABLE 3.3
Primary Regression Coefficients, 2022 SOFS-A

Characteristic	Base Model	Add demo-graphics	Add Food Assistance	Add Financial Knowledge	Add Financial Management and Financial Well-Being	Add Occupation
Total monthly compensation (log)	-0.238***	-0.226***	-0.211***	-0.207***	-0.101***	-0.101***
	(0.0388)	(0.0371)	(0.0344)	(0.0341)	(0.0208)	(0.0212)
Pay variability (log)	0.257**	0.197**	0.169*	0.170*	0.148*	0.163**
	(0.106)	(0.0910)	(0.0940)	(0.0931)	(0.0769)	(0.0739)
Female		0.0181	0.0198	0.0158	0.0203	0.0228
		(0.0198)	(0.0197)	(0.0203)	(0.0168)	(0.0165)
Black		0.0119	0.0128	0.0103	-0.00573	-0.00712
		(0.0206)	(0.0212)	(0.0205)	(0.0165)	(0.0159)
Asian		0.0740***	0.0741***	0.0727***	0.0636**	0.0618**
		(0.0265)	(0.0273)	(0.0269)	(0.0258)	(0.0250)
American Indian/ Alaska Native		0.0967**	0.0995**	0.100**	0.0984**	0.0977**
		(0.0391)	(0.0407)	(0.0410)	(0.0412)	(0.0416)
Native Hawaiian or Pacific Islander		-0.0131	-0.0227	-0.0233	-0.0566	-0.0578
		(0.0747)	(0.0707)	(0.0712)	(0.0598)	(0.0600)
Hispanic		0.0204	0.0199	0.0186	0.0206	0.0198
		(0.0170)	(0.0173)	(0.0175)	(0.0142)	(0.0148)
Married (DMDC)		0.00862	0.00414	0.00476	-0.00968	-0.00822
		(0.0272)	(0.0265)	(0.0264)	(0.0239)	(0.0236)
Has any dependents (DMDC)		0.0861**	0.0849**	0.0848**	0.0475	0.0450
		(0.0369)	(0.0362)	(0.0360)	(0.0299)	(0.0302)
Number of dependents (DMDC)		0.0171***	0.00993	0.00967	-0.00470	-0.00471
		(0.00642)	(0.00690)	(0.00697)	(0.00525)	(0.00532)
Army		0.0530**	0.0493**	0.0481**	0.0268*	0.0261
		(0.0232)	(0.0225)	(0.0220)	(0.0154)	(0.0175)
Navy		0.110***	0.107***	0.106***	0.0400**	0.0407**

Characteristic	Base Model	Add demo-graphics	Add Food Assistance	Add Financial Knowledge	Add Financial Management and Financial Well-Being	Add Occupation
		(0.0193)	(0.0193)	(0.0192)	(0.0171)	(0.0185)
Marine Corps		-0.0263	-0.0267	-0.0274	-0.0227	-0.0266
		(0.0224)	(0.0217)	(0.0216)	(0.0186)	(0.0197)
Coast Guard		0.0623	0.0642	0.0632	0.0163	0.0168
		(0.0439)	(0.0425)	(0.0421)	(0.0317)	(0.0358)
Education is BA or higher		-0.0693***	-0.0657***	-0.0634***	-0.0331**	-0.0312**
		(0.0190)	(0.0190)	(0.0190)	(0.0151)	(0.0144)
Enlisted		0.158***	0.156***	0.153***	0.0676***	0.128***
		(0.0243)	(0.0233)	(0.0233)	(0.0176)	(0.0354)
Lives in high cost of living area		0.0674***	0.0681***	0.0686***	0.0234**	0.0244**
		(0.0145)	(0.0146)	(0.0145)	(0.0105)	(0.0102)
Currently deployed		-0.0805*	-0.0772*	-0.0779*	-0.0112	-0.00969
		(0.0434)	(0.0438)	(0.0443)	(0.0266)	(0.0267)
Deployed within past 24 months		0.0147	0.0146	0.0149	0.0127	0.00994
		(0.0144)	(0.0141)	(0.0141)	(0.0126)	(0.0125)
Receives WIC			0.205***	0.204***	0.133***	0.134***
			(0.0318)	(0.0314)	(0.0271)	(0.0279)
Receives SNAP			0.134	0.135	0.0741	0.0736
			(0.0943)	(0.0939)	(0.103)	(0.104)
Answered all Big Three correctly				-0.0191	-0.00125	0.00286
				(0.0139)	(0.00995)	(0.00954)
I am just getting by financially					0.0992***	0.0992***
					(0.0120)	(0.0121)
I am concerned that the money I have or will save won't last					0.0754***	0.0763***
					(0.0111)	(0.0108)

Characteristic	Base Model	Add demo-graphics	Add Food Assistance	Add Financial Knowledge	Add Financial Management and Financial Well-Being	Add Occupation
Because of my money situation, I feel like I will never have the things I want					0.103***	0.102***
					(0.0120)	(0.0124)
My finances control my life					0.0715***	0.0708***
					(0.0191)	(0.0193)
I have money left over at the end of the month					-0.180***	-0.179***
					(0.0208)	(0.0210)
Able to save something each month					-0.169***	-0.170***
					(0.0205)	(0.0213)
Has emergency savings fund					-0.0318	-0.0307
					(0.0196)	(0.0200)
Provides financial assistance to family outside the hhld					0.0605***	0.0602***
					(0.0172)	(0.0170)
Meals eaten in dining facilities per week					-0.00404***	-0.00391**
					(0.00150)	(0.00153)
Electronic Equipment Repairers						-0.0313
						(0.0192)
Communications/ Intelligence Specialists						-0.0383
						(0.0278)
Health Care Specialists						-0.0183
						(0.0317)
Tech/Allied Specialists						-0.0298
						(0.0432)
Functional Support/ Admin						-0.00510

Characteristic	Base Model	Add demo-graphics	Add Food Assistance	Add Financial Knowledge	Add Financial Management and Financial Well-Being	Add Occupation
						(0.0265)
Electrical/Mechanic Repairers						0.000418
						(0.0295)
Craftsworkers						0.00131
						(0.0251)
Service/Supply Handlers						0.00379
						(0.0238)
Non-Occupational						-0.00623
						(0.0724)
General Officers						0.0379
						(0.0398)
Tactical Operations Officers						0.0529**
						(0.0237)
Intelligence Officers						0.0494
						(0.0305)
Engineering/ Maintenance Officers						0.0613**
						(0.0302)
Scientists and Professionals						0.00500
						(0.0312)
Health Care Officers						0.0339
						(0.0211)
Administrators						0.0705*
						(0.0366)
Supply, Procurement, Allied Officers						0.0695**
						(0.0347)
Non-Occupational						0.0301
						(0.0315)

Characteristic	Base Model	Add demo-graphics	Add Food Assistance	Add Financial Knowledge	Add Financial Management and Financial Well-Being	Add Occupation
Constant	2.435***	2.020***	1.897***	1.872***	1.187***	1.136***
	(0.346)	(0.338)	(0.315)	(0.312)	(0.194)	(0.199)
Observations	9,135	9,135	9,135	9,135	9,135	9,135
R-squared	0.049	0.106	0.114	0.114	0.337	0.338

SOURCES: Produced using SOFS-A 2022 matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. Calculations included members of the Coast Guard and used survey weights. Standard errors clustered at survey stratum level are shown in parenthesis. The Air Force is the omitted service category, and infantry is the omitted occupation category. Variables with (DMDC) were taken from the administrative DMDC data. All other variables came from SOFS-A. *** denotes that the result is statistically significant at the 1-percent level. ** denotes that the result is statistically significant at the 5-percent level. * denotes that the result is statistically significant at the 10-percent level. BA = bachelor's degree..

Relationship Between Levels of Pay and Food Insecurity

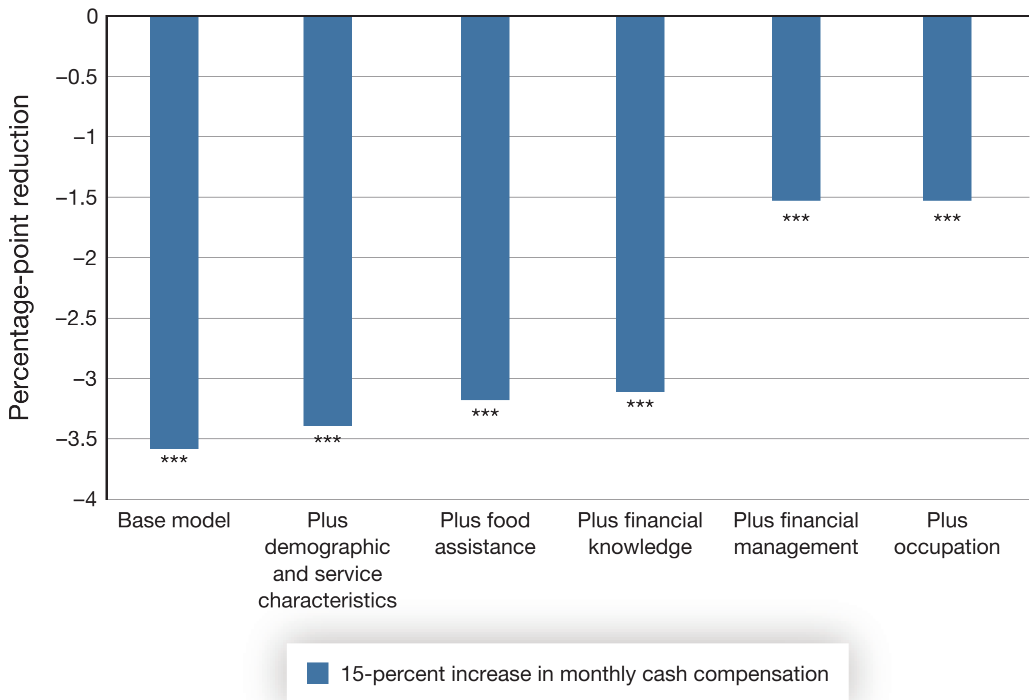
The coefficients on the level of pay can be interpreted as the association between changes in monthly cash compensation (measured in percentage terms) and the likelihood of food insecurity. The coefficients shown in the Table 3.3 reflect the impact of a 100-percent change: For example, taking the coefficient in column 7 implies that doubling pay would be associated with a 10–percentage point decline in the likelihood of being food insecure, from 40 percent to 30 percent, after controlling for all other covariates in the model, implying that the estimated relationship is relatively small. However, we can scale the coefficients to estimate the association for pay changes of other magnitudes. In Figure 3.1, we present results considering a 15-percent increase in pay, which is the increase in pay being considered for junior enlisted members by Congress as of summer 2024 (Kheel, 2024).

The results show that increasing pay by 15 percent is associated with a 3.5–percentage point decline in the likelihood of food insecurity in this base model or a 9-percent predicted decrease from a 40-percent food insecurity rate to 36.5 percent. Adding controls for demographic and service characteristics, use of food assistance, or financial knowledge do not significantly moderate the relationship between food insecurity and levels of pay. Controlling for financial well-being and management, on the other hand, reduces the relationship between pay and food insecurity by approximately one-half: A 15-percent increase in pay is associated with a 1.5–percentage point (4-percent) reduction in the likelihood of being food insecure. Adding controls for occupation categories do not significantly change the relationship between food insecurity and levels of pay after controlling for all the other characteristics in the model.

Because the model did not control for pay grade, it is likely the estimated negative relationship between cash compensation and likelihood of food insecurity reflects the higher com-

FIGURE 3.1

Estimated Percentage Point Change in Likelihood of Food Insecurity Associated with a 15-Percent Increase in Monthly Cash Compensation Among 2022 Respondents



SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. *** denotes that the result is statistically significant at the 1-percent level.

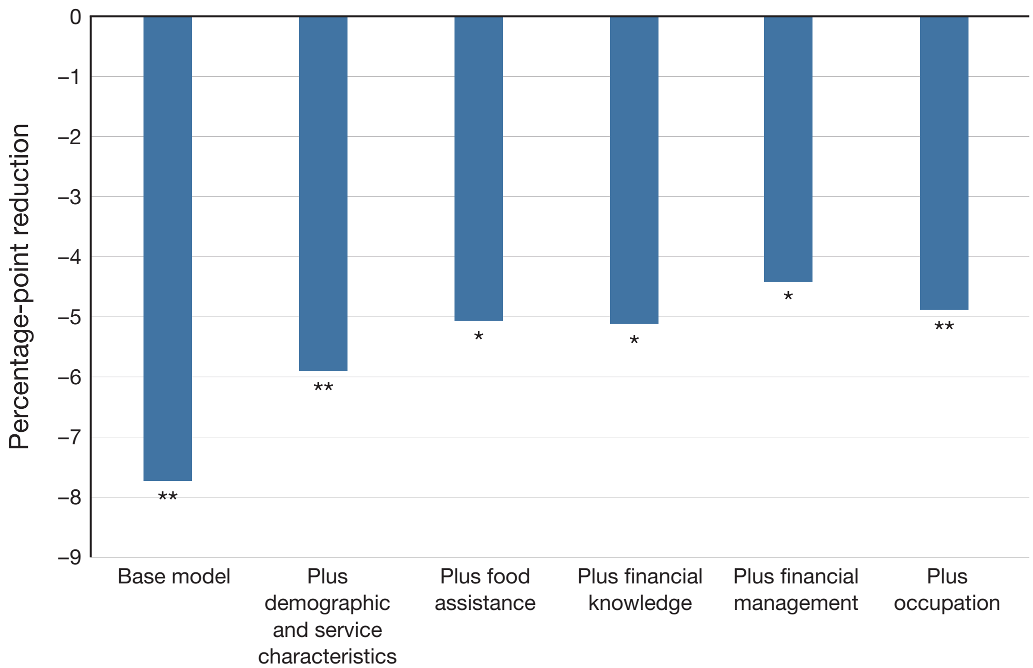
pensation and lower food insecurity rates among higher grade personnel relative to junior personnel. Later in this chapter, we investigate this explanation further when we show results where we limit the regressions to specific pay grade groups, such as junior enlisted (E1 to E4) and career enlisted (E5 and above) and so forth.

Relationship Between Pay Variability and Food Insecurity

Figure 3.2 shows the magnitude of the relationship between pay variability and food insecurity across the various specifications in our model. We again scaled the coefficients to consider the relationship in the context of a concrete example. As shown in Table 3.1, pay variability declines as seniority increases. Moving from the average variability of the most junior enlisted members (16.3 percent) to the average variability of E5 to E9 service members (11.4 percent) represents a 30-percent reduction in variability. Relative to average monthly earnings for an E4, this translates into smoothing out monthly swings in income by approximately $200.

FIGURE 3.2

Estimated Percentage Point Change in Likelihood of Food Insecurity Associated with a 30-Percent Decrease in Variability in Monthly Cash Compensation Among Respondents

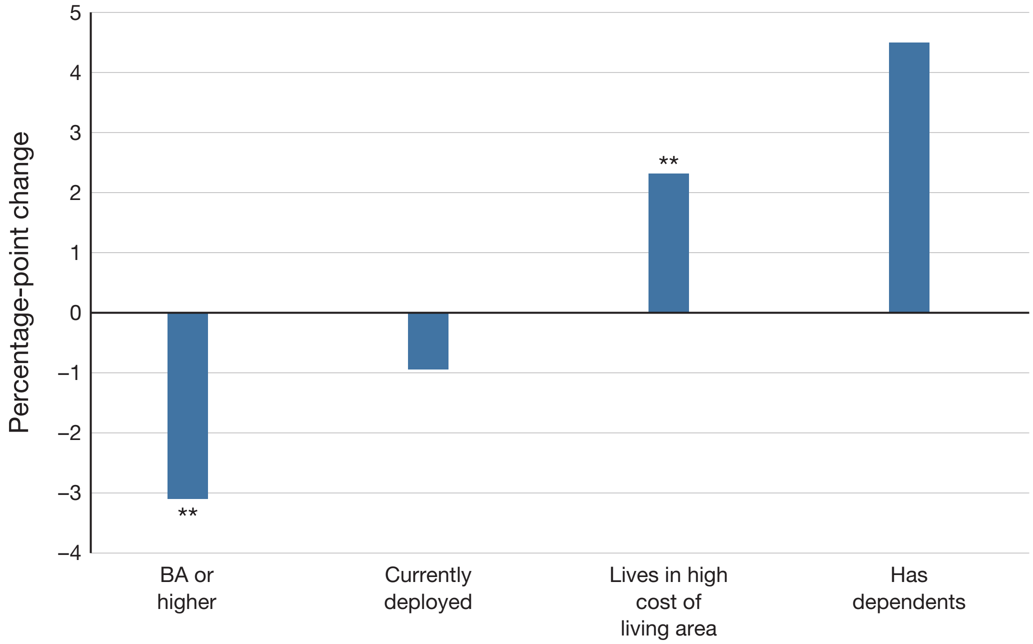


SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. ** denotes that the result is statistically significant at the 5-percent level. * denotes that the result is statistically significant at the 10-percent level.

The results show that decreasing variability is associated with a decline in food insecurity among respondents and the estimate is statistically significant. In the base model, decreasing variability by 30 percent leads to a 7.7–percentage point (19-percent) reduction in the likelihood of food insecurity. Here, the magnitude of the relationship declines slightly to approximately 6 percentage points when adding demographic and service controls and to 5 percentage points when adding controls for receipt of food assistance. The relationship between food insecurity and pay variability remains relatively steady when controlling for financial knowledge, financial management, and occupation. Based on the results in these final three columns, a 30-percent reduction in variability would translate into a 4.5– to 5–percentage point decline in the likelihood of being food insecure, roughly a 12-percent change relative to the 40-percent average in 2022.

FIGURE 3.3
Estimated Percentage Point Change in Likelihood of Food Insecurity and Selected Demographic and Service Characteristics Among 2022 Respondents



SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: BA = bachelor's degree. Analysis was restricted to members who had two full years of pay history. *N* = 9,135. ** denotes that the result is statistically significant at the five-percent level. Figure 3.3 shows coefficients from the model with the full set of covariates (column 7 in Table 3.2).

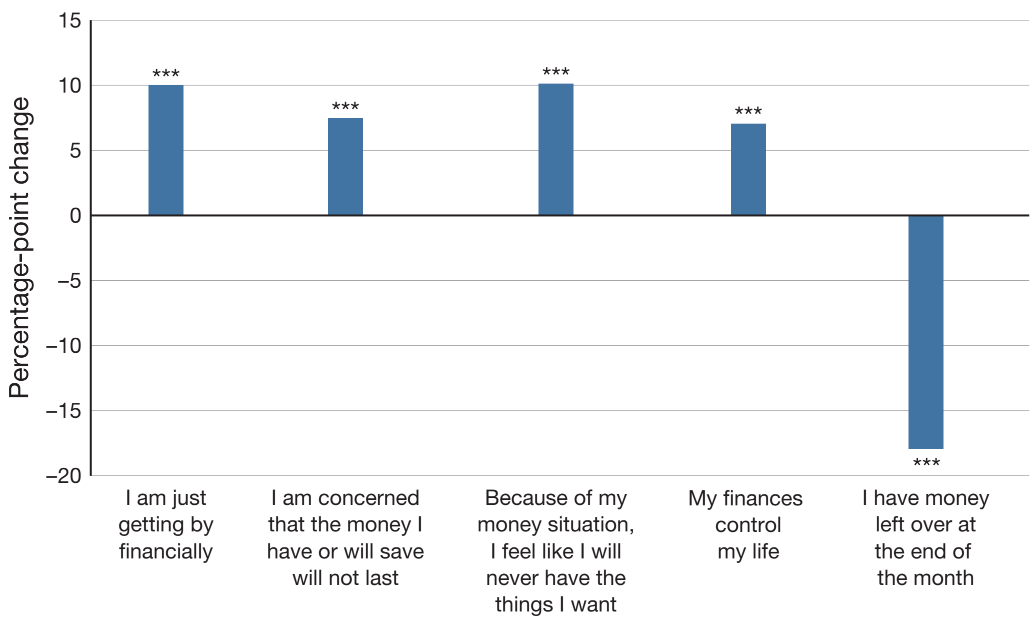
Relationship Between Demographic and Service Characteristics and Food Insecurity

Figure 3.3 shows the relationships between key demographic and service characteristics and the likelihood of food insecurity in the 2022 data. The coefficient estimates shown in Figure 3.3 are for the regression model with the full set of covariates (column 7 in Table 3.2). In this version of the model, having a bachelor's degree or higher was associated with a 3.1–percentage point (8-percent) reduction in the likelihood of being food insecure, while living in a high cost of living area was associated with a 2.4–percentage point (6-percent) increase in the likelihood of being food insecure. The coefficients in the model indicated a positive association between food insecurity and having dependents and a negative relationship between deployment and food insecurity, although these relationships were not statistically significant after controlling for financial characteristics or occupation.

In addition to the covariates shown in Figure 3.3, Table 3.3 shows a higher likelihood of food insecurity for respondents in the Navy after controlling for other covariates. The model also suggests a higher likelihood of food insecurity for those in the Army, although this relationship is not statistically significant after controlling for occupation.[5] Enlisted status has a large association with food insecurity relative to being an officer: Enlisted respondents are 12.8–percentage points more likely to be food insecure than officers. There is also a positive correlation between receiving benefits from WIC and food insecurity, which likely reflects a correlation based on need for assistance with food rather than a causal relationship. There is also a positive association between food insecurity and some racial minority groups (Asian and American Indian or Alaska Natives).

FIGURE 3.4

Estimated Percentage Point Change in Likelihood of Food Insecurity and Metrics of Financial Well-Being



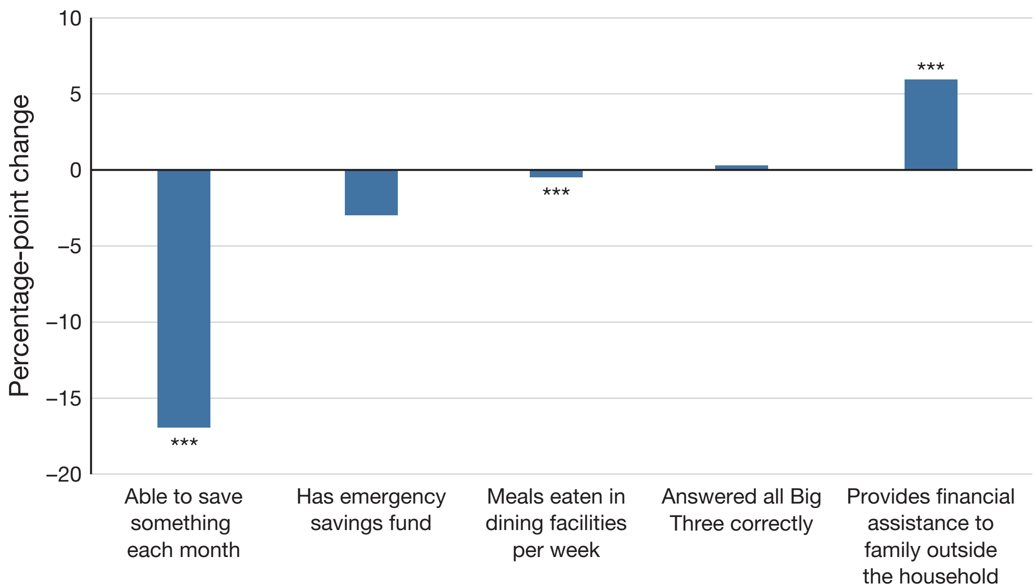
SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. *** denotes that the result is statistically significant at the 1-percent level. Figure 3.4 shows coefficients from the model with the full set of covariates (column 7 in Table 3.2). Coefficients are from indicators for respondents who responded that the statement applied to them "completely," "very well," "always," or "often." See Table A.1 in the appendix for full text of the questions and response options.

[5] We used the Air Force as the service reference group; the branch has the lowest base rate of food insecurity (36 percent).

FIGURE 3.5

Estimated Percentage Point Change in Likelihood of Food Insecurity and Metrics of Financial Management and Knowledge



SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. *** denotes that the result is statistically significant at the 1-percent level. Figure shows coefficients from the model with the full set of covariates (column 7 in Table 3.2).

Relationship Between Financial Well-Being, Knowledge and Management, and Food Insecurity

Figures 3.4 and 3.5 show the relationship between food insecurity and measures of financial well-being, knowledge, and management in the data. First, Figure 3.4 shows the relationship between each of the five questions included in the CFPB Financial Well-Being Scale. As in Figure 3.3, we reported the coefficients from the full model with all controls shown in column 7 of Table 3.2. For each of these questions, we reported the relationship for respondents who reported they agreed or strongly agreed with the statement. Four of these five questions measure negative financial well-being and all have a positive association with food insecurity. Respondents who agreed that they were "just getting by financially" or who felt they would "never have things they wanted in life due to [their] money situation" were each approximately 10 percentage points (25 percent) more likely to be food insecure. Respondents who agreed that their "finances control [their lives]" or who were "concerned that money . . . won't last" were each approximately 7 percentage points more likely to be food insecure. By contrast, respondents who reported having money left over at the end of the month were nearly 18 percentage points (45 percent) less likely to be food insecure.

Figure 3.5 shows the relationship with the variables intended to measure financial management behaviors and financial knowledge. Members who reported being able to save something each month were 17 percentage points (43 percent) less likely to be food insecure, while respondents who reported providing financial assistance to family members outside of the household were 6 percentage points (15 percent) more likely to be food insecure. The model did not demonstrate a statistically significant relationship between having an emergency savings fund and food insecurity, likely because this measure is so highly correlated with being able to save each month.

In addition, we also found a small but statistically significant relationship with use of the dining facilities: Each additional meal eaten in the dining facilities per week reduced the likelihood of food insecurity by 0.4 percentage points (1 percent). This relationship is even stronger for E1 to E4s: Each additional meal eaten in the dining facilities per week reduced the likelihood of food insecurity by 0.6 percentage points (see Table A.7 in the appendix).

Although we found evidence of a relationship between financial management behaviors and food insecurity, the results in Figure 3.5 also show that financial knowledge (as measured by whether members answered all the Big Three questions correctly) does not have a statistically significant association with food insecurity. The lack of a significant relationship could reflect the possibility that, although these questions are commonly used to measure financial knowledge, answers to these questions might not directly translate into the day-to-day financial skills needed to manage money and budget appropriately in ways that would affect food insecurity. It is also possible, as discussed earlier, that the measures of behaviors included in our analysis also reflect financial knowledge to some degree.

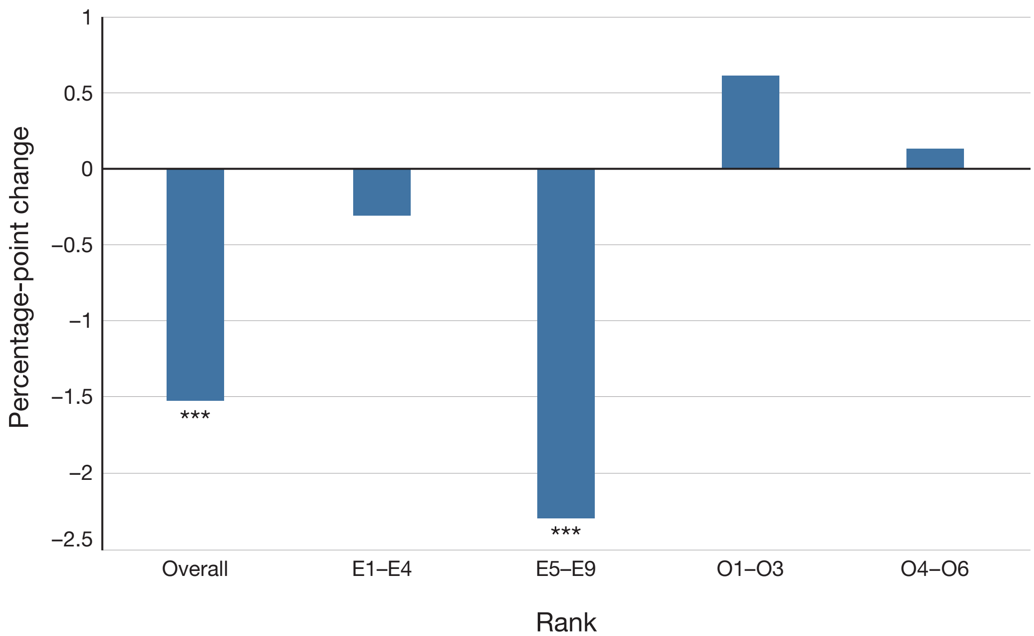
Subgroup Analyses and Robustness

The results above demonstrate evidence of a small but statistically significant relationship between food insecurity and the level of monthly compensation across the full sample of respondents. They also show a statistically significant relationship between food insecurity and variability of cash compensation. The analysis sample includes personnel from all stages of their careers and in all grades, including mid-career and senior grade personnel. Therefore, the coefficients on pay are likely reflecting, at least in part, the relationship between seniority and food insecurity (Figure 2.3). To understand the potential associations of changes in pay on food insecurity rates within levels of seniority, we estimated the same model with stratified samples for subgroups by grade: E1 to E4, E5 to E9, O1 to O3, O4 to O6. These stratified models allowed us to quantify the relationship between food insecurity and pay within narrower bands of grade and to understand how this relationship varies for junior members compared with more-senior members. The full regression coefficients from these stratified models are included in Tables A.9–A.10 in the appendix.

Figure 3.6 shows the estimated relationship between a 15-percent increase in compensation and food insecurity for each of the four subgroups mentioned above. The figure shows

FIGURE 3.6

Estimated Percentage Point Change in Likelihood of Food Insecurity Associated with a 15-Percent Increase in Cash Compensation for Subsamples Defined by Grade Grouping, 2022



SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. *** denotes that the result is statistically significant at the 1-percent level. Results shown for each group are the coefficient estimate on the logarithm of monthly cash compensation where the sample is restricted to each grade range. Coefficients are from the version of the model with the full set of controls.

the relationship for each subgroup from each version of the model with additional controls added, following the structure in Figure 3.1. The results show there is not a statistically significant association for three out of the four groups: E1 to E4, O1 to O3, and O4 to O6.[6] However, there is a small but statistically significant association for more senior enlisted members E5 to E9: A 15-percent pay increase is associated with a 2–percentage point (5-percent) decline in the likelihood of food insecurity for this group. In other words, the relationship in the overall sample is being driven by the E5 to E9 subsample. The pattern of results is consistent as addi-

[6] Given the low base rates of food insecurity for officers, the regression's officer subgroups are slightly underpowered to detect effect sizes of the magnitudes shown here. For the point estimates in Table A.6, we conducted power calculations to estimate the statistical power of these estimates based on the sample sizes for each subgroup in the 2022 data and effect sizes relative to the sample mean and standard deviation for each subgroup. Compared with the standard power threshold of 0.8, we obtained power estimates of 0.52 and 0.44 for O1 to O3 and O4 to O6, respectively, and 0.38 for E1-E4.

tional controls are added to the model, although the magnitude of the relationship between pay and food insecurity declines, as in Figure 3.1.

As shown in the appendix tables, we found no statistically significant relationship between variability of pay and likelihood of food insecurity in any of the grade subgroup analyses, although the direction and magnitude of the relationship is similar for the E5 to E9 regressions as in the overall sample. The magnitude of the relationship is smaller for officers and is *wrong signed* for junior enlisted members, meaning higher compensation is associated with a greater likelihood of food insecurity. The lack of statistical significance likely results, in part, because the smaller sample sizes in each subgroup limited the power of the analysis.

Finally, we repeated this regression analysis using data from the 2018 and 2020 SOFS-A surveys to identify whether the estimated relationships between food insecurity and compensation were specific to the 2022 sample or robust to the earlier periods. We found that the results depended on the grade group and year.

In 2018, the relationship between compensation and food insecurity for E1 to E4 is wrong signed, and the estimated coefficients are either insignificant or marginally significant. The estimated relationship for the E5 to E9 group followed a similar pattern as the results in 2022 where we estimated greater compensation is associated with a lower likelihood of food insecurity. However, in the 2018 sample, we found a negative and statistically significant relationship for O1 to O3, in contrast to 2022. When we use the 2020 data, the model shows a negative relationship between food insecurity and the level of compensation for all groups, although it is only statistically significant for the E1 to E4 group after controlling for all the other characteristics in the model. Thus, we found a statistically significant negative relationship between compensation and food insecurity for junior personnel, (i.e., higher compensation is associated with a lower likelihood of food insecurity) but only in the 2020 survey and not in either the 2018 or 2022 surveys.

Thus, the grade-specific results differ depending on the year of the sample. Of course, each sample year presented a different set of circumstances for respondents, which should be kept in mind when interpreting these results. The 2018 SOFS-A captures the conditions before the coronavirus disease 2019 (COVID-19) pandemic, and the 2020 SOFS-A was fielded during the midst of the early stages of the pandemic when unemployment levels were high and many individuals were still receiving economic stimulus payments. The 2022 SOFS-A was fielded in the waning period of the pandemic, when most stimulus payments had ended and employment had stabilized, but inflation was at record high levels, particularly for food costs (U.S. Bureau of Labor Statistics, 2024a; U.S. Bureau of Labor Statistics, 2024b). Therefore, the results seem to differ depending on the circumstances, although it is unclear whether these differing circumstances resulted in the estimates we found. We could conclude that there is no robust relationship between compensation and food insecurity across years for any specific subgroup of grades, including junior enlisted personnel. The only exception is career enlisted personnel in grades E5 to E9 where we estimated a negative association between compensation and food insecurity in two of the three years.

Discussion

These results demonstrate a complex relationship between military compensation and food insecurity. We found that both the level of pay and the variability of pay have a statistically significant relationship with the likelihood of food insecurity, although the magnitudes of the estimates are not large and are even smaller when we add control variables. A 15-percent increase in cash compensation is predicted to reduce the likelihood of food insecurity (from a mean level of 40 percent) by only 3.6 percentage points in the base model with no other control variables. A 30-percent decrease in variability is associated with a 7.7–percentage point increase in the likelihood of food insecurity in the base model. These relationships are even smaller once we also accounted for members' ability to save and other financial management skills: The estimates on pay levels and variability fell from 3.6 to 1.5 percentage points (or 9 to 4 percent) and 7.7 to 4.4 percentage points (19 to 11 percent), respectively. Other member circumstances, such as being in a high cost of living area, were also associated with increases in the likelihood of food insecurity.

These relationships also vary for members at different stages in their careers and are generally not strongly robust; the results for a given seniority group differ depending on the survey year. Using 2022 data, we did not find evidence of a statistically significant relationship between pay and food insecurity for junior enlisted members or for officers, although there was a significant relationship with pay for career enlisted members. We also did not find a statistically significant relationship between food insecurity and pay variability for junior enlisted members or for officers.

However, the results varied when examining earlier waves of SOFS-A. In 2020, we found a statistically significant negative relationship between pay and food insecurity for junior enlisted members but a positive relationship in 2018. Overall, the results combined with the descriptive patterns in Chapter 2 suggest that at least part of the relationship between compensation and food insecurity is driven more by differences across junior and senior members than differences in pay within seniority groups.

The results also provided evidence that higher levels of financial well-being and financial knowledge are associated with lower levels of food insecurity. Even conditional on demographics and other factors in the model, the measures of financial well-being and financial knowledge were highly statistically significant, and the impacts were large. Accounting for financial well-being also reduced the magnitude of the relationship between pay and food insecurity.

As noted in Chapter 1, Congress is contemplating a targeted 15-percent pay raise for junior enlisted members, in part because of concerns about food insecurity among junior enlisted personnel. We did not find a robust relationship between cash compensation and food insecurity among junior enlisted members when we controlled for other factors across the three surveys: 2018, 2020, and 2022. Nonetheless, it is reasonable to ask by how much the rate of food insecurity is predicted to fall if Congress increased cash compensation for junior enlisted members by15 percent and how much would it cost if, counter to our findings, we assumed our estimates for junior enlisted members were robust. Given that there are 553,445

E1 to E4 service members with at most ten years of service, we estimated that a 15-percent pay raise would reduce the number of food insecure E1 to E4s by 1,685 using our 2022 estimates and by 6,210 using the 2020 estimates (as shown in the appendix). We estimated that the annual increase in cost to DoD in 2023 dollars would be $3.71 billion or $2.2 million per reduction in food insecure member ($3.71 billion/1,685) based on 2022 estimates or $597,100 based on the 2020 estimates.[7] The implication is that, even if we had found a robust relationship between pay and food insecurity, using a pay increase to address food insecurity would be disproportionately expensive because the estimated relationship is so small.

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7 The $3.71 billion estimate assumes that the targeted pay raise would involve only an increase in basic pay for E1 to E4s, and the cost estimate reflects the increase in basic pay costs in 2023 given the grade and year of service distribution of E1 to E4s in 2023, as well as the increase in the retirement accrual costs to DoD given that accrual costs are a multiple of the basic pay bill. This estimate understates the total cost because it ignores other elements of cost that depend on the basic pay bill, such as Federal Insurance Contributions Act taxes, and ignores how costs are affected in future years given that a pay raise is built into to future costs.

CHAPTER 4

Comparing Military and Civilian Food Insecurity Rates

Official U.S. population food insecurity rates are measured using the U.S. Census's CPS Food Security Supplement, fielded in December of each year, that includes a food security questionnaire designed by USDA. The national 2022 food insecurity rate reported by CPS was 13 percent (USDA, 2023a), a figure that is one-third of the 40 percent food insecurity rate estimated in the 2022 SOFS-A for survey respondents.[1] If we restrict the CPS sample to those with at least a high school degree, to full-time workers, and exclude active-duty military respondents,[2] then the civilian food insecurity rate is estimated to be 10 percent.

In this chapter, we seek to understand why the military food insecurity rate is higher than the food insecurity rate among similar civilians, a result that is puzzling given that average military pay significantly exceeds the median earnings of similar civilians. We took both the military and civilian food insecurity rates as given. In Chapters 1 and 2, we noted that the introduction, there are multiple reasons that lead us to believe that the SOFS-A food insecurity responses may not be generalizable to the overall active-duty population, including because of low response rates, long time lag between sampling and surveying, unexplainable high estimates of food insecurity, and, as we will show in this chapter, unexplainable results showing that high shares of food insecure respondents also reported good financial circumstances. For this analysis, we used the 2022 SOFS-A sample that has not been merged with the administrative DMDC data, as was discussed in Chapter 2 and used in the analysis for Chapter 3. The full SOFS-A sample enabled us to capture the entire survey population when we calculated aggregate food insecurity statistics for all active-duty respondents.

We conducted three types of analyses to investigate the difference in food insecurity rates between the civilian and military populations. The first dives deeper into the SOFS-A data to understand the financial situation of members who report being food insecure because many

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1 The U.S. population food insecurity reported using CPS data includes active-duty military respondents. Recalculating the food insecurity rate without active-duty military respondents yields a civilian food insecurity rate of 13 percent, the same as the rate for the overall population.

2 An individual is classified as being a full-time worker if he or she usually works at least 35 hours per week. We restricted to unmarried respondents who are full-time workers, and among married households, we restricted to couples with at least one full-time worker.

of the questions used to determine food insecurity are related to money and affordability of food. The second set of analyses adjusted for differences in the way the food insecurity is measured between the CPS and SOFS-A to determine whether differences in screening processes or differences in questions used to determine food insecurity explain any of the difference between the civilian and the active-duty respondent food insecurity rates. The third set of analyses controlled for different demographic characteristics and compared the civilian food insecurity rate in the 2022 CPS with the food insecurity rate for active-duty respondents in the 2022 SOFS-A to determine whether demographic differences are driving the difference in the civilian and active-duty respondent food insecurity rates.

We conclude the chapter by summarizing the results of our analysis and describe other reasons that might explain the differences between the civilian and military food insecurity rates that are not explicitly explored in this report, such as the representativeness of SOFS-A data, differences in how military and civilian populations interpret questions used to measure food insecurity, differences between military and civilian lifestyles that make military populations appear more food insecure than civilian populations, differences in other unobservable characteristics, and differences in the extent to which food insecurity is episodic or chronic. Finally, it is unclear whether a 12-month period is the best way to measure food insecurity in military (or civilian) populations.

Investigating the Financial Circumstances of Military Food Insecure Members

In this section, we tabulate responses to questions in SOFS-A about members' financial conditions and savings to better understand the financial circumstances of food insecure members. We expected that those who are food insecure would also report poor financial conditions and have limited ability to save. We used three different questions in SOFS-A that measure the financial condition of members. In contrast to the food security questions in the survey, which ask about experiences over the past 12 months, the following questions ask about members' current status at the time of the survey.

1. Which of the following statements best describes your financial condition? Response categories are
   - very comfortable and secure
   - able to make ends meet without much difficulty
   - occasionally have some difficulty making ends meet
   - tough to make ends meet but keeping your head above water
   - in over your head.

2. Which of the following statements best describes your saving and investments habits? Response categories are

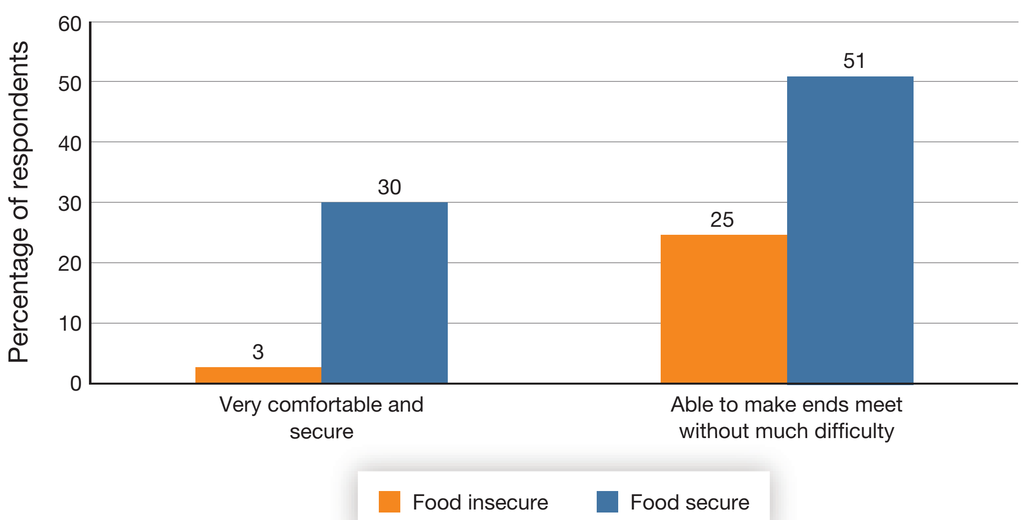
- unable to save or invest—usually spend more than income
- unable to save or invest—usually spend about as much as income
- save or invest whatever is left over at the end of the month—no regular plan
- save or invest regularly by putting money aside each month.

3. How much do you have in an emergency savings fund, in terms of your average monthly expenses? Response categories are
   - less than one month
   - between one and three months
   - between four and six months
   - more than six months
   - I do not have an emergency savings fund.

Our tabulations show that large shares of food insecure members reported good financial condition, reported saving and investing, and had an emergency savings fund. Figure 4.1 shows that 3 percent of food insecure members in 2022 reported having a very comfortable and secure financial condition and 25 percent reported being able to make ends meet without much difficulty, demonstrating that a total of 28 percent of food insecure members reported good financial condition, as proxied by these two response categories. As expected, a larger

FIGURE 4.1

Respondent-Reported Descriptions of Financial Condition, by Food Insecurity Status, SOFS-A 2022 Respondents



SOURCE: Produced using SOFS-A 2022 data.
NOTE: Tabulations were weighted. Military rates were estimated using SOFS-A.

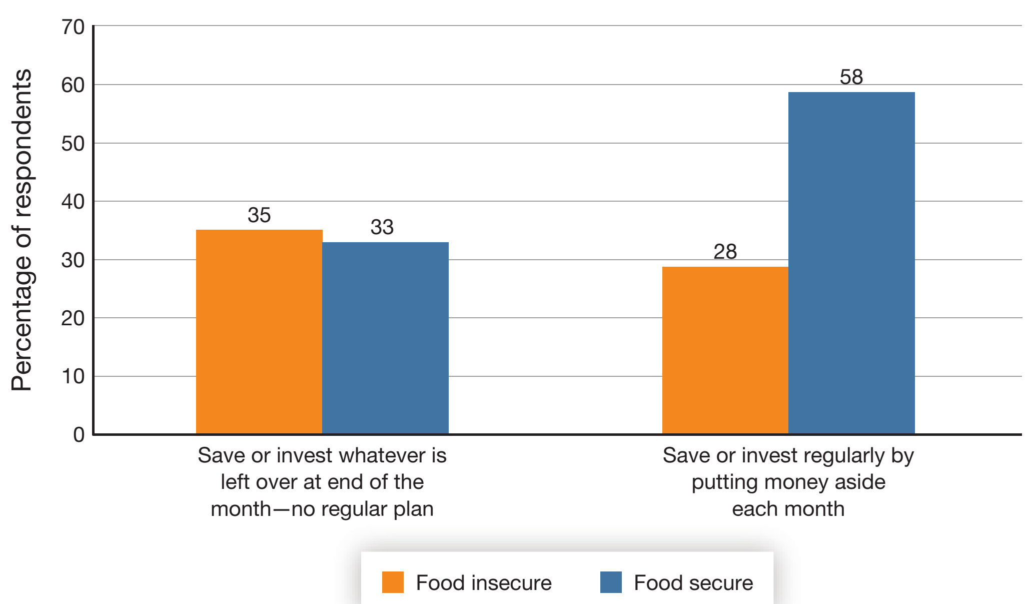
share of food secure members, 81 percent, reported good financial condition, while higher shares of food insecure members report poor financial condition.

Figure 4.2 shows that 25 percent of food insecure members reported saving or investing whatever is left over at the month with no regular plan for saving and investing, and 28 percent reported saving or investing regularly by putting money aside each month.[3] In total, more than half of food insecure members reported saving or investing, and over 90 percent of food secure members reported saving or investing. More than 80 percent of food insecure members had an emergency savings, and 53 percent had an emergency savings fund that could cover at least one month of expenses (Figure 4.3).

These tabulations suggest that there is a disconnect between reported food insecurity and financial circumstances or behaviors in SOFS-A. One possible explanation is that members who reported food insecurity were food insecure at some point in the prior 12 months but were no longer food insecure based on the questions about financial condition, savings, and

FIGURE 4.2

Respondent-Reported Descriptions of Saving and Investments Habits, by Food Insecurity Status, SOFS-A 2022 Respondents

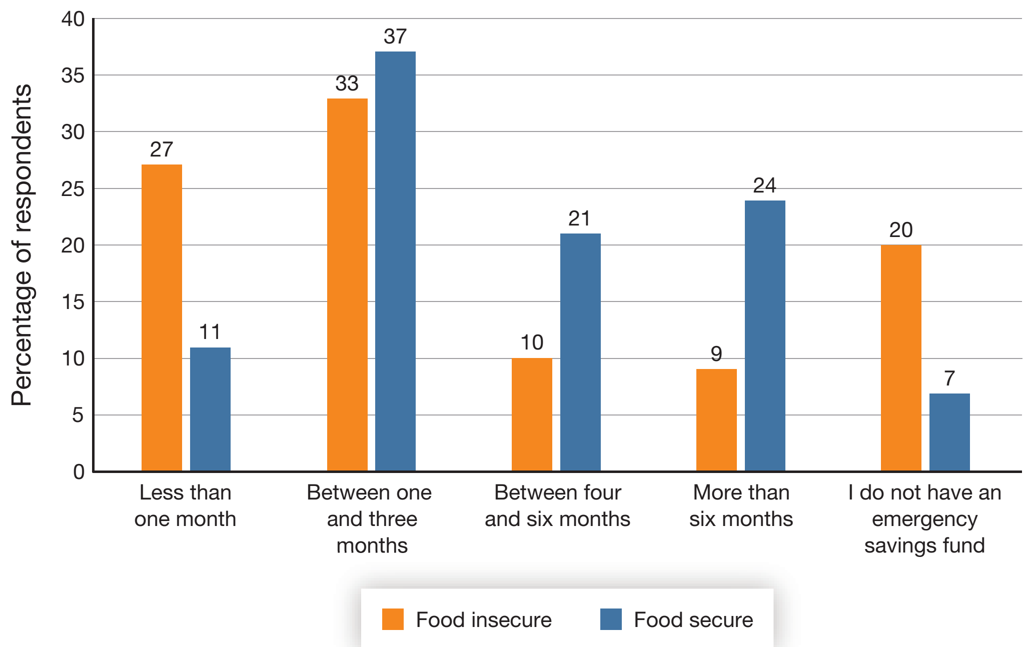


SOURCE: Produced using SOFS-A 2022 data.
NOTE: Tabulations were weighted. Military rates were estimated using SOFS-A.

[3] Service members are auto enrolled into the Thrift Savings Plan (TSP) and might view contributions to their TSP accounts as saving and investing. Although SOFS-A shows that more than 80 percent of food insecure members who reported saving and investing also reported contributing to a retirement account (e.g., TSP), a 1arge share (more than 70 percent) of food insecure members who did not report saving and investing also report that they contribute to a retirement account.

FIGURE 4.3

Respondent-Reported Amount in Savings, by Food Insecurity Status, SOFS-A 2022 Respondents



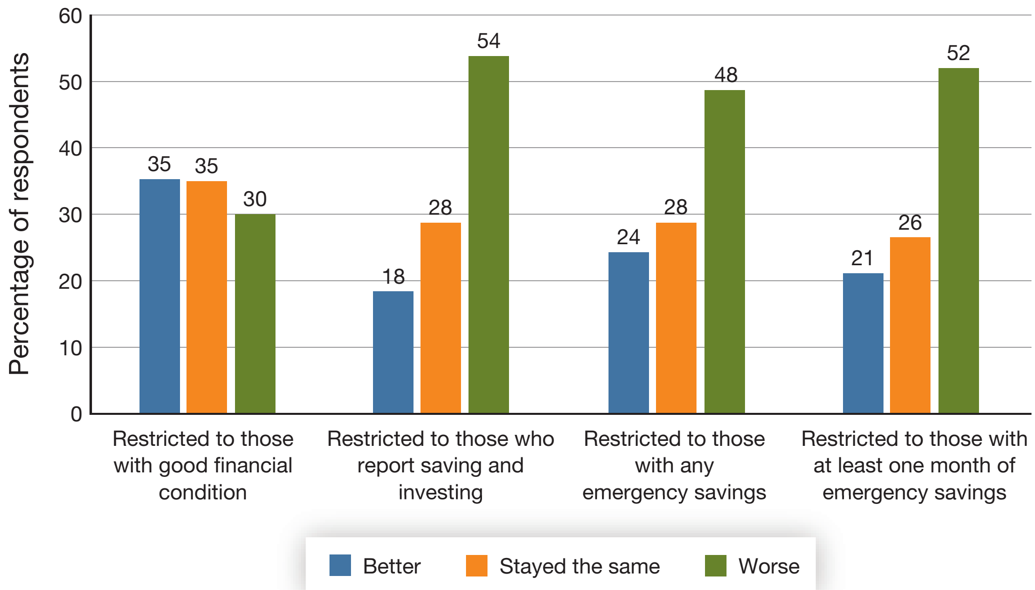
SOURCE: Produced using SOFS-A 2022 data.
NOTE: Tabulations were weighted. Military rates were estimated using SOFS-A.

investing. We tested this hypothesis by tabulating the extent to which food insecure members in good financial condition and who had savings reported improvements in their financial condition. The results are shown in Figure 4.4.

We found that among food insecure members who reported good financial condition (i.e., said they were very comfortable and secure or were able to make ends meet without much difficulty), just over one-third or 35 percent said their financial situation improved, 35 percent said their financial situation stayed the same, and 30 percent said their financial situation got worse. Thus, we found little evidence that an improved financial situation explains why food insecure members also reported good financial condition. Consistent with this finding, among food insecure members who reported saving and investing, only 18 percent also reported that their financial situation got better, and more than one-half (54 percent) reported that their financial situation got worse.[4] Just under one-half of food insecure members who reporting that they had any emergency savings said their financial situation

[4] Another possibility is that food insecure members who reported saving and investing and that their financial situation worsened usually save and invest but were currently experiencing acute food insecurity at the time of the survey.

Figure 4.4
Respondent-Reported Current Financial Situation Versus Situation 12 Months Ago, Among Food Insecure Respondents, 2022



SOURCE: Produced using SOFS-A 2022 data.
NOTE: Tabulations were weighted. Military rates were estimated using SOFS-A.

got worse, and only 24 percent said their financial situation improved. The distribution of responses in Figure 4.4 is similar to those with any emergency savings and those with at least one month of emergency savings. Thus, improved financial condition does not explain why food insecure members were able to report a good financial situation.

It is unclear how members could be food insecure while also reporting that they were able to make ends meet without difficulty, save, or maintain an emergency savings fund. It is further unclear how this is possible without a sizable share also reporting an improvement in financial circumstances. It is possible that some of those who were considered food insecure experienced a temporary period of food insecurity—for example, because of delays in receiving certain pays—but we were unable to discern the extent to which this might be true using SOFS-A. Another possibility is that the USDA short-form questionnaire does not accurately capture food insecurity of military members, the financial questions might not be measured accurately, or both might suffer from mismeasurement.

For those who appear to have a financial cushion, we conducted simulations that assumed that these members are food secure as opposed to food insecure. Specifically, if food insecure members who also reported good financial circumstances were not truly food insecure, either due to mismeasurement or because they were temporarily food insecure, then SOFS-A will overestimate food insecurity rates at the point in time when members responded to the survey. To estimate how much this potential overestimation is driving the gap between military and civilian food insecurity rates, we reclassified food insecure members who reported being in good financial condition, saving or investing, or maintaining emergency savings as were moved into the food secure group, and we estimated the recalculated the active-duty respondent food insecurity rate based on these simulations rates. This reclassification exercise is meant to be illustrative, and we are not taking a position on whether members should spend their money on food versus saving or investing or if food insecurity should be defined this way.

Table 4.1 show the results. We found that the difference between active-duty respondent and civilian food insecurity rates would fall. Reclassifying food insecure members who say their financial condition is very comfortable and secure or that they were able to make ends meet without much difficulty as food secure reduces the active-duty respondent food insecurity rate from 40 percent to 29 percent. Reclassifying food insecure members who reported saving and investing as food secure would reduce the active-duty respondent food insecurity rate to 15 percent, which is close to the national rate of 13 percent. If we reclassified food insecure members with any emergency savings as food insecure, the food insecurity rate would fall from 40 percent to 8 percent, which is below the national food insecurity rate of 13 percent and below our civilian estimated rate of 10 percent.

However, we were unable to construct the analogous alternative measures in the civilian data because the CPS does not ask the same questions about financial status. Presumably, the 10-percent civilian rate would be lower if we could make similar adjustments to the definition of who is labeled as food insecure. If we limit the emergency fund reclassification to those who have at least one month of emergency savings, then the food insecurity rate for active-duty respondents would be 19 percent. Reclassifying food insecure members as food secure if they meet any of the good financial status conditions (i.e., report good financial condition, report saving and investing, or report maintaining any emergency savings) would reduce the food insecurity rate for active-duty respondents to 5 percent.

TABLE 4.1

Reclassifying Food Insecure Active-Duty Respondents with Good Financial Status as Food Secure

Condition to Reclassify Food Insecure Members	Food Insecurity Rate
Reported being in good financial condition	29%
Reported saving and investing	15%
Reported that they had emergency savings	8%
Reported that they had at least one month's worth of emergency savings	19%
Reported being in good financial condition, saving and investing, or that they had emergency savings	5%

SOURCE: Features authors' tabulations using SOFS-A 2022 data.

Controlling for Differences in How Food Insecurity Is Measured

Military and civilian food insecurity rates might also differ because of differences in how food insecurity is measured between the two surveys. Both surveys use the USDA food security questionnaires, but the questions and the screening process are not the same.

The CPS uses 10 questions to determine food insecurity, as shown in Table A.1 in the appendix, with an additional eight questions asked of households with children. Households were deemed food insecure if they responded to at least three questions that indicate food insecurity (USDA, 2023b). In contrast, SOFS-A asks six questions to determine food insecurity, where the six questions are a subset of the ten questions used in the CPS, as shown in Table A.1 in the appendix, and a respondent is deemed food insecure if they respond to at least two questions that indicate food insecurity. We controlled for the differences in questions used by recalculating the CPS food insecurity rate using the six questions used in SOFS-A. For the CPS population, we found that the food insecurity rate would increase to 13.5 percent, and if we restricted to households with at least one full-time worker and those with at least a high school degree, the food insecurity rate would be 11.3 percent. This demonstrates that controlling for differences in questions asked does not account for the large disparity in food insecurity rates between active-duty respondents and the civilian population.

Next, we approximated the CPS screener in SOFS-A to determine whether the CPS screening process helps explain the difference in food insecurity rates. To reduce the burden of the survey on respondents, CPS allows households to skip the food security questionnaire if they meet the following three criteria: (1) have a household income above 185 percent of the federal poverty line, (2) respond no to a question about running out of money for food, and (3) respond "enough of the kinds of food we want to eat" to a question about describing the food eaten in your household (see Table 4.2 for specifics).

We estimated whether military households in SOFS-A were above 185 percent of the federal poverty line by making use of questions in the survey that asked about household income, marital status, and number of dependents. Questions 2 and 3 used in the CPS screener are not included in SOFS-A so, as an approximation, we made use of two questions that are part of SOFS-A's six food security questionnaire that are similar to these two questions as detailed in Table 4.2. To approximate the CPS screener in SOFS-A, we reclassified food insecure respondents in SOFS-A as food secure if they were estimated to have household income above 185 percent of the federal poverty line and answered negatively to questions about not having enough food and not being able afford balanced meals.

After approximating the CPS food security screener, as summarized in Table 4.2, we found that the food insecurity rate for active-duty respondents is 39 percent, only 1 percentage point lower than the overall 40 percent rate in the 2022 SOFS-A. Thus, the additional CPS

TABLE 4.2
Approximating the CPS Food Security Screener in SOFS-A

CPS Food Security Screener Criteria	SOFS-A Approximate Screener Criteria
Household income is above 185 percent of the federal poverty line.	We used household income bins, marital status, and number of dependents to estimate whether a respondent has household income above 185 percent of the federal poverty line.
Respondent responded “no” to: In the past 12 months, since December of last year, did you ever run short of money and try to make your food or your food money go further?	Service member responded “never true” to: The food that we bought just didn’t last and we didn’t have money to get more.
Respondent responded “enough of the kinds of food we want to eat” to: Which of these statements best describes the food eaten in your household—enough of the kinds of food we want to eat, enough but not always the kinds of food we want to eat, sometimes not enough to eat, or often not enough to eat?	Service member responded “never true” to: We couldn’t afford to eat balanced meals.

SOURCE: Produced using Rabbitt et al. (2023), OPA (2023).

screener that is not applied to the SOFS-A military population does not seem to explain the large difference between the active-duty respondent and civilian food insecurity rates.[5]

Controlling for Demographic Differences

Three recent studies have investigated whether demographic differences can explain the difference in civilian and military food insecurity rates. All three studies found that even controlling for demographic differences, the military food insecurity rate is higher than for demographically similar civilians. Asch et al. (2023) controlled for differences in age, gender, and education by reweighting the CPS data to match the active-duty population’s distribution of the intersection of these three characteristics (i.e., age by gender by education). They estimated that civilians with similar characteristics in terms of age, gender, and education as military personnel would have a food insecurity rate of 10.5 percent in 2020, a figure that is less than one-half the military food insecurity rate of 25 percent estimated in the 2020 SOFS-A. Heissel and Schanzenbach (2023) imputed military food insecurity rates by applying the food insecurity rates for different demographic groups in the CPS to the same demographic group in military personnel data using data from 2010 to 2021. They estimated that controlling for demographics would yield a military food insecurity rate of 6.9 percent, which is well below SOFS-A military food insecurity rates reported from the 2018, 2020, and 2022 surveys. Rab-

[5] In contrast, Ahn et al. (2020) found that implementing a screener did reduce estimated food insecurity rates by 20 percent. However, this estimated reduction used an internet survey limited to residents of Oklahoma in 2016.

bitt and Beymer (2024) compared military and civilian food insecurity rates using the 2018 and 2020 SOFS-A and CPS data, using a raking approach to construct a civilian population that matches the mean demographic characteristics of the military population. Similar to the other two studies, Rabbitt and Beymer (2024) found that the military food insecurity rate was higher than that for the civilian population.

These three studies suggest that factors other than demographic differences are driving differences between the civilian and military food insecurity rates, but the studies also have drawbacks. Asch et al. (2023) controlled for a limited set of demographics and excluded characteristics that have different distributions in the military population compared with the civilian population, such as spouse unemployment status and presence of children. Heissel and Schanzenbach (2023) controlled for a more expansive list of demographic characteristics, but they did not observe spouse employment status, household income, or food security status in their military data sources. Rabbitt and Beymer (2024) compared military and civilian food insecurity rates between SOFS-A and their demographically similar civilian population by individual characteristics but did not control for multiple characteristics in their comparisons. Moreover, all three studies used data that predate 2022, which is when SOFS-A experienced a large increase in military food insecurity.

The analysis in this section adds to this literature by investigating whether controlling for observable differences in characteristics between active-duty respondents and civilian populations explains the disparity in food insecurity rates. We leveraged the ability to observe food insecurity rates in SOFS-A for active-duty respondents and directly compared this food insecurity rate with the civilian food insecurity rate while controlling for different sets of attributes, including age, gender, education, presence of children, marital status, spouse unemployment status, and household income. Because of the small sample size, we were unable to condition on all the attributes at the same time, as we describe in more detail below.

Table 4.3 shows that the civilian population and the military respondents differ, demonstrating the potential importance of controlling for these differences when comparing food insecurity rates between these groups. Compared with the civilian population, military respondents are more likely to be younger, have a high school degree, be unmarried men, and have children. CPS has a variable indicating whether a household is above 185 percent of the federal poverty line because this is part of the criteria that could screen a household out of having to answer the USDA food security questionnaire. SOFS-A does not include this question for military personnel. To construct the analogous variable in SOFS-A, we used survey responses to household income, number of dependents, and marital status.[6]

[6] Household size is equal to 1 plus the number of dependents for unmarried members and equal to 2 plus the number of dependents for married members. SOFS-A reports household income bins that do not match with the federal poverty line cutoffs, so the above 185 percent of the federal poverty line in SOFS-A data is an approximation. Table A.11 in the appendix shows SOFS-A household income cutoffs used to define 185 percent of federal poverty line status.

TABLE 4.3
Comparison of Civilian Characteristics in CPS and Military Respondent Characteristics in SOFS-A, 2022

Characteristic	CPS	SOFS-A
Married, spouse unemployed	2%	3%
Unmarried male	21%	40%
Unmarried female	22%	10%
Age 18–29	11%	61%
Age 30–50	35%	38%
Age 50+	53%	1%
Less than a high school degree	8%	3%
High school degree	25%	61%
More than a high school degree	67%	34%
Yes, children	25%	39%
Above 185% of federal poverty line	76%	68%
Food insecure	13%	40%

SOURCE: Produced using SOFS-A 2022 data matched to DMDC data.

NOTE: Tabulations were weighted. The 2022 CPS tabulations excluded active-duty members. Percentages may not add up to 100 percent due to rounding. In SOFS-A, the indicator for being above 185 percent of the federal poverty line is imputed based on household income, marital status, and number of dependents reported by survey respondents.

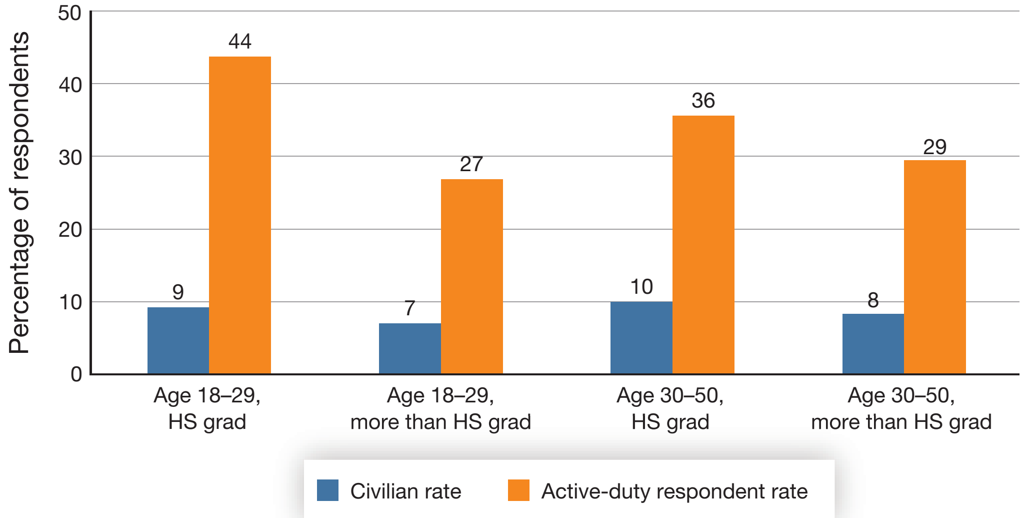
Table 4.3 shows that the military sample, when we do not adjust for demographic differences between the two groups, is less likely than civilians to have household income above 185 percent of the federal poverty line. Based on the differences shown in Table 4.3, we subset the CPS and SOFS-A data in various ways to determine whether differences in observable demographics help explain the disparity between their food insecurity rates. For this analysis, we limited the CPS sample to respondents with at least a high school degree. In addition, for married couples, we limited the sample to couples with at least one full-time worker and unmarried respondents were limited to full-time workers.[7]

Figures 4.5–4.8 compare food insecurity rates between civilian and active-duty respondents populations while controlling for age, gender, education, presence of children, marital status, and spouse unemployment status. Figures 4.4 and 4.5 present differences among

[7] We define a *full-time worke*r in CPS as someone who works at least 35 hours per week.

FIGURE 4.5

Food Insecurity Rates Among Civilians Versus Among Unmarried Male Active-Duty Respondents Without Children, 2022



SOURCE: Produced using CPS 2022 data and SOFS-A 2022 data.

NOTE: HS grad = high school graduate. Tabulations were weighted. Civilian rates were estimated using the 2022 CPS data and active-duty respondent rates were estimated using SOFS-A data. Civilian rates were restricted to those with at least a high school degree and to full-time workers.

unmarried individuals without children, and Figures 4.6 and 4.7 present differences among married couples.[8]

Figure 4.5 presents food insecurity rates for unmarried men without children with results further stratified by age group (18–29 and 30–50) and educational attainment (high school graduates and more than a high school graduate). Across all four groups, food insecurity rates for active-duty respondents were at least 3.5 times the food insecurity rates for civilians in the same demographic group. The military food insecurity rate ranged from 27 to 44 percent, and the civilian food insecurity rate ranged from 7 to 10 percent in the 2022 data.

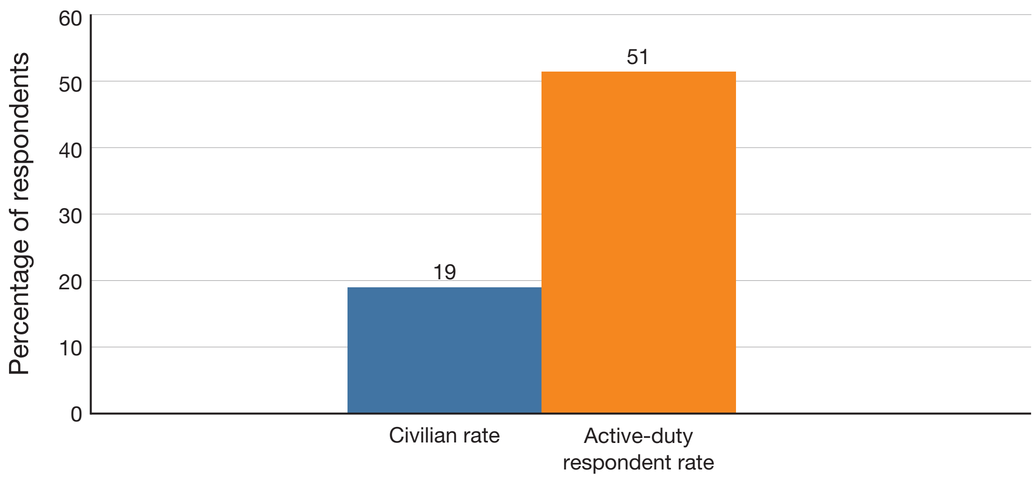
In Figure 4.5, we restricted the tabulations to unmarried women without children, age 18–29, and high school graduates, which is the only demographic subgroup among unmarried women without children with sufficient sample size and that represents a sizable share of the military population (5 percent) to merit a comparison.[9] We found that the food insecurity

[8] There are too few observations to compare food insecurity rates between military and civilian populations among unmarried individuals with children.

[9] Other demographic subgroups of unmarried women each represent no more than 1.5 percent of the military population, and, for some subgroups, the number of respondents in the CPS or SOFS-A was ten or fewer.

FIGURE 4.6

Food Insecurity Rates Among Civilian Versus Unmarried Female Active-Duty Respondents Without Children, Ages 18–29, High School Graduates, 2022



SOURCE: Produced using CPS 2022 data and SOFS-A 2022 data.

NOTE: Tabulations were weighted. Civilian rates were estimated using the 2022 CPS data and active-duty respondent rates were estimated using SOFS-A data. Civilian rates were restricted to full-time workers.

rate for active-duty respondents (51 percent) in 2022 was more than twice the civilian rate (19 percent) for this demographic group.

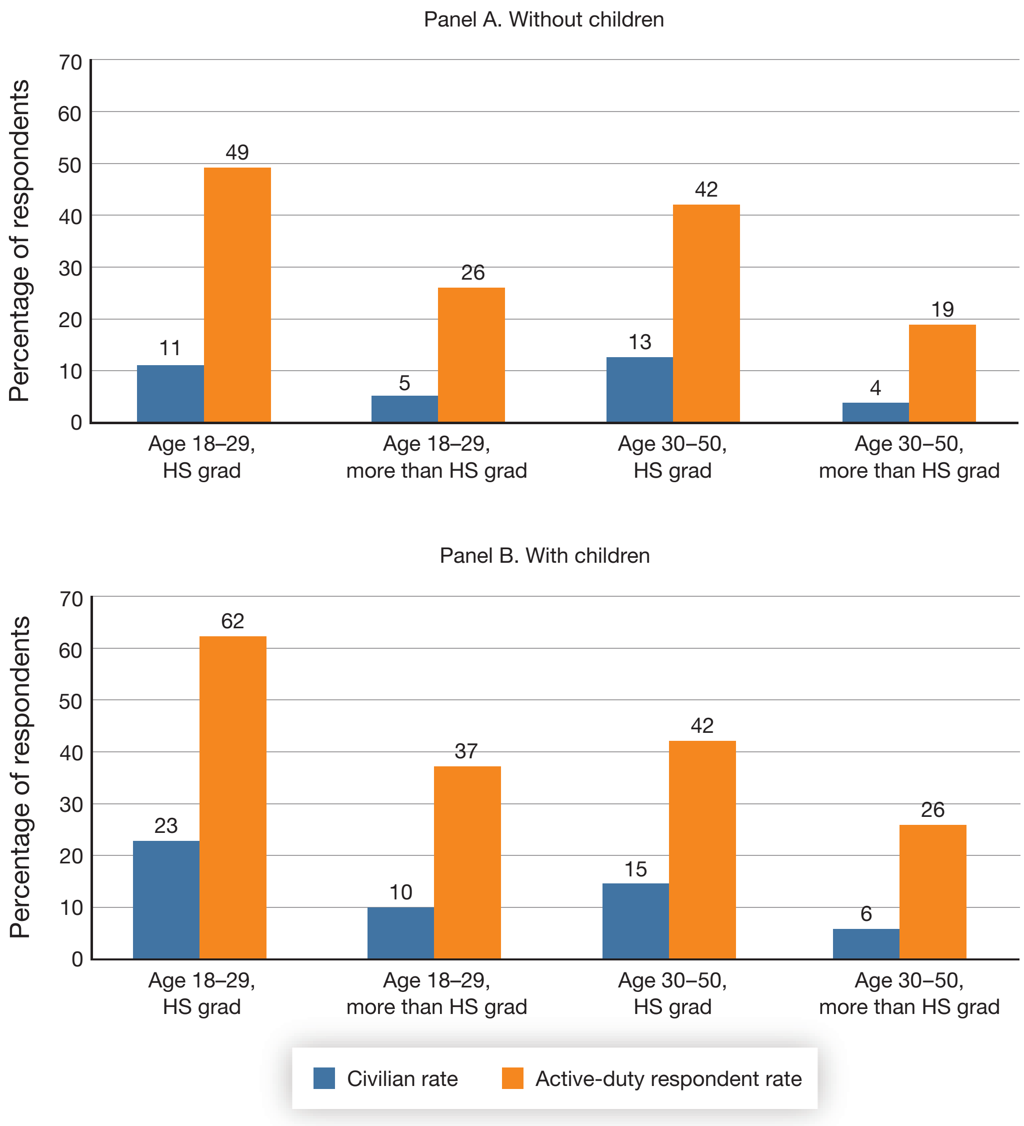
Figure 4.7 shows food insecurity rates among married couples with a spouse who was not unemployed for couples without children (panel a) and for couples with children (panel b). Spouses who were not unemployed could be employed or not in the labor force. Again, the figure shows that the food insecurity rate for active-duty respondents is orders of magnitude greater than the civilian food insecurity rate for each demographic group. Among married couples without children where the spouse was not unemployed, the food insecurity rate for active-duty respondents ranges from 19 to 49 percent, while the civilian food insecurity rate ranges from 4 to 13 percent. Among married couples with children where the spouse was not unemployed, the food insecurity rate for active-duty respondents ranges from 26 to 62 percent, while the civilian food insecurity rate ranges from 6 to 23 percent.

Figure 4.8 shows food insecurity rates among married couples with a spouse who is unemployed by whether children are present. We were unable to disaggregate further by age and educational attainment due to small sample size.[10] The food insecurity rate for married active-duty respondents without children is 47 percent, more than 20 percentage points higher than the civilian rate of 26 percent. For married couples with children, the difference

[10] Disaggregating further by age and educational attainment yield ten or fewer respondents in the CPS or SOFS-A.

FIGURE 4.7

Food Insecurity Rates Among Civilian Versus Married Active-Duty Respondents with Spouse Not Unemployed, 2022

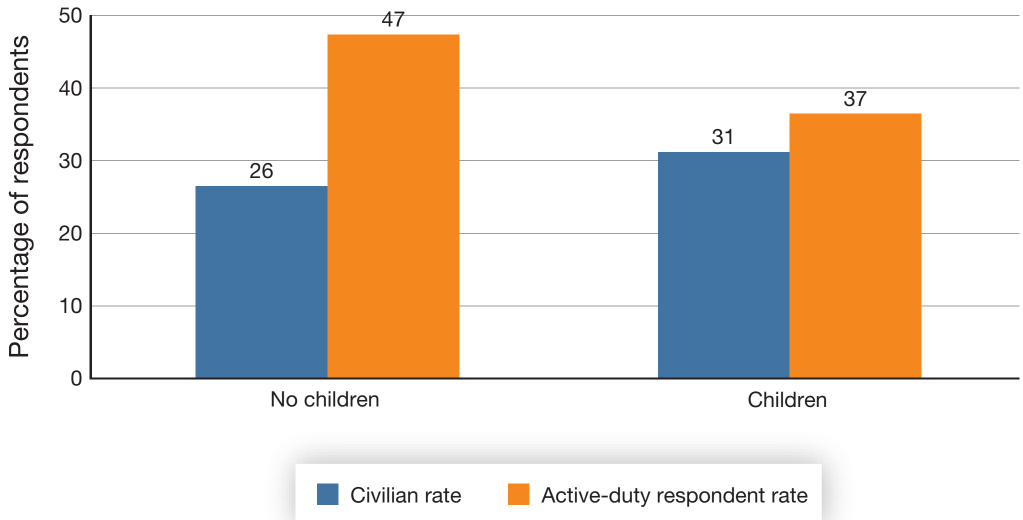


SOURCE: Produced using CPS 2022 data and SOFS-A 2022 data.

NOTE: HS grad = high school graduate. Tabulations were weighted. Civilian rates were estimated using the 2022 CPS data and active-duty respondent rates were estimated using SOFS-A data. Civilian rates were restricted to those with at least a high school degree and to full-time workers.

FIGURE 4.8

Food Insecurity Rates Among Civilian Versus Married Active-Duty Respondents with an Unemployed Spouse, 2022



SOURCE: Produced using CPS 2022 data and SOFS-A 2022 data.

NOTE: Tabulations were weighted. Civilian rates were estimated using the 2022 CPS data and active-duty respondent rates were estimated using SOFS-A data. Civilian rates were restricted to those with at least a high school degree and to full-time workers.

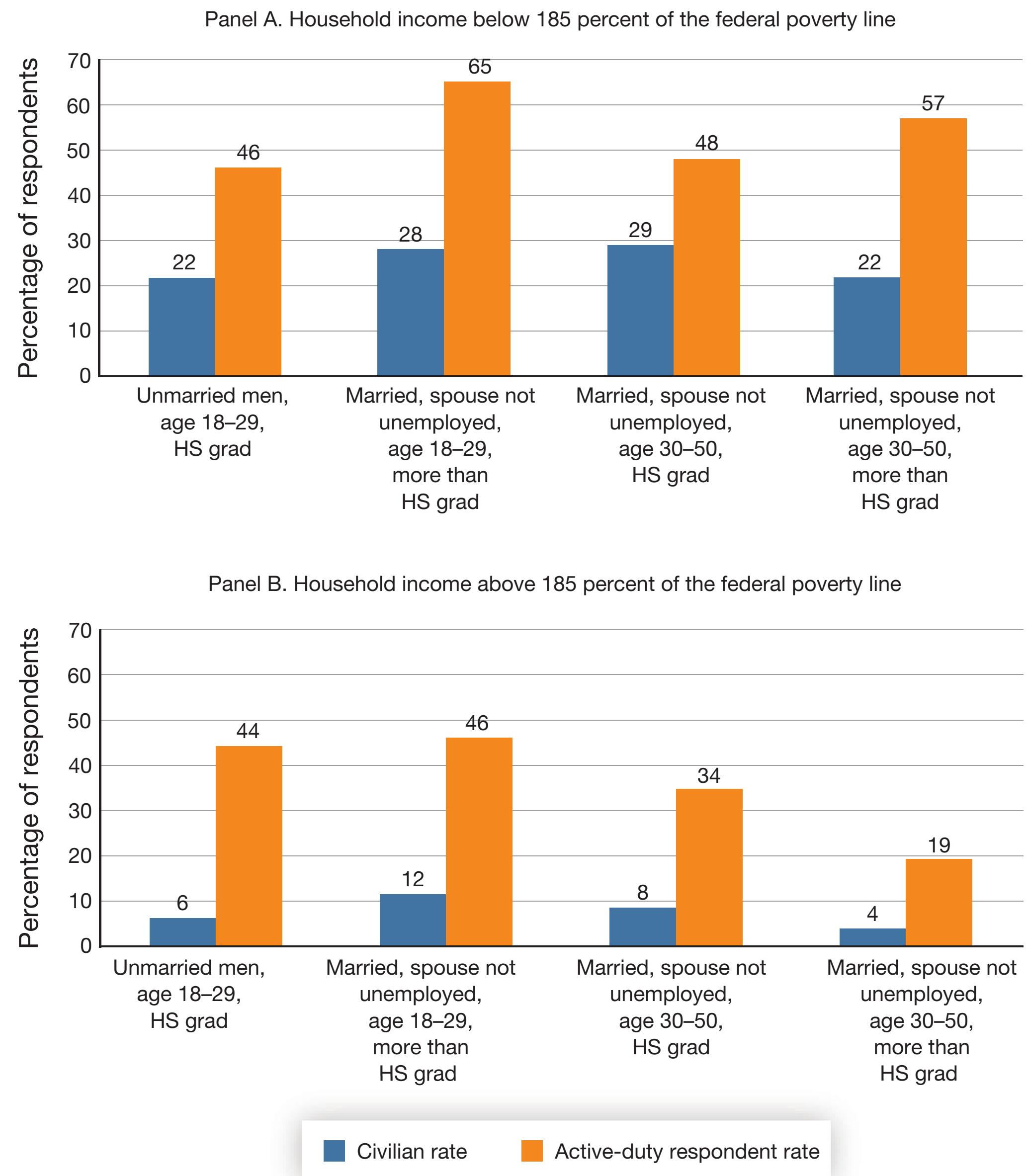
in rates is smaller: the food insecurity rate for active-duty respondents is 37 percent compared with a civilian food insecurity rate of 31 percent.

Figure 4.9 compares the active-duty respondent and civilian food insecurity rates by whether the household income was above 185 percent of the federal poverty line. We show the food insecurity rates for the four largest demographic groups by marital status, spouse employment, age, and educational attainment conditional on household income being above or below this cutoff, where the eight demographic groups presented represent more than 70 percent of the service member population in SOFS-A.[11] As expected, food insecurity rates were higher among households with lower income, but we also found that the active-duty respondent food insecurity rates were much larger than the civilian food insecurity rates. Among households with income below 185 percent of the federal poverty line, the active-duty respondent food insecurity rate varied between 46 percent and 65 percent, while the civilian rates varied between 22 and 29 percent. Among households with income above 185 percent of the federal poverty line, the active-duty respondent food insecurity rate varied between 19 percent and 46 percent, while the civilian rates varied between 4 percent and 12 percent.

[11] We are unable to subset the data further by presence of children due to small sample size in the surveys.

FIGURE 4.9

Food Insecurity Rates Among Civilian Versus Active-Duty Respondents by Whether Household Income is Above 185 Percent of the Federal Poverty Line, 2022



SOURCE: Produced using CPS 2022 data and SOFS-A 2022 data.

NOTE: HS grad = high school graduate. Tabulations were weighted. Civilian rates were estimated using the 2022 CPS data and active-duty respondent rates were estimated using SOFS-A data. Civilian rates were restricted to those with at least a high school degree. Unmarried respondents in the CPS data were limited to full-time workers. Married respondents in the CPS data were limited to couples with one spouse who was a full-time worker. In SOFS-A, the indicator for being above 185% of the federal poverty line was imputed based on household income, marital status, and number of dependents reported by survey respondents.

In summary, our analysis of demographic differences indicates that controlling for age, gender, education, presence of children, marital status, spouse unemployment status, and household income does not explain why active-duty respondent food insecurity rates were higher than civilian food insecurity rates in the 2022 data. The analysis was limited to characteristics observable in the CPS and SOFS-A data, and it is possible that unobservable characteristics explain the differences in food insecurity rates. For example, we did not observe financial and in-kind assistance from family and friends, yet Pew Research Center (Minkin et al., 2024) reports that 44 percent of adults aged 18 to 34 who have a living parent say they received financial help from their parents in the past 12 months. This rate was 68 percent among adults younger than 25, and 52 percent of adults aged 18 to 24 reported getting help with household expenses, such as groceries or utilities (Minkin et al., 2024). If civilian young adults are more likely to receive assistance from family and friends compared with young adults in the military, then this could help explain part of the difference in food insecurity rates (assuming that the SOFS-A military food insecurity rate is measured accurately). We also were unable to observe differences in financial literacy and financial management skills between the two populations or whether there were differences in the extent to which civilians and military populations provide financial assistance to others.

Discussion

In this chapter, we discuss our findings that controlling for differences in a broad set of observable characteristics, including age, gender, education, presence of children, marital status, spouse unemployment status, and household income, does not explain why military food insecurity rates are so much higher than civilian food insecurity rates. This finding is consistent with those of earlier studies that show that controlling for differences in demographics does not explain why military food insecurity rates are higher than those in the civilian population (Asch et al., 2023, Heissel and Schanzenbach, 2023; Rabbitt and Beymer, 2024). We also showed that accounting for differences in the questions used to derive food security status between CPS and SOFS-A nor the presence of the food security questionnaire screener in the CPS explain these differences.

Our analysis of SOFS-A data indicate that large shares of food insecure military members report good financial condition, report saving or investing, and have emergency savings. Yet only a minority of these respondents also reported an improvement in financial circumstances. One possibility is that some members who were identified as food insecure in SOFS-A were temporarily food insecure. Another possibility is that food insecurity or the financial circumstances might not be measured accurately. If we recategorized food insecure members as food secure when they reported good financial condition, saving or investing, or maintaining emergency savings as food secure, then military food insecurity rates would fall to between 5 to 29 percent, depending on the reclassification. CPS does not contain these questions about financial circumstances, so we were unable to make the analogous changes to the civilian food insecurity definitions, which would cause the 10-percent civilian food insecurity rate to decrease.

Other factors could also explain differences between military and civilian food insecurity rates. As mentioned earlier, we took the food insecurity rates as given, and it is unclear whether SOFS-A results pertaining to food insecurity can be generalized to the overall active-duty service population, given the survey limitations described in Chapter 2. Military and civilian populations could also differ in how they interpret questions in the food security questionnaires or have fundamentally different lifestyles that cause the military population to appear more food insecure. There could be differences in unobservable characteristics between military and civilian populations, such as propensity to send or receive financial or in-kind assistance from family and friends or differences in financial knowledge and management skills. There could also be differences in survey methodology and response rates. Another factor could be the time horizon over which food insecurity is measured. Asking about food insecurity over the previous 12 months might not be the best way to measure food insecurity in military or civilian populations. If food insecurity in the military is episodic, then SOFS-A food insecurity rates will overestimate the percentage of military members who are food insecure at any given point in time. Moreover, differences in military and civilian food insecurity rates could also be due to different ways military and civilians access food and differences in the method of data collection (i.e., SOFS-A is web-based, and the CPS is interview-based).

CHAPTER 5

Summary and Implications

The high rate of food insecurity among respondents in SOFS-A surveys, which are designed to be representative of the overall active-duty population, has raised questions about the economic security of members and whether military compensation plays a role. This question is particularly salient as Congress, as of summer 2024, contemplates a targeted pay raise of 15 percent to junior enlisted members to address food insecurity among junior enlisted members. Especially puzzling is the higher rate of food insecurity reported among military respondents compared with comparable civilians, despite higher average military pay relative to the earnings of most civilians. An additional question is whether better financial knowledge, well-being, and management skills reduce the likelihood of food insecurity in the military and whether these factors affect the relationship between food insecurity and compensation. The analysis summarized in this report investigate these questions in response to a request from the 14th QRMC.

We merged SOFS-A data on food insecurity in the military with administrative pay and personnel records to create an analysis file that would enable comparisons of cash compensation between respondents who reported being food insecure and those who reported being food secure. Cash compensation in the data includes basic pay, allowances, and special and incentive pays and can vary across members because of differences in the level and composition of these components. We assessed the relationship between the level of cash compensation and likelihood of food insecurity, controlling for other variables that might affect compensation or food security, including demographic characteristics, service characteristics, financial knowledge, and financial well-being and management skills. We considered not just the level of compensation but also the degree of variability of compensation experienced by respondents in the two years prior to the survey, because research on civilians suggest that individuals who experience more volatility in earnings are more likely to experience adverse health and welfare outcomes. We also took a closer look at why the military food insecurity rate reported in the survey is higher than the rate among civilians as reported by CPS data by examining differences in civilian versus military demographic characteristics, differences in screening for food insecurity, and, for military personnel, financial well-being. This chapter summarizes our main findings and conclusions.

Our analysis of the role of military compensation in explaining food insecurity took the 2022 SOFS-A data that we used as given and did not focus on resolving data limitations in the surveys (e.g., low response rates, long time lag). We also did not conduct an in-depth analysis of what the root causes of food insecurity are beyond our examination of the role of compensation, or why large shares of food insecure members in the 2022 SOFS-A also report having good financial circumstances. Thus, we do not know the reliability and robustness of the SOFS-A in measuring food insecurity in the overall active-duty population, and an important caveat to our analysis is that our results with respect to food insecurity and financial circumstances may not be generalizable beyond the survey samples we used. It is also important to note that our regression analysis was not a causal analysis and only shows associations between variables.

Relationship Between Military Food Insecurity and Compensation

Using the merged 2022 analysis sample that includes all enlisted and officer respondents, we found that increases in monthly cash compensation were associated with a reduced likelihood of food insecurity among respondents, although the estimated effect is relatively small, and we did not find a statistically significant association when we considered only junior personnel. We also found that an increase in the variability of cash compensation over the previous two years was associated with an increase in the likelihood of food insecurity. For example, in the baseline model with no other control variables, a 15-percent increase in monthly cash compensation was associated with a 3.57–percentage point reduction in the food insecurity rate, while a 30-percent decrease in variability was estimated to reduce the food insecurity rate by 7.7 percentage points, to 33.3 percent. These estimated relationships were even smaller once we also accounted for respondents' ability to save and other financial management skills. Estimates fell from 3.57 to 1.5 percentage points and from 7.7 to 4.9 percentage points, respectively. These findings for the military sample are consistent with research on civilians that shows that higher-income civilians are less likely to be food insecure but that savings and financial management skills mediate the relationship (Gunderson and Ziliak, 2018).

The results also provided evidence that higher levels of financial well-being and financial management are associated with lower levels of food insecurity. Even conditional on demographics and other factors in the model, the measures of financial well-being and financial management were highly statistically significant, and the impacts were large. As noted, accounting for financial well-being also reduced the magnitude of the relationship between pay and food insecurity.

Because our set of control variables did not include pay grade or years of service, the estimated negative relationship between compensation and likelihood of food insecurity could be the result of more-senior and higher-income respondents being less likely to be food insecure than more junior personnel. Because junior enlisted respondents were more likely to be food insecure, policymakers are particularly interested in whether higher compensation could help mitigate food insecurity among these personnel. To investigate this question, we conducted the regression analysis by seniority group, focusing specifically on junior enlisted

(E1 to E4), career enlisted (E5 to E9), junior officer (O1 to O3), and career officer (O4 and above). For junior enlisted respondents, we did not find a statistically significant relationship between compensation and likelihood of food insecurity in our fully specified model using the 2022 data, and the magnitude of the estimate was small. However, there was a statistically significant association for more-senior enlisted respondents (E5 to E9): A 15-percent pay increase is associated with a 2–percentage point decline in the likelihood of food insecurity for this group. However, these results were not strongly robust across survey years. That is, we found no consistent relationship between compensation and food insecurity across years for any specific subgroup of grades, including junior enlisted respondents. Career enlisted personnel in grades E5 to E9 showed the strongest possible relationship, where we estimated a negative association between compensation and food insecurity in two of the three survey years (2018 and 2022).

The implication of the analysis is that the relationship between compensation and food insecurity is complex with an important role for financial knowledge, well-being, and skills in explaining the relationship between compensation and food insecurity in the military. We found no evidence that raising cash compensation would significantly reduce the high rate of food insecurity reported among junior enlisted respondents, although it might have some positive impact for more-senior enlisted respondents. We found evidence that reducing variability in compensation could reduce the likelihood of food insecurity, although we were unable to investigate how reducing delays in receiving certain pays or fewer errors in receipt of those pays would affect variability and food insecurity with the data available to us. It is important to reiterate, however, that our analysis was not causal, and we only estimated associations between compensation and food insecurity.

Finally, although we did not find a robust relationship between cash compensation and food insecurity among junior enlisted members when we controlled for other factors across the three surveys (2018, 2020, and 2022), we considered by how much the rate of food insecurity would be predicted to fall if Congress increased cash compensation for junior enlisted members by 15 percent and how much would it cost, if, counter to our findings, we assumed our estimates for junior enlisted members were robust. Given that there are 553,445 E1 to E4 service members with at most ten years of service, we estimated that a 15-percent pay raise would reduce the number of food insecure E1 to E4 service members by 1,685 using our 2022 estimates and by 6,210 using the 2020 estimates. We estimated that the annual increase in cost to DoD in 2023 dollars would be $3.71 billion or $2.2 million per reduction in food insecure member ($3.71 billion/1,685) based on 2022 estimates or $597,100 based on the 2020 estimates.[1] The implication

[1] The $3.71 billion estimate assumes that the targeted pay raise involved only an increase in basic pay for E1 to E4s, and the cost estimate reflects the increase in basic pay costs in 2023 given the grade and year of service distribution of E1 to E4s in 2023, as well as the increase in the retirement accrual costs to DoD given that accrual costs are a multiple of the basic pay bill. This estimate understates the total cost because it ignores other elements of cost that depend on the basic pay bill, such as Federal Insurance Contributions Act taxes, and ignores how costs are affected in future years given that a given pay raise is built into future costs.

is that, even if we had found a robust relationship between pay and food insecurity, using a pay increase to address food insecurity among junior enlisted members would be disproportionately expensive because the estimated relationship is so small.

Explaining the Higher Reported Rate of Food Insecurity in the Military

Building on three previous studies, we examined whether controlling for additional demographic characteristics could explain higher food insecurity for the military sample versus the rate for similar civilians. We found that controlling for age, gender, education, presence of children, marital status, spouse unemployment status, and household income does not explain why military food insecurity rates are so much higher than civilian food insecurity rates, a finding consistent with the three earlier studies. The military survey data did not use the same set of questions to determine food insecurity status or include the same screening questions as the CPS data used to measure civilian food insecurity. When we controlled for differences in questions and approximated the CPS screening criteria, we were still unable to explain why military food insecurity rates were higher. This led us to conclude that neither accounting for differences in the questions used to derive food security status between civilians and military respondents nor the presence of the food security questionnaire screener in the civilian survey explained the differences in food insecurity rates between the two groups.

We found in the 2022 data that large shares of food insecure military respondents reported good financial condition, reported saving or investing, and had emergency savings. Nonetheless, only a minority of these respondents also reported an improvement in financial circumstances. One possibility is that some members who were identified as food insecure in the survey data were temporarily food insecure. Another possibility is that food insecurity or the financial circumstances might not be measured accurately, resulting in an overestimate of military food insecurity. When we conducted simulations that recategorized food insecure members as, instead, food secure if they reported good financial condition, saving or investing, or maintaining emergency savings, then food insecurity rates for active-duty respondents fell to between 5 percent and 29 percent.

The implication is that the higher rate of food insecurity among military respondents than civilians is not explained by differences in observable characteristics or differences in how people are screened in the different surveys. Instead, the different food insecurity rates could be due to differences in unobservable characteristics between military and civilian populations, such as the propensity to send or receive financial or in-kind assistance from family and friends or differences in financial knowledge and management skills. Other possible explanations are a difference in survey methodology and response rates or how the time horizon over which food insecurity is measured. Asking about food insecurity over the previous 12 months might not be the best way to measure food insecurity in military populations because a focus on 12 months could overestimate food insecurity that was short-lived and temporary.

Future data collection efforts on food insecurity in the military should consider the inclusion of questions that better capture (1) why some members who report a good financial condition and who save or invest are also food insecure and (2) temporary or short-lived incidents of food insecurity and the possible reasons for why these incidents occur.

Conclusion

This study considered the contribution of compensation to explaining the high rate of food insecurity of military members making use of DoD survey data of active duty personnel. We find that the relationship between compensation and food insecurity is not straightforward. Across military respondents, those with higher compensation are less likely to be food insecure, but demographic characteristics, service-related characteristics, and financial well-being and management skills have a mediating role that reduces the relationship between pay and food insecurity, and the estimated relationship is small overall. Financial well-being and financial management skills are important contributors to explaining food insecurity among the military respondents. Furthermore, at least part of the relationship between compensation and food insecurity is driven more by differences across junior and senior members rather than differences in pay within seniority groups. We found no strong evidence that the level or variability of pay contributes to higher food insecurity among junior enlisted respondents. Furthermore, we estimated that, even if our results were robust and statistically significant, they imply that using a pay increase to address food insecurity among junior enlisted members would be disproportionately expensive because the estimated relationship is so small. These results call into question policies that focus exclusively on raising junior enlisted pay to address food insecurity in the military. The study also points to the need for improvements in the data collection on food insecurity and the questions that capture the experiences of food insecure members and why and how often they are food insecure.

APPENDIX

Supplemental Tables and Analysis

Table A.1 displays the questions in CPS that screen for food security and denotes whether those questions are also included in SOFS-A.

TABLE A.1

Food Security Questionnaire in the Current Population Survey and SOFS-A

CPS Food Security Questionnaire	SOFS-A Inclusion
"We worried whether our food would run out before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?	
"The food we bought just didn't last, and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?	Yes
"We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?	Yes
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 or food? (Yes/No)	Yes
(If yes to question 4) How often did this happen—almost every month, some months but not every month, or in only 1-2 months?	Yes
In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? (Yes/No)	Yes
In the last 12 months, were you ever hungry, but didn't eat, because there wasn't enough money for food? (Yes/No)	Yes
In the last 12 months, did you lose weight because there wasn't enough money for food? (Yes/No)	
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)	
(If yes to question 9) How often did this happen—almost every month, some months but not every month, or in only 1-2 months?	

SOURCE: Rabbitt et al. (2023), Office of People Analytics (2023)

NOTE: CPS asks an additional eight questions to households with children. CPS respondents are food insecure if they respond to three questions in a way that indicates they are food insecure (USDA, 2023b).

The Big Three questions used to screen for financial literacy and their answer options are below (Lusardi and Mitchell, 2023).

1. Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?
   a. More than $102
   b. Exactly $102
   c. Less than $102
   d. Don't know
   e. Refuse to answer

2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, with the money in this account, would you be able to buy . . .
   a. More than today
   b. Exactly the same as today
   c. Less than today
   d. Don't know
   e. Refuse to answer

3. Do you think the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund.
   a. True
   b. False
   c. Don't know
   d. Refuse to answer

The text of the abbreviated CFPB financial well-being scale is below. Respondents were asked to identify how well they related to the statement (questions 1–3) or how often the statement applied to their lives (questions 4–5) (Consumer Financial Protection Bureau, undated).

1. Because of my money situation, I feel like I will never have the things I want in life.
   a. Completely
   b. Very well
   c. Somewhat
   d. Very little
   e. Not at all

2. I am just getting by financially.
   a. Completely
   b. Very well
   c. Somewhat

   d. Very little
   e. Not at all

3. I am concerned that the money I have or will save won't last.
   a. Completely
   b. Very well
   c. Somewhat
   d. Very little
   e. Not at all

4. I have money left over at the end of the month.
   a. Always
   b. Often
   c. Sometimes
   d. Rarely
   e. Never

5. My finances control my life.
   a. Always
   b. Often
   c. Sometimes
   d. Rarely
   e. Never

Table A.2 displays a comparison between 2022 SOFS-A respondents who matched with 2022 DMDC data and those who did not. Table A.3 compares characteristics of 2022 SOFS-A respondents who were no longer active duty at the time of the survey with those who were active duty. Table A.4 shows the share of food insecure respondents who answered affirmatively to each of the given questions in the six-question short form. Table A.5 shows the correlates of variability across different characteristic breakdowns and additions. Table A.6 shows the results of the regression broken down by grade for the 2022 SOFS-A. Table A.7 displays the summary statistics for E1 to E4 respondents to the 2022 SOFS-A. Table A.8 displays the summary statistics for E5 to E9 respondents to the 2022 SOFS-A. Table A.9 shows the results of the regression broken down by grade for the 2020 SOFS-A. Table A.10 shows the results of the regression broken down by grade for the 2018 SOFS-A. And Table A.11 shows the SOFS-A income cutoff used to determine 185 percent of the federal poverty line by household size.

Figure A.1 shows the distribution of household income by food insecurity status. Figure A.2 displays the relationship between compensation and food insecurity using tabulations from the 2022 SOFS-A data by grade. Figure A.3 displays the relationship between compensation and food insecurity using tabulations from the 2018 SOFS-A data by grade. Figure A.4 displays the relationship between compensation and food insecurity using tabulations from the 2020 SOFS-A data by grade

TABLE A.2

Comparing Characteristics: SOFS-A 2022 Respondents Who Matched DMDC Versus Those Who Did Not Match

Characteristic	Not matched to DMDC	Matched to DMDC	p-value
Female	0.20	0.17	0.19
Male	0.80	0.83	0.19
Age	33.60	28.27	0.00
Hispanic	0.13	0.21	0.00
Not Hispanic	0.87	0.76	0.00
White	0.80	0.74	0.01
Black	0.13	0.19	0.01
Asian	0.09	0.09	0.76
American Indian or Alaska Native	0.03	0.05	0.05
Native Hawaiian or Pacific Islander	0.02	0.02	0.55
Army	0.32	0.35	0.29
Navy	0.00	0.26	0.00
Marine Corps	0.04	0.13	0.00
Air Force	0.61	0.23	0.00
Coast Guard	0.02	0.03	0.43
Years of Service	11.29	7.91	0.00
E1	—	0.03	0.00
E2	0.00	0.05	0.00
E3	0.02	0.15	0.00
E4	0.03	0.21	0.00
E5	0.03	0.18	0.00
E6	0.02	0.13	0.00
E7	0.01	0.07	0.00
E8	0.00	0.02	0.03
E9	—	0.01	0.09
O1	0.04	0.02	0.00
O2	0.08	0.02	0.00
O3	0.31	0.05	0.00

Table A.2—Continued

Characteristic	Not matched to DMDC	Matched to DMDC	p-value
O4	0.16	0.03	0.00
O5	0.03	0.02	0.15
O6	0.01	0.01	0.73
W1	0.08	0.00	0.00
W2	0.13	0.00	0.00
W3	0.07	0.00	0.00
W4	0.00	0.00	0.86
W5	—	0.00	0.65
Spouse serving	0.18	0.14	0.06
Spouse working	0.47	0.48	0.71
Ever PCS	0.94	0.73	0.00
Months since last PCS	22.18	21.70	0.63
Any dependents	0.61	0.40	0.00
Dependents 0-5 (count)	1.26	1.20	0.31
Dependents 6-13 (count)	1.45	1.20	0.00
Dependents 14-18 (count)	0.64	0.65	0.88
Receive BAH	0.87	0.80	0.00
Observations	635	10848	.

SOURCES: Produced using authors' tabulations of 2022 SOFS-A data matched to 2022 DMDC data.

NOTE: *P*-values are from *t*-tests comparing whether the difference in means among those who matched to DMDC and who did not match is statistically significant.

TABLE A.3

Comparing Characteristics: Active-Duty 2022 SOFS-A Respondents Versus No Longer Active-Duty Respondents

Characteristic	No Longer Active Duty	Active Duty	p-value
Female	0.13	0.17	0.06
Male	0.87	0.83	0.06
Age	29.15	28.25	0.05
Hispanic	0.14	0.22	0.00

Table A.3—Continued

Characteristic	No Longer Active Duty	Active Duty	p-value
Not Hispanic	0.82	0.76	0.01
White	0.74	0.74	0.89
Black	0.22	0.19	0.17
Asian	0.09	0.09	0.81
American Indian or Alaska Native	0.03	0.05	0.12
Native Hawaiian or Pacific Islander	0.01	0.02	0.24
Army	0.17	0.35	0.00
Navy	0.25	0.26	0.72
Marine Corps	0.11	0.13	0.35
Air Force	0.46	0.22	0.00
Coast Guard	0.00	0.03	0.01
Years of Service	8.83	7.88	0.02
E1	0.01	0.03	0.04
E2	0.05	0.05	0.92
E3	0.10	0.15	0.01
E4	0.19	0.21	0.53
E5	0.23	0.17	0.02
E6	0.16	0.13	0.15
E7	0.07	0.07	0.84
E8	0.01	0.02	0.53
E9	0.00	0.01	0.29
O1	0.02	0.02	0.91
O2	0.01	0.02	0.19
O3	0.05	0.05	0.93
O4	0.04	0.03	0.51
O5	0.04	0.02	0.03
O6	0.02	0.01	0.16
W1	—	0.00	0.78
W2	—	0.00	0.42
W3	0.00	0.00	0.75

Table A.3—Continued

Characteristic	No Longer Active Duty	Active Duty	p-value
W4	0.00	0.00	0.60
W5	-	0.00	0.69
Spouse serving	0.11	0.14	0.24
Spouse working	0.44	0.48	0.23
Ever PCS	0.75	0.73	0.34
Months since last PCS	22.04	21.69	0.78
Any dependents	0.46	0.40	0.03
Dependents 0-5 (count)	1.25	1.19	0.41
Dependents 6-13 (count)	1.07	1.21	0.13
Dependents 14-18 (count)	0.76	0.65	0.20
Receive BAH	0.77	0.80	0.16
Observations	280	10,568	—

SOURCES: Produced using authors' tabulations of 2022 SOFS-A data matched to DMDC data.

NOTE: *P*-values are from *t*-tests comparing whether the difference in means among those on active duty and those no longer on active duty is statistically significant.

TABLE A.4

Share of Food Insecure Respondents Answering Affirmatively to Each Question in the Six-Question Short Form

Question	Share of Respondents
Food we bought didn't last, and we didn't have money to get more	0.87
Couldn't afford to eat balanced meals	0.90
Did you or other adults cut the size of your meals because there was not enough money for food?	0.66
How often did you cut the size of your meals or skip meals because there was not enough money for food	0.52
Did you or other adults eat less than you felt you should because there was not enough money for food?	0.71
Were you ever hungry but did not eat because there was not enough money for food?	0.57

SOURCE: Produced using authors' calculations using 2022 SOFS-A data matched to DMDC data.

TABLE A.5
Correlates of Variability

Characteristic	Pay	Add Pay-Related	Add dependents	Add service	Add demo-graphics	Add occupation
Total monthly compensation (log)	-0.0454***	-0.0498***	-0.0417***	-0.0398***	-0.0193	-0.0201
	(0.00842)	(0.0103)	(0.00883)	(0.00938)	(0.0142)	(0.0144)
Received special pay in survey month	0.0187***	0.0183***	0.0179***	0.0160***	0.0155***	0.0156***
	(0.00640)	(0.00597)	(0.00568)	(0.00500)	(0.00487)	(0.00446)
Received bonus in survey month	0.146***	0.148***	0.140***	0.134***	0.123***	0.119***
	(0.0225)	(0.0234)	(0.0236)	(0.0214)	(0.0198)	(0.0192)
Currently deployed		-0.0159**	-0.0158**	-0.0170**	-0.0167**	-0.0175**
		(0.00753)	(0.00796)	(0.00816)	(0.00808)	(0.00758)
Deployed within past 24 months		0.000461	-0.000705	-0.00157	-0.00198	-0.00165
		(0.00454)	(0.00438)	(0.00459)	(0.00484)	(0.00523)
Receives BAH (DMDC)		0.00881	0.00510	0.00846	0.00566	0.00534
		(0.0125)	(0.0107)	(0.0132)	(0.0132)	(0.0132)
PCS in last 12 months		0.0199***	0.0204***	0.0198***	0.0203***	0.0209***
		(0.00415)	(0.00381)	(0.00415)	(0.00400)	(0.00353)
Lives in high cost of living area		-0.0125	-0.00962	-0.0111*	-0.0105*	-0.0115*
		(0.00816)	(0.00772)	(0.00653)	(0.00633)	(0.00614)
Married (DMDC)			0.0248***	0.0220***	0.0209***	0.0194**
			(0.00791)	(0.00801)	(0.00752)	(0.00766)
Has any dependents (DMDC)			0.0122	0.0127	0.00902	0.0111
			(0.0106)	(0.00961)	(0.00903)	(0.00879)
Number of dependents (DMDC)			-0.0134***	-0.0139***	-0.0141***	-0.0141***
			(0.00341)	(0.00339)	(0.00352)	(0.00343)
Army				0.0292***	0.0312***	0.0279***

Table A.5—Continued

Characteristic	Pay	Add Pay-Related	Add dependents	Add service	Add demo-graphics	Add occupation
				(0.00934)	(0.0102)	(0.00851)
Navy				0.0210**	0.0199*	0.0176
				(0.0105)	(0.0119)	(0.0123)
Marine Corps				0.0145	0.0170	0.0183
				(0.0105)	(0.0123)	(0.0123)
Coast Guard				-0.0160*	-0.0184*	-0.0251**
				(0.00926)	(0.0106)	(0.0110)
Female					0.00564	0.00695
					(0.00808)	(0.00741)
Black					-0.00616	-0.00207
					(0.00441)	(0.00428)
Asian					-0.000304	0.00150
					(0.00346)	(0.00362)
American Indian or Alaska Native					0.00608	0.00530
					(0.00684)	(0.00706)
Native Hawaiian or Pacific Islander					0.000648	0.00196
					(0.00923)	(0.00935)
Hispanic					-0.000792	0.000997
					(0.00413)	(0.00415)
Education is BA or higher					-0.0178***	-0.0178***
					(0.00389)	(0.00387)
Enlisted					0.0113	0.0136
					(0.0103)	(0.0203)
Electronic Equipment Repairers						0.00924
						(0.00954)
Comm/ Intelligence specialists						0.00244

Table A.5—Continued

Characteristic	Pay	Add Pay-Related	Add dependents	Add service	Add demo-graphics	Add occupation
						(0.0155)
Health Care Specialists						-0.0180
						(0.0142)
Tech/Allied Specialists						0.00621
						(0.0191)
Functional Support/ Admin						-0.0344***
						(0.0104)
Electrical/Mechanic Repairers						-0.0186
						(0.0133)
Craftsworkers						-0.0296**
						(0.0120)
Service/Supply Handlers						-0.0253**
						(0.0118)
Non-Occupational						-0.0210
						(0.0163)
General officers						0.0130
						(0.0215)
Tactical Operations Officers						-0.0305**
						(0.0133)
Intelligence Officers						-0.0156
						(0.0174)
Engineering/ Maintenance Officers						-0.0173
						(0.0111)
Scientists and Professionals						-0.00784
						(0.0150)

Table A.5—Continued

Characteristic	Pay	Add Pay-Related	Add dependents	Add service	Add demo-graphics	Add occupation
Health Care Officers						0.0415**
						(0.0183)
Administrators						-0.0328***
						(0.00911)
Supply, Procurement, Allied Officers						-0.0241*
						(0.0123)
Non-Occupational						0.00210
						(0.0339)
Constant	0.510***	0.546***	0.474***	0.442***	0.265**	0.283**
	(0.0723)	(0.0858)	(0.0740)	(0.0777)	(0.128)	(0.132)
Observations	9,135	9,135	9,135	9,135	9,135	9,135
R-squared	0.075	0.084	0.105	0.118	0.125	0.148

SOURCES: Produced using authors' tabulations of SOFS-A 2022 matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. The dependent variable in each regression was pay variability as described in Chapter 3. The analysis was conducted with survey weights and includes members of the Coast Guard. Standard errors clustered at survey stratum level are shown in parenthesis. Air Force is the omitted service category, and infantry is the omitted occupation category. Variables with (DMDC) were taken from the administrative DMDC data, and all other variables come from SOFS-A. *** denotes that the result is statistically significant at the 1-percent level. ** denotes that the result is statistically significant at the 5-percent level. * denotes that the result is statistically significant at the 10-percent level..

TABLE A.6

Regression Results by Grade, 2022

Characteristic	Overall	E1-E4	E5-E9	O1-O3	O4-O6
Total monthly compensation (log)	-0.101***	-0.0203	-0.153***	0.0417	0.00848
	(0.0212)	(0.0423)	(0.0347)	(0.0503)	(0.0276)
Variability	0.163**	-0.0654	0.179	0.115	0.0172
	(0.0739)	(0.115)	(0.108)	(0.124)	(0.0480)
Female	0.0228	0.0352	0.0284	-0.0406*	-0.0332**
	(0.0165)	(0.0312)	(0.0225)	(0.0225)	(0.0145)

Table A.6—Continued

Characteristic	Overall	E1-E4	E5-E9	O1-O3	O4-O6
Black	-0.00712	0.00496	-0.0151	0.00323	0.0131
	(0.0159)	(0.0310)	(0.0242)	(0.0311)	(0.0283)
Asian	0.0618**	0.0796*	0.0693**	0.00250	0.00477
	(0.0250)	(0.0461)	(0.0295)	(0.0317)	(0.0218)
American Indian or Alaska Native	0.0977**	0.160***	0.0257	0.140	0.139*
	(0.0416)	(0.0448)	(0.0339)	(0.0859)	(0.0704)
Native Hawaiian or Pacific Islander	-0.0578	-0.124	0.00541	-0.187**	-0.0392
	(0.0600)	(0.0948)	(0.0514)	(0.0856)	(0.0428)
Hispanic	0.0198	0.0278	0.0180	-0.0251	0.0148
	(0.0148)	(0.0201)	(0.0212)	(0.0260)	(0.0183)
Married (DMDC)	-0.00822	-0.0564**	-0.00244	0.0253	-0.0518*
	(0.0236)	(0.0271)	(0.0276)	(0.0369)	(0.0288)
Has any dependents (DMDC)	0.0450	0.188***	-0.0295	-0.0240	0.0106
	(0.0302)	(0.0427)	(0.0319)	(0.0424)	(0.0262)
Number of dependents (DMDC)	-0.00471	-0.0291	0.00566	0.00392	0.00377
	(0.00532)	(0.0275)	(0.00622)	(0.0133)	(0.00524)
Army	0.0261	0.0451	0.0306	-0.0437	0.0231***
	(0.0175)	(0.0385)	(0.0189)	(0.0284)	(0.00769)
Navy	0.0407**	0.114***	0.0387*	-0.0812***	-0.00357
	(0.0185)	(0.0331)	(0.0206)	(0.0288)	(0.00863)
Marine Corps	-0.0266	0.0164	-0.0393**	-0.0518**	0.000453
	(0.0197)	(0.0405)	(0.0189)	(0.0237)	(0.0111)
Coast Guard	0.0168	0.0735**	0.00476	-0.0434	0.0310
	(0.0358)	(0.0305)	(0.0364)	(0.0656)	(0.0277)
Education is BA or higher	-0.0312**	-0.0712	-0.0113	0.00326	0.0320
	(0.0144)	(0.0457)	(0.0161)	(0.0352)	(0.0422)
Enlisted	0.128***	-	-	-	-
	(0.0354)				

Table A.6—Continued

Characteristic	Overall	E1-E4	E5-E9	O1-O3	O4-O6
Lives in high cost of living area	0.0244**	0.0248	0.0342**	-0.00422	0.00352
	(0.0102)	(0.0202)	(0.0157)	(0.0149)	(0.0138)
Currently deployed	-0.00969	-0.0151	-0.0232	-0.0136	0.0501
	(0.0267)	(0.0446)	(0.0452)	(0.0189)	(0.0336)
Deployed within past 24 months	0.00994	-0.00548	0.0218	-0.0261	0.0108
	(0.0125)	(0.0210)	(0.0162)	(0.0181)	(0.0137)
Receives WIC	0.134***	0.0932**	0.125***	0.585***	-0.0487*
	(0.0279)	(0.0389)	(0.0389)	(0.0591)	(0.0266)
Receives SNAP	0.0736	-0.0217	0.154**	-	0.0278
	(0.104)	(0.179)	(0.0622)		(0.242)
Answered all Big Three correctly	0.00286	0.0183	-0.000878	-0.0279*	-0.0384***
	(0.00954)	(0.0244)	(0.0104)	(0.0143)	(0.0134)
I am just getting by financially	0.0992***	0.0853***	0.110***	0.0665**	0.0617**
	(0.0121)	(0.0296)	(0.0159)	(0.0257)	(0.0269)
I am concerned that the money I have or will save won't last	0.0763***	0.0840***	0.0887***	0.0478***	0.0184*
	(0.0108)	(0.0229)	(0.0168)	(0.0167)	(0.0107)
Because of my money situation, I feel like I will never have the things I want	0.102***	0.105***	0.0899***	0.153***	0.0994***
	(0.0124)	(0.0285)	(0.0212)	(0.0272)	(0.0317)
My finances control my life	0.0708***	0.0586	0.0865***	0.0407***	0.0226
	(0.0193)	(0.0465)	(0.0215)	(0.0135)	(0.0209)
I have money left over at the end of the month	-0.179***	-0.190***	-0.200***	-0.110***	-0.0544***
	(0.0210)	(0.0485)	(0.0183)	(0.0276)	(0.00903)
Able to save something each month	-0.170***	-0.188***	-0.153***	-0.159***	-0.141***
	(0.0213)	(0.0463)	(0.0197)	(0.0367)	(0.0304)
Has emergency savings fund	-0.0307	0.0101	-0.0672***	0.0208	-0.0151

Table A.6—Continued

Characteristic	Overall	E1-E4	E5-E9	O1-O3	O4-O6
	(0.0200)	(0.0272)	(0.0229)	(0.0233)	(0.0392)
Provides financial assistance to family outside the hhld	0.0602***	0.0680***	0.0542**	0.0149	0.0487
	(0.0170)	(0.0209)	(0.0266)	(0.0326)	(0.0315)
Meals eaten in dining facilities per week	-0.00391**	-0.00644***	-0.000231	0.00401**	-0.000459
	(0.00153)	(0.00177)	(0.00233)	(0.00181)	(0.00102)
Electronic Equipment Repairers	-0.0313	-0.0619**	-0.0209	-	-
	(0.0192)	(0.0263)	(0.0232)		
Communications/ Intelligence Specialists	-0.0383	-0.0621	-0.0263	-	-
	(0.0278)	(0.0473)	(0.0315)		
Health Care Specialists	-0.0183	-0.0713	-0.0111	-	-
	(0.0317)	(0.0493)	(0.0354)		
Tech/Allied Specialists	-0.0298	-0.0412	-0.0343	-	-
	(0.0432)	(0.0626)	(0.0440)		
Functional Support/Admin	-0.00510	-0.00942	-0.0149	-	-
	(0.0265)	(0.0505)	(0.0337)		
Electrical/Mechanic Repairers	0.000418	-0.0209	0.00250	-	-
	(0.0295)	(0.0625)	(0.0245)		
Craftsworkers	0.00131	0.0472	-0.0168	-	-
	(0.0251)	(0.0440)	(0.0377)		
Service/Supply Handlers	0.00379	-0.0396	0.0251	-	-
	(0.0238)	(0.0428)	(0.0292)		
Non-Occupational	-0.00623	-0.0102	-0.0166	-	-
	(0.0724)	(0.102)	(0.0971)		
General Officers	0.0379	-	-	-0.0160	0.000175
	(0.0398)			(0.0468)	(0.0300)
Tactical Operations Officers	0.0529**	-	-	0.0109	0.0221
	(0.0237)			(0.0224)	(0.0295)

Table A.6—Continued

Characteristic	Overall	E1-E4	E5-E9	O1-O3	O4-O6
Intelligence Officers	0.0494	-	-	0.0317	0.0104
	(0.0305)			(0.0364)	(0.0375)
Engineering/Maintenance Officers	0.0613**	-	-	-0.00277	0.0696**
	(0.0302)			(0.0374)	(0.0339)
Scientists and Professionals	0.00500	-	-	-0.0826***	0.0283
	(0.0312)			(0.0176)	(0.0284)
Health Care Officers	0.0339	-	-	-0.00630	0.0521
	(0.0211)			(0.0233)	(0.0339)
Administrators	0.0705*	-	-	0.0218	0.0743***
	(0.0366)			(0.0438)	(0.0272)
Supply, Procurement, Allied Officers	0.0695**	-	-	0.0118	0.0610
	(0.0347)			(0.0331)	(0.0369)
Non-Occupational	0.0301	-	-	-0.0653	0.0548*
	(0.0315)			(0.0513)	(0.0322)
Constant	1.136***	0.600*	1.736***	-0.0658	0.0930
	(0.199)	(0.332)	(0.305)	(0.471)	(0.282)
Observations	9,135	1,672	3,925	1,408	1,934
R-squared	0.338	0.285	0.318	0.272	0.208

SOURCES: Produced using authors' calculations using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 9,135. The dependent variable in each regression was pay variability as described in Chapter 3. The analysis was conducted with survey weights and includes members of the Coast Guard. Standard errors clustered at survey stratum level are shown in parenthesis. Air Force is the omitted service category, and infantry is the omitted occupation category. Variables with (DMDC) were taken from the administrative DMDC data, and all other variables come from SOFS-A. *** denotes that the result is statistically significant at the 1-percent level. ** denotes that the result is statistically significant at the 5-percent level. * denotes that the result is statistically significant at the 10-percent level. BA = bachelor's degree; SNAP = Supplemental Nutrition Assistance Program.

TABLE A.7
Summary Statistics for E1 to E4, 2022

Characteristic	Overall	Food insecure	Food secure	P-value
Food insecurity	0.51	1.00	—	—
Total monthly compensation (log) (DMDC)	8.26	8.29	8.24	0.00
Total monthly compensation (DMDC)	$4,089	$4,164	$4,009	0.10
Pay variability (log) (DMDC)	0.16	0.17	0.16	0.21
Female	0.20	0.22	0.18	0.10
Black	0.21	0.22	0.21	0.69
Asian	0.09	0.10	0.08	0.14
American Indian or Alaska Native	0.07	0.09	0.05	0.02
Native Hawaiian or Pacific Islander	0.03	0.02	0.03	0.46
Hispanic	0.24	0.24	0.23	0.52
Married (DMDC)	0.46	0.53	0.39	0.00
Has any dependents (DMDC)	0.40	0.49	0.31	0.00
Number of dependents (DMDC)	0.63	0.78	0.47	0.00
Army	0.33	0.35	0.31	0.13
Navy	0.23	0.27	0.20	0.01
Marine Corps	0.20	0.18	0.22	0.03
Coast Guard	0.02	0.02	0.02	0.51
Education is BA or higher	0.05	0.05	0.06	0.18
Enlisted	1.00	1.00	1.00	—
Lives in high cost of living area	0.73	0.75	0.70	0.06
Currently deployed	0.05	0.04	0.06	0.05
Deployed within past 24 months	0.30	0.30	0.30	0.88
Receives WIC	0.05	0.07	0.03	0.00
Receives SNAP	0.01	0.01	0.01	0.74
Answered all Big Three correctly	0.26	0.26	0.26	0.76
I am just getting by financially	0.69	0.82	0.54	0.00
I am concerned that the money I have won't last	0.67	0.83	0.50	0.00
Because of my money situation I don't have the things I want in life	0.56	0.73	0.39	0.00

Table A.7—Continued

Characteristic	Overall	Food insecure	Food secure	P-value
My finances control my life	0.64	0.78	0.49	0.00
I have money left over at the end of the month	0.40	0.22	0.60	0.00
Able to save something each month	0.76	0.62	0.90	0.00
Has emergency savings fund	0.82	0.77	0.87	0.00
Provides financial assistance to family members outside hhld	0.18	0.23	0.13	0.00
Meals eaten in dining facilities	2.69	2.21	3.20	0.00
Occupations				
Infantry	0.13	0.14	0.12	0.29
Electronic Equipment Repairers	0.11	0.09	0.12	0.18
Comm/Intelligence specialists	0.12	0.10	0.14	0.02
Health Care Specialists	0.13	0.14	0.12	0.46
Tech/Allied Specialists	0.03	0.02	0.03	0.80
Functional Support/Admin	0.18	0.18	0.17	0.51
Electrical/Mechanic Repairers	0.17	0.18	0.17	0.73
Craftsworkers	0.03	0.04	0.03	0.50
Service/Supply Handlers	0.10	0.10	0.11	0.84
Non-Occupational Enlisted	0.01	0.01	0.01	0.33

SOURCE: SOFS-A 2022 merged to DMDC data.

NOTE: Analysis was restricted to members in grades E1 to E4 who had two full years of pay history. N = 1,672. The analysis was conducted with survey weights and includes members of the Coast Guard. *P*-values are from a *t*-test of whether the difference in the means between members who were food secure and food insecure are statistically significant. Variables with (DMDC) were taken from the administrative DMDC data, all other variables come from SOFS-A. BA = bachelor's degree; SNAP = Supplemental Nutrition Assistance Program.

TABLE A.8

Summary Statistics for E5 to E9, 2022

Characteristic	Overall	Food insecure	Food secure	*P*-value
Food insecurity	0.42	1.00	—	—
Total monthly compensation (log) (DMDC)	8.76	8.73	8.79	0.00
Total monthly compensation (DMDC)	$6,653	$6,438	$6,810	0.00
Pay variability (log) (DMDC)	0.11	0.12	0.11	0.05
Female	0.14	0.15	0.14	0.94

Table A.8—Continued

Characteristic	Overall	Food insecure	Food secure	*P*-value
Black	0.20	0.20	0.20	0.97
Asian	0.09	0.10	0.08	0.03
American Indian or Alaska Native	0.05	0.05	0.04	0.14
Native Hawaiian or Pacific Islander	0.02	0.03	0.02	0.23
Hispanic	0.19	0.21	0.18	0.17
Married (DMDC)	0.73	0.74	0.72	0.37
Has any dependents (DMDC)	0.78	0.78	0.78	0.82
Number of dependents (DMDC)	1.99	2.05	1.94	0.09
Army	0.34	0.36	0.33	0.15
Navy	0.29	0.32	0.26	0.00
Marine Corps	0.10	0.08	0.11	0.00
Coast Guard	0.03	0.03	0.04	0.26
Education is BA or higher	0.19	0.16	0.21	0.00
Enlisted	1.00	1.00	1.00	—
Lives in high cost of living area	0.75	0.77	0.73	0.02
Currently deployed	0.05	0.04	0.05	0.33
Deployed within past 24 months	0.32	0.33	0.32	0.78
Receives WIC	0.05	0.09	0.03	0.00
Receives SNAP	0.01	0.01	0.00	0.00
Answered all Big Three correctly	0.43	0.41	0.45	0.06
I am just getting by financially	0.61	0.84	0.43	0.00
I am concerned that the money I have won't last	0.63	0.84	0.47	0.00
Because of my money situation I don't have the things I want in life	0.50	0.73	0.34	0.00
My finances control my life	0.58	0.78	0.43	0.00
I have money left over at the end of the month	0.43	0.18	0.62	0.00
Able to save something each month	0.79	0.62	0.91	0.00
Has emergency savings fund	0.90	0.84	0.95	0.00
Provides financial assistance to family members outside hhld	0.18	0.24	0.14	0.00

Table A.8—Continued

Characteristic	Overall	Food insecure	Food secure	*P*-value
Meals eaten in dining facilities	1.22	1.19	1.24	0.76
Occupations				
Infantry	0.15	0.16	0.15	0.51
Electronic Equipment Repairers	0.10	0.09	0.10	0.75
Comm/Intelligence specialists	0.14	0.13	0.14	0.18
Health Care Specialists	0.08	0.09	0.08	0.49
Tech/Allied Specialists	0.03	0.03	0.04	0.37
Functional Support/Admin	0.18	0.18	0.19	0.38
Electrical/Mechanic Repairers	0.18	0.19	0.17	0.40
Craftsworkers	0.04	0.04	0.04	0.67
Service/Supply Handlers	0.09	0.10	0.09	0.24
Non-Occupational Enlisted	0.01	0.01	0.01	0.97

SOURCE: SOFS-A 2022 merged to DMDC data.

NOTE: Analysis was restricted to members in grades E5 to E9 who had two full years of pay history. N = 3,925. The analysis was conducted with survey weights and includes members of the Coast Guard. *P*-values are from a *t*-test of whether the difference in the means between members who were food secure and food insecure are statistically significant. Variables with (DMDC) were taken from the administrative DMDC data, all other variables come from SOFS-A.

TABLE A.9

Regression Results by Grade, 2020

Characteristic	Overall	E1 to E4	E5 to E9	O1 to O3	O4 to O6
Total monthly compensation (log)	-0.0708***	-0.0748**	-0.0277	0.0417	-0.00890
	(0.0176)	(0.0320)	(0.0363)	(0.0503)	(0.00935)
Variability	0.149**	0.167	0.0736	0.115	0.0256
	(0.0676)	(0.116)	(0.0848)	(0.124)	(0.0475)
Female	0.0165	0.0350	0.00209	-0.0406*	-0.0146*
	(0.0135)	(0.0262)	(0.0191)	(0.0225)	(0.00764)
Black	0.0101	0.000969	0.00790	0.00323	0.00146
	(0.0151)	(0.0320)	(0.0192)	(0.0311)	(0.0181)
Asian	0.0206	-0.0515	0.0654**	0.00250	0.0131
	(0.0229)	(0.0421)	(0.0279)	(0.0317)	(0.0141)

Table A.9—Continued

Characteristic	Overall	E1 to E4	E5 to E9	O1 to O3	O4 to O6
American Indian or Alaska Native	0.105***	0.0594	0.148***	0.140	-0.0465*
	(0.0302)	(0.0584)	(0.0324)	(0.0859)	(0.0239)
Native Hawaiian or Pacific Islander	-0.0512	-0.124***	-0.0275	-0.187**	-0.0106
	(0.0414)	(0.0412)	(0.0654)	(0.0856)	(0.0239)
Hispanic	0.0126	0.0148	0.00756	-0.0251	-0.0206**
	(0.0142)	(0.0224)	(0.0189)	(0.0260)	(0.00821)
Married (DMDC)	0.0163	0.0742*	-0.0227	0.0253	-0.00777
	(0.0165)	(0.0402)	(0.0224)	(0.0369)	(0.0162)
Has any dependents (DMDC)	-0.0391*	-0.0896**	-0.0458	-0.0240	0.0365**
	(0.0199)	(0.0403)	(0.0311)	(0.0424)	(0.0178)
Number of dependents (DMDC)	0.00755	0.0192	0.0107	0.00392	-0.00491*
	(0.00469)	(0.0221)	(0.00689)	(0.0133)	(0.00271)
Army	0.0385***	0.0259	0.0592***	-0.0437	0.00409
	(0.0142)	(0.0215)	(0.0164)	(0.0284)	(0.00875)
Navy	0.0540***	0.0574**	0.0601***	-0.0812***	0.00626
	(0.0172)	(0.0220)	(0.0204)	(0.0288)	(0.00611)
Marine Corps	-0.00469	-0.0535**	0.0230	-0.0518**	0.00343
	(0.0164)	(0.0208)	(0.0195)	(0.0237)	(0.0134)
Coast Guard	-0.0132	-0.0214	-0.00380	-0.0434	0.0294
	(0.0221)	(0.0211)	(0.0229)	(0.0656)	(0.0183)
Education is BA or higher	0.00768	-0.0781**	0.0363*	0.00326	0.0200
	(0.0141)	(0.0376)	(0.0204)	(0.0352)	(0.0249)
enlisted	0.0575	-	-	-	-
	(0.0359)				
Lives in high cost of living area	-0.0119	-0.0189	-0.0177	-0.00422	0.000572
	(0.0137)	(0.0284)	(0.0183)	(0.0149)	(0.0115)
Currently deployed	0.00973	0.00624	0.0113	-0.0136	-0.0115
	(0.0362)	(0.0690)	(0.0447)	(0.0189)	(0.0210)

Table A.9—Continued

Characteristic	Overall	E1 to E4	E5 to E9	O1 to O3	O4 to O6
Deployed within past 24 months	0.0285*	0.0430**	0.0346	-0.0261	0.0142**
	(0.0149)	(0.0193)	(0.0255)	(0.0181)	(0.00682)
Receives WIC	-0.00919	0.00362	-0.00955	0.585***	0.0270*
	(0.0187)	(0.0719)	(0.0207)	(0.0591)	(0.0143)
Receives SNAP	0.0723**	-0.192**	0.0962***	-	-0.0586*
	(0.0344)	(0.0921)	(0.0319)		(0.0335)
Answered all Big Three correctly	-0.00942	-0.00188	-0.0142	-0.0279*	-0.0319**
	(0.0108)	(0.0175)	(0.0157)	(0.0143)	(0.0147)
I am just getting by financially	0.0564***	0.0429	0.0654***	0.0665**	0.0305***
	(0.0145)	(0.0273)	(0.0169)	(0.0257)	(0.0100)
I am concerned that the money I have or will save won't last	0.0541***	0.132***	0.0191	0.0478***	0.00828
	(0.0159)	(0.0230)	(0.0139)	(0.0167)	(0.00797)
Because of my money situation, I feel like I will never have the things I want	0.0798***	0.0256	0.110***	0.153***	0.0244
	(0.0202)	(0.0366)	(0.0199)	(0.0272)	(0.0185)
My finances control my life	0.0647***	0.0747***	0.0665***	0.0407***	0.0348***
	(0.0130)	(0.0209)	(0.0194)	(0.0135)	(0.0103)
I have money left over at the end of the month	-0.154***	-0.183***	-0.177***	-0.110***	-0.0358***
	(0.0135)	(0.0217)	(0.0179)	(0.0276)	(0.0118)
Able to save something each month	-0.143***	-0.220***	-0.0956***	-0.159***	-0.0925**
	(0.0281)	(0.0288)	(0.0345)	(0.0367)	(0.0457)
Has emergency savings fund	0.0743**	0.0389	0.0852	0.0208	0.204**
	(0.0312)	(0.0361)	(0.0569)	(0.0233)	(0.0947)
Provides financial assistance to family outside the hhld	0.219***	0.213***	0.208**	0.0149	0.245*

Table A.9—Continued

Characteristic	Overall	E1 to E4	E5 to E9	O1 to O3	O4 to O6
	(0.0626)	(0.0781)	(0.103)	(0.0326)	(0.136)
Electronic Equipment Repairers	0.0227	-0.0519	0.0616***	0.00401**	-
	(0.0244)	(0.0343)	(0.0227)	(0.00181)	
Comm/ Intelligence specialists	0.0250	-0.0564	0.0646***	-	-
	(0.0259)	(0.0387)	(0.0191)		
Health Care Specialists	0.0530**	-0.0112	0.0655*	-	-
	(0.0236)	(0.0416)	(0.0335)		
Tech/Allied Specialists	-0.0134	0.0106	-0.00439	-	-
	(0.0229)	(0.0612)	(0.0239)		
Functional Support/ Admin	0.00122	-0.0237	0.0104	-	-
	(0.0323)	(0.0649)	(0.0305)		
Electrical/Mechanic Repairers	0.0290	-0.0286	0.0577**	-	-
	(0.0262)	(0.0494)	(0.0221)		
Craftsworkers	0.0492	-0.0293	0.0906*	-	-
	(0.0343)	(0.0380)	(0.0516)		
Service/Supply Handlers	-0.00241	-0.0885**	0.0387	-	-
	(0.0326)	(0.0413)	(0.0561)		
Non-Occupational	-0.0217	-0.0242	0.0312	-	-
	(0.0990)	(0.0962)	(0.155)		
General officers	0.0543*	-	-	-0.0160	-0.0274
	(0.0293)			(0.0468)	(0.0208)
Tactical Operations Officers	0.0179	-	-	0.0109	0.0112
	(0.0258)			(0.0224)	(0.0118)
Intelligence Officers	0.0205	-	-	0.0317	-0.00752
	(0.0245)			(0.0364)	(0.0199)
Engineering/Maintenance Officers	0.00527	-	-	-0.00277	0.0263***
	(0.0186)			(0.0374)	(0.00926)

Table A.9—Continued

Characteristic	Overall	E1 to E4	E5 to E9	O1 to O3	O4 to O6
Scientists and Professionals	0.0191	-	-	-0.0826***	0.00268
	(0.0205)			(0.0176)	(0.0171)
Health Care Officers	0.00956	-	-	-0.00630	0.000970
	(0.0212)			(0.0233)	(0.0141)
Administrators	0.00600	-	-	0.0218	0.0129
	(0.0274)			(0.0438)	(0.0200)
Supply, Procurement, Allied Officers	0.0146	-	-	0.0118	0.0158
	(0.0244)			(0.0331)	(0.0123)
Non-Occupational	-0.0236	-	-	-0.0653	-0.0156
	(0.0213)			(0.0513)	(0.0122)
Constant	0.613***	0.861***	0.263	-0.0658	-0.0553
	(0.189)	(0.282)	(0.348)	(0.471)	(0.197)
Observations	9,592	1,519	3,756	1,408	2,543
R-squared	0.269	0.276	0.244	0.272	0.146

SOURCES: Produced using authors' calculations using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. N = 9,592. The dependent variable in each regression was pay variability as described in Chapter 3. The analysis was conducted with survey weights and includes members of the Coast Guard. Standard errors clustered at survey stratum level are shown in parenthesis. Air Force is the omitted service category, and infantry is the omitted occupation category. Variables with (DMDC) were taken from the administrative DMDC data, and all other variables come from SOFS-A. *** denotes that the result is statistically significant at the 1-percent level. ** denotes that the result is statistically significant at the 5-percent level. * denotes that the result is statistically significant at the 10-percent level.

TABLE A.10
Regression Results by Grade, 2018

Characteristic	(1)	(2)	(3)	(4)	(5)
	Overall	E1-E4	E5-E9	O1-O3	O4-O6
Total monthly compensation (log)	-0.118***	0.106*	-0.147***	-0.109***	-0.00456
	(0.0238)	(0.0539)	(0.0274)	(0.0331)	(0.0163)
Variability	0.165**	0.00477	0.185**	0.0199	-0.0278

Table A.10—Continued

Characteristic	(1)	(2)	(3)	(4)	(5)
	(0.0656)	(0.102)	(0.0904)	(0.0408)	(0.0356)
Female	0.00589	0.0310	-0.0214	-0.00459	-0.00761
	(0.0189)	(0.0267)	(0.0245)	(0.0119)	(0.00613)
Black	0.0116	0.0599	-0.0341**	0.0139	0.0360**
	(0.0245)	(0.0373)	(0.0172)	(0.0197)	(0.0137)
Asian	0.0217	-0.0211	0.0549	0.0152	0.00810
	(0.0237)	(0.0438)	(0.0385)	(0.0148)	(0.0151)
American Indian or Alaska Native	0.00475	-0.112*	0.0621	-0.0850***	0.117**
	(0.0314)	(0.0569)	(0.0517)	(0.0278)	(0.0502)
Native Hawaiian or Pacific Islander	0.0213	-0.165	0.0626	-0.00929	0.0548
	(0.0490)	(0.102)	(0.0625)	(0.0642)	(0.0560)
Hispanic	0.0133	-0.0454	0.0356	0.0320	0.0291
	(0.0202)	(0.0405)	(0.0233)	(0.0199)	(0.0190)
Married (DMDC)	0.0243	0.0808	-0.0139	0.0116	-0.0223
	(0.0195)	(0.0560)	(0.0209)	(0.0278)	(0.0240)
Has any dependents (DMDC)	0.0347	-0.0405	0.0456*	0.0129	-0.00608
	(0.0224)	(0.0657)	(0.0236)	(0.0280)	(0.0213)
Number of dependents (DMDC)	-0.000772	0.0134	0.00662	0.00128	0.00462
	(0.00477)	(0.0176)	(0.00756)	(0.00510)	(0.00294)
Army	0.0442***	0.110***	0.0157	0.0233	0.0109*
	(0.0150)	(0.0290)	(0.0200)	(0.0150)	(0.00626)
Navy	0.0577**	0.168***	0.0316*	0.00864	-0.00229
	(0.0226)	(0.0339)	(0.0184)	(0.0172)	(0.00661)
Marine Corps	-0.00704	0.0360	-0.00671	-0.00214	0.00394
	(0.0166)	(0.0348)	(0.0192)	(0.0151)	(0.00891)
Coast Guard	0.0129	0.0335	-0.0151	0.0592	0.00390
	(0.0166)	(0.0429)	(0.0223)	(0.0377)	(0.0167)
Education is BA or higher	-0.00795	-0.0790	0.0191	0.0121	-0.00944
	(0.0187)	(0.0533)	(0.0186)	(0.0531)	(0.0425)
Enlisted	0.0655***	-	-	-	-

Table A.10—Continued

Characteristic	(1)	(2)	(3)	(4)	(5)
	(0.0242)				
Lives in high cost of living area	0.00736	0.00503	0.00944	0.00474	0.00250
	(0.0120)	(0.0388)	(0.0182)	(0.0105)	(0.00659)
Currently deployed	-0.0139	0.0119	-0.0383	-0.0441	-0.0257***
	(0.0336)	(0.0521)	(0.0423)	(0.0278)	(0.00824)
Deployed within past 24 months	0.0101	0.0234	0.00389	0.0169*	-0.00699
	(0.0159)	(0.0405)	(0.0186)	(0.00900)	(0.00777)
Receives WIC	-0.00817	-0.130	0.00940	0.0459	0.0161
	(0.0158)	(0.0841)	(0.0166)	(0.0399)	(0.0183)
Receives SNAP	0.0898**	0.305**	0.0721	0.109	-0.00482
	(0.0402)	(0.120)	(0.0462)	(0.133)	(0.0349)
Answered all Big Three correctly	-0.00865	0.00794	-0.0221*	0.00203	0.00565
	(0.0117)	(0.0277)	(0.0115)	(0.0137)	(0.00823)
I am just getting by financially	0.0274*	0.0105	0.0304	0.0499***	0.0210**
	(0.0165)	(0.0303)	(0.0194)	(0.0168)	(0.0102)
I am concerned that the money I have or will save won't last	0.0519***	0.102***	0.0397***	0.0358***	0.00962*
	(0.0137)	(0.0330)	(0.0125)	(0.0119)	(0.00568)
Because of my money situation, I feel like I will never have the things I want	0.0656***	0.118***	0.0432**	0.0544***	0.0126
	(0.0157)	(0.0337)	(0.0194)	(0.0202)	(0.00955)
My finances control my life	0.109***	0.0590	0.142***	0.0612***	0.0457***
	(0.0264)	(0.0541)	(0.0238)	(0.0174)	(0.0125)
I have money left over at the end of the month	-0.151***	-0.175***	-0.169***	-0.0418	-0.0352***
	(0.0135)	(0.0260)	(0.0155)	(0.0302)	(0.00880)
Able to save something each month	-0.158***	-0.200***	-0.137***	-0.0967**	-0.0380
	(0.0194)	(0.0371)	(0.0280)	(0.0428)	(0.0279)
Has emergency savings fund	-0.0855***	-0.0150	-0.118***	-0.0825*	-0.0850**
	(0.0232)	(0.0358)	(0.0237)	(0.0439)	(0.0339)
Provides financial assistance to family outside the hhld	0.151**	0.00730	0.179***	0.387**	0.589***

Table A.10—Continued

Characteristic	(1)	(2)	(3)	(4)	(5)
	(0.0764)	(0.113)	(0.0589)	(0.187)	(0.125)
Electronic Equipment Repairers	-0.0171	0.0102	-0.0363	-	-
	(0.0279)	(0.0411)	(0.0298)		
Comm/ Intelligence specialists	-0.0442*	-0.0223	-0.0406	-	-
	(0.0253)	(0.0534)	(0.0262)		
Health Care Specialists	-0.0484	-0.0776	-0.0404	-	-
	(0.0312)	(0.0482)	(0.0447)		
Tech/Allied Specialists	-0.0433	-0.0846	-0.0277	-	-
	(0.0324)	(0.0891)	(0.0283)		
Functional Support/Admin	-0.0441*	-0.00504	-0.0489	-	-
	(0.0257)	(0.0373)	(0.0305)		
Electrical/Mechanic Repairers	-0.0172	0.0270	-0.0378	-	-
	(0.0238)	(0.0474)	(0.0249)		
Craftsworkers	-0.0117	0.0150	-0.0156	-	-
	(0.0404)	(0.108)	(0.0412)		
Service/Supply Handlers	0.00546	0.0533	-0.0450	-	-
	(0.0313)	(0.0553)	(0.0289)		
Non-Occupational	-0.0426	0.0129	-0.0561	-	-
	(0.0794)	(0.124)	(0.0629)		
General officers		-	-	-0.0749	-0.0213
				(0.0563)	(0.0196)
General officers	3.93e-05	-	-	-0.0957**	-
	(0.0191)			(0.0458)	
Tactical Operations Officers	0.00918	-	-	-0.0423	0.00959
	(0.0173)			(0.0385)	(0.0134)
Intelligence Officers	0.0227	-	-	-	-0.00698
	(0.0288)				(0.0170)
Engineering/Maintenance Officers	-0.00627	-	-	-0.0172	-0.00427
	(0.0189)			(0.0475)	(0.0198)
Scientists and Professionals	3.05e-05	-	-	-0.0554	0.00151

Table A.10—Continued

Characteristic	(1)	(2)	(3)	(4)	(5)
	(0.0220)			(0.0394)	(0.0188)
Health Care Officers	-0.0213	-	-	-0.0626	0.00422
	(0.0176)			(0.0381)	(0.0141)
Administrators	-0.0119	-	-	-0.0443	-0.0145
	(0.0181)			(0.0412)	(0.0141)
Supply, Procurement, Allied Officers	0.0183	-	-	-0.0190	0.00290
	(0.0197)			(0.0421)	(0.0187)
Non-Occupational	-0.00545	-	-	-0.0518	-0.0245
	(0.0219)			(0.0416)	(0.0161)
Constant	1.310***	-0.495	1.664***	1.172***	0.204
	(0.208)	(0.412)	(0.239)	(0.305)	(0.158)
Observations	12,491	1,413	5,193	2,075	3,313
R-Squared	0.279	0.280	0.273	0.189	0.148

SOURCES: Produced using authors' calculations using SOFS-A 2022 data matched to DMDC data.

NOTE: Analysis was restricted to members who had two full years of pay history. *N* = 12,491. The dependent variable in each regression was pay variability as described in Chapter 3. The analysis was conducted with survey weights and includes members of the Coast Guard. Standard errors clustered at survey stratum level are shown in parenthesis. Air Force is the omitted service category, and infantry is the omitted occupation category. Variables with (DMDC) were taken from the administrative DMDC data, and all other variables come from SOFS-A. *** denotes that the result is statistically significant at the 1-percent level. ** denotes that the result is statistically significant at the 5-percent level. * denotes that the result is statistically significant at the 10-percent level.

TABLE A.11

SOFS-A Income Cutoffs Used to Determine 185 Percent of Federal Poverty Line by Household Size

2022 185% of FPL Household Income Cutoff	Household Size	Define as above 185% of FPL if SOFS-A Household Income is:
$24,462	1	$25,000+
$32,958	2	$35,000+
$42,606	3	$50,000+
$51,338	4	$50,000+
$60,070	5	$75,000+

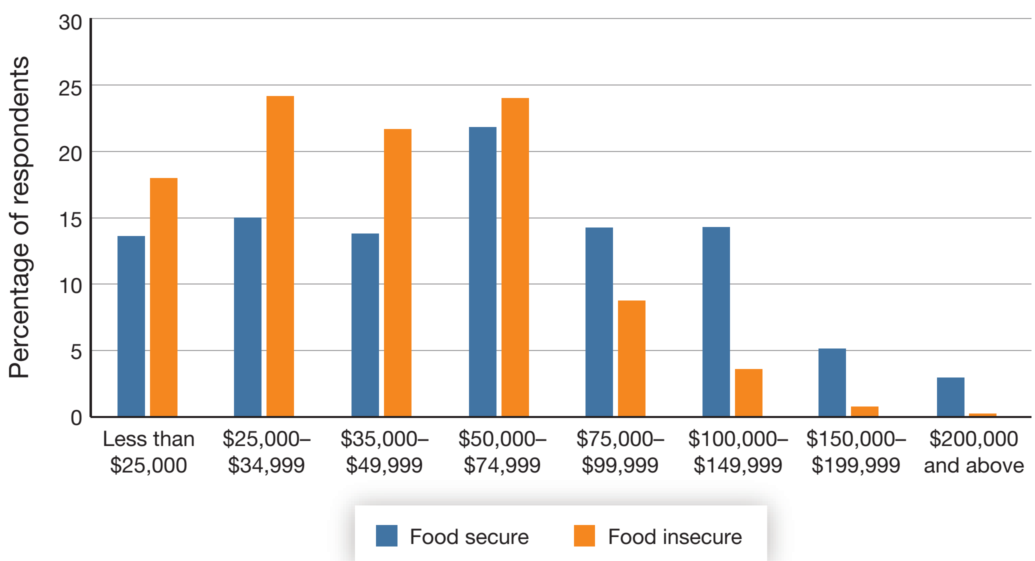
Table A.11—Continued

2022 185% of FPL Household Income Cutoff	Household Size	Define as above 185% of FPL if SOFS-A Household Income is:
$68,802	6	$75,000+
$77,534	7	$75,000+
$86,266	8	$100,000+

SOURCE: 185 percent of the federal poverty line cutoffs are from U.S. Department of Health and Human Services (undated).

NOTE: FPL = federal poverty line. Tabulations are weighted. Percentages may not add up to 100 percent due to rounding. In SOFS-A, the indicator for being above 185 percent of the federal poverty line was imputed based on household income, marital status, and number of dependents reported by survey respondents.

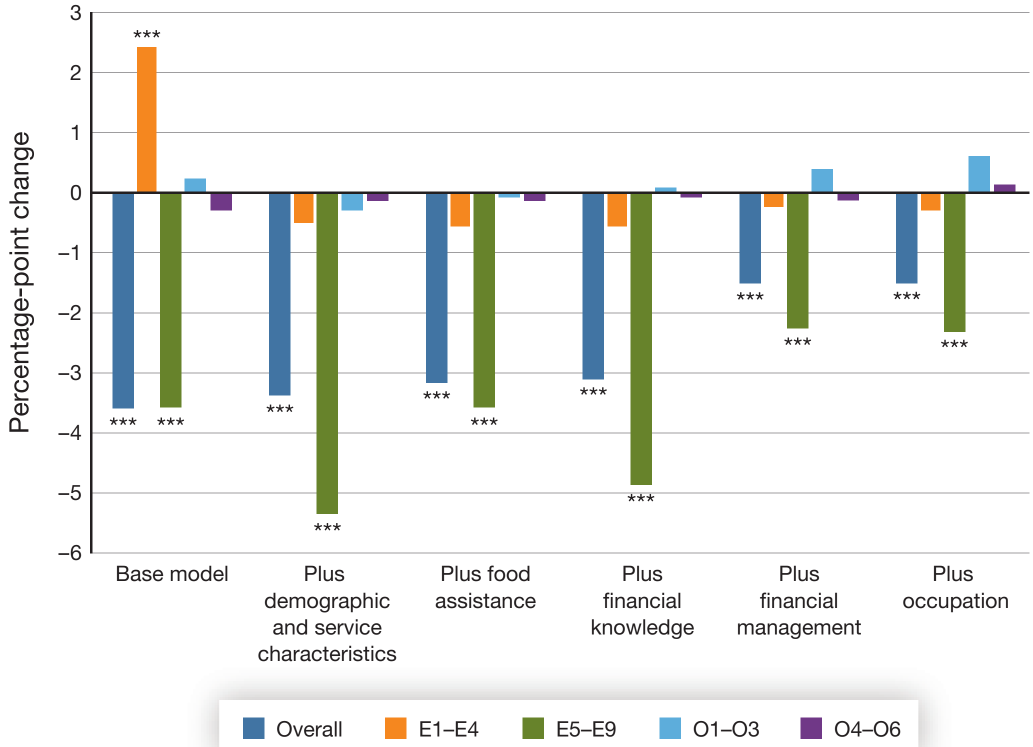
Figure A.1. Distribution of Household Income by Food Insecurity Status



SOURCES: Produced using SOFS-A 2022 data matched to DMDC data.
NOTE: Tabulations incorporated survey weights and included members of the Coast Guard.

FIGURE A.2

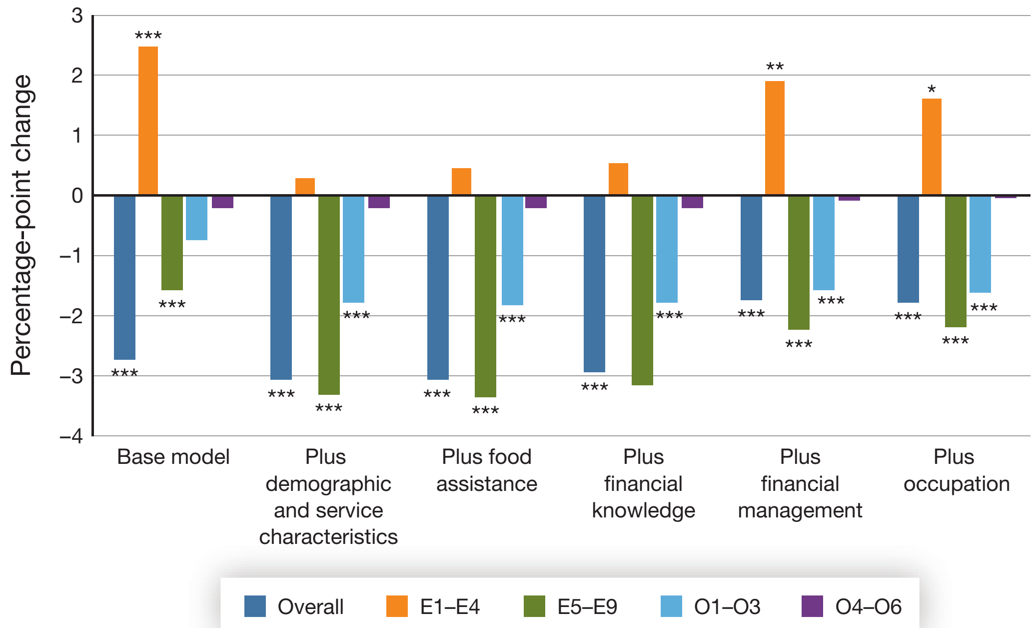
Relationship Between a 15-Percent Change in Monthly Cash Compensation and Food Insecurity in 2022, by Grade



SOURCES: Produced using SOFS-A 2022 data matched to DMDC pay records.
NOTE: Analysis used survey weights and incorporated members of the Coast Guard. *** $p < 0.01$.

FIGURE A.3

Relationship Between a 15-Percent Change in Monthly Cash Compensation and Food Insecurity in 2018, by Grade

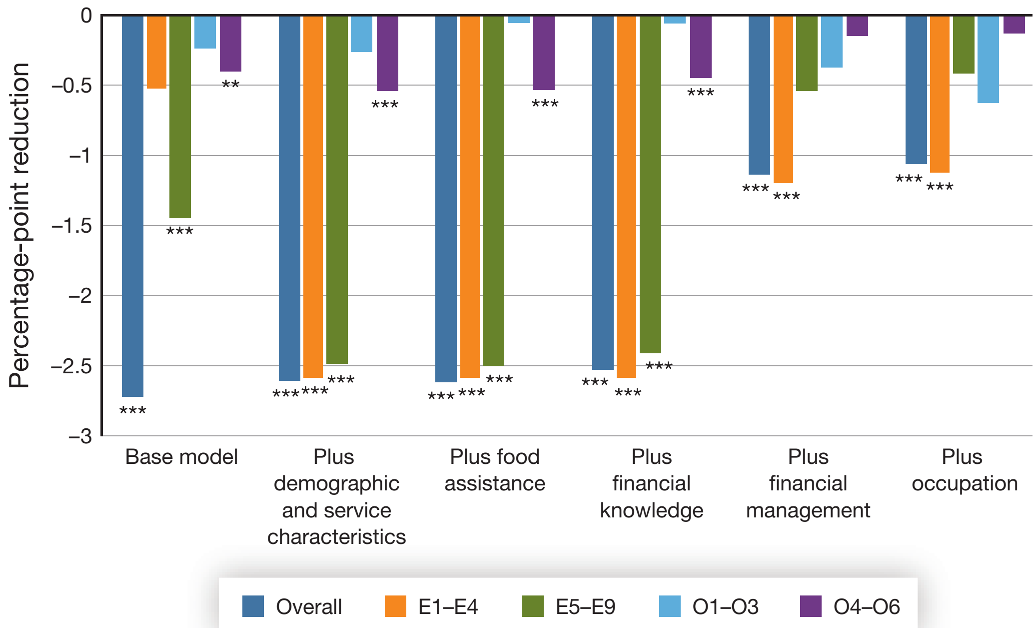


SOURCES: Produced using SOFS-A 2018 data matched to DMDC pay records.

NOTE: Analysis used survey weights and incorporated members of the Coast Guard. *** $p < 0.01$.

FIGURE A.4

Relationship Between a 15-Percent Change in Monthly Cash Compensation and Food Insecurity in 2020, by Grade



SOURCES: Produced using SOFS-A 2018 data matched to DMDC pay records.
NOTE: Analysis used survey weights and incorporated members of the Coast Guard. *** $p < 0.01$.

Abbreviations

BA	bachelor's degree
BAH	basic allowance for housing
BAS	basic allowance for subsistence
BNA	basic needs allowance
CFPB	Consumer Financial Protection Bureau
CPS	Current Population Survey
DMDC	Defense Manpower Data Center
DoD	U.S. Department of Defense
NDAA	National Defense Authorization Act
NDRI	National Defense Research Institute
OPA	Office of People Analytics
OUSD(P&R)	Office of the Under Secretary, Personnel & Readiness
PCS	permanent change of station
QRMC	Quadrennial Review of Military Compensation
SNAP	Supplemental Nutrition Assistance Program
SOFS-A	Status of the Forces Survey of Active Duty Members
TSP	Thrift Savings Plan
USDA	U.S. Department of Agriculture
WIC	Special Supplemental Nutrition Program for Somen, Infants, and Children

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RAND NATIONAL SECURITY RESEARCH DIVISION

With an estimated military food insecurity rate of 25 percent, according to 2018 and 2020 survey data, policymakers are interested in whether levels and components of military compensation affect food insecurity. The analysis in this report is in response to a request from the 14th Quadrennial Review of Military Compensation (QRMC) to (1) provide an assessment of whether and to what degree military compensation explains military food insecurity and (2) analyze why food insecurity rates are higher among military personnel than among civilians. The White House charter for the 14th QRMC includes a mandate to consider military compensation from the standpoint of strengthening members' economic security.

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