Research Report

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Reassessing the Basic Allowance for Housing for Army Personnel in a Rapidly Changing Housing Market

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About This Research Report

This report documents research and analysis conducted as part of a project entitled *Assessing the Basic Allowance for Housing (BAH) in a Rapidly Changing U.S. Housing Market*, sponsored by the Assistant Secretary of the Army (Manpower and Reserve Affairs). The purpose of the project was to provide information on how the fit between BAH and area housing prices has evolved for Army personnel and the implications of that fit for the adequacy of housing for Army personnel.

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Summary

The research reported here was completed in March 2024, followed by security review by the sponsor and the U.S. Army Office of the Chief of Public Affairs, with final sign-off in December 2024.

The rising housing prices and inflation since 2020 have brought attention to the adequacy of the Basic Allowance for Housing (BAH) for military personnel. Nearly half of households in states with major Army installations are rent-burdened, and one-quarter are severely rent-burdened (Joint Center for Housing Studies, undated).[1] BAH rates are based on geographic location, rank, and dependency status (i.e., whether the member has dependents) and are intended to offset service members' housing costs. However, concerns have been raised about the BAH data collection methodology and the quality of privatized Army housing projects, which are set to BAH rates.

The Seventh Quadrennial Review of Military Compensation (QRMC) in 1992 set forth two objectives for the military housing allowance (U.S. Department of Defense, 1992, p. 7):

- The housing allowance should be sufficient to procure housing commensurate with that occupied by civilians at similar income levels and
- A service member should be unaffected by the housing price variations between locations.

That is, the methodology should result in rates that are accurate in terms of reflecting housing prices in each area where members live, reliable in terms of using the same methodology across locations, and fair across locations by holding members harmless when they move in terms of the cost of adequate housing. These objectives are described in the 2018 BAH Primer produced by the Defense Travel Management Office and embedded in the U.S. Code Title 37, Section 403, defining BAH.[2] But the BAH methodology has not been reviewed since it was established in 1998, though the 14th QRMC charter in 2023 includes a requirement to review BAH from a service-wide perspective. The Army requested that RAND Arroyo Center assess the adequacy of BAH and the BAH rate-setting methodology from the standpoint of the Army and recent changes in the housing market.[3] This report summarizes that assessment.

[1] *Rent burdened* is defined as spending more than 30 percent of gross household income on rent, and *severely rent burdened* is defined as spending more than 50 percent of gross household income on rent (Dawkins and Jeon, 2017).

[2] According to the primer, the purpose of BAH is "to provide fair housing to service members" (Defense Travel Management Office, 2018, p. 1). It further states that "DoD determines an equitable housing allowance to enable members to afford housing near their duty location" (p. 1) and is designed to provide accurate housing allowances based on the market price of rental housing. Furthermore, the primer indicates that DoD and the services conduct on-site evaluations to confirm "reliability and accuracy of the rental data" (p. 3).

[3] This study began August 2022, before the QRMC charter was established in January 2023 requiring a review of BAH.

Approach

Our approach involves using pay and personnel data on Army personnel from the Defense Manpower Data Center, data for the U.S. population and active duty military personnel from the U.S. Census Bureau's American Community Survey (ACS) for 2017–2021, and housing-related data from other sources to assess the adequacy of BAH for military personnel focusing on six Army installations, accounting for about half of the Army's active duty force that receives BAH.

First, we assess the BAH methodology by considering the housing choices made by military personnel and whether soldiers are making choices consistent with the way the allowance is set. For this analysis, we examine the extent to which soldiers live in the military housing areas (MHAs) used to determine BAH rates, whether they live in the housing profiles that DoD assigns to their grade and dependent status, and whether their housing expenditures equal their BAH rate for their location. While members are not required to live in the MHA assigned to their duty location or in the housing profile DoD uses to define their BAH rate, the validity of the methodology used to set BAH rates is better supported if a sizable share of members choose to live in the MHAs and in the housing profiles used by the DoD methodology.

Second, we assess the adequacy of BAH and the housing procured by members by using the 2017–2021 ACS data to assess the extent to which the housing expenditures of active duty military members are comparable to income-matched civilians and to civilians with comparable demographic characteristics. We also assess the extent to which we observe differences in location amenities across the MHAs surrounding the six exemplar installations for military personnel versus civilians. The location amenities we consider are commuting distance, school quality, and violent and property crime rates.

Finally, we assess the extent to which the BAH methodology adequately captured changes in housing prices, particularly given the dramatic increases in both rents and home sale prices in the years since the start of the coronavirus disease 2019 (COVID-19) pandemic. These changes raised the question of how well the BAH methodology performs when housing prices increase very quickly. For this final analysis, we use publicly available data on changes in rental prices and housing costs from Zillow and compare them with changes in BAH.

Key Findings

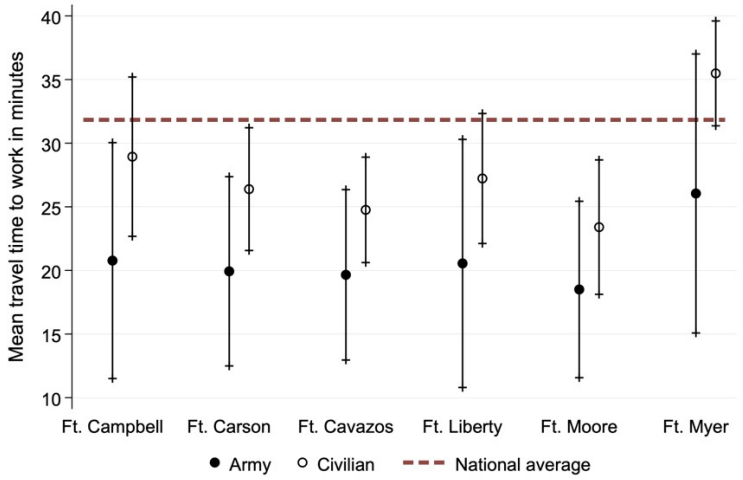
The key findings from our analysis of the adequacy of BAH for Army personnel are as follows:

- Army personnel receiving BAH generally live in the MHA to which they are assigned by DoD, indicating that the zip codes used to define MHAs in the BAH methodology are effective in covering the zip codes where Army personnel reside. This finding is consistent with the DoD target of collecting rental data within an MHA corresponding to the set of zip codes where 90 percent of service members assigned to the MHA live.
- Army personnel tend to live in housing types that differ from the type they are "assigned" in terms of how their BAH amount is set. Military households tend to consume more housing than civilian households of comparable age, education status, and dependency status. This

difference in housing choice may reflect differences in the available housing stock in these areas and more granular differences in family structure, such as the number and ages of children.

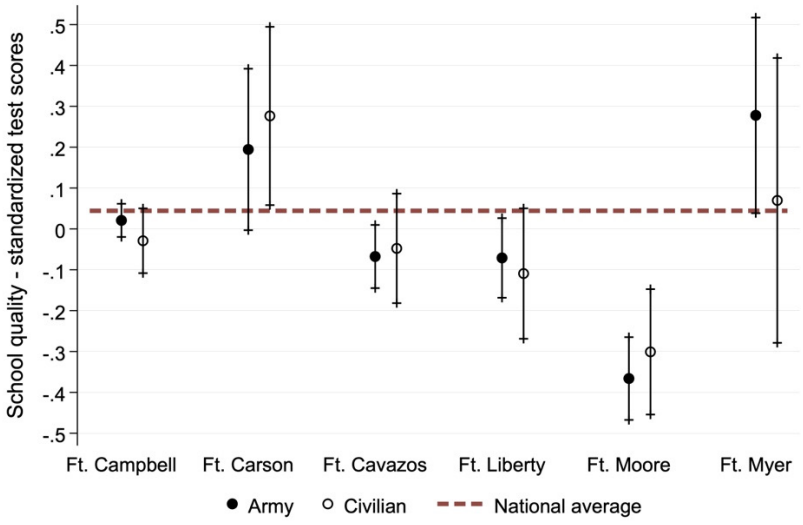
- At the MHA level, BAH covers or more than covers housing expenditures, on average, for military households in most MHAs included in our analysis, except for junior officers—and even for this group, the share of MHAs where BAH fully covers housing expenditures is, on average, over 40 percent. This suggests that BAH rates tend to be adequate in covering the housing that members choose.
- Military households procure housing that is at least as good, in terms of expenditures, as that of civilians with similar incomes. Among renters, military households in 2021 spent between $2,700 and $4,350 more annually than comparable civilians in the same locations and for the same types of housing.
- Military households also spend more on housing than civilians who are comparable in terms of demographic characteristics, also controlling for geographic area and housing type. Because the analysis controls for location, housing profile, and demographics, it is likely that military members procure better-quality housing than comparable civilians, in terms of characteristics not observable in our data—for example, newer or higher-quality construction, remodeled kitchens, pools, and so forth.
- Differences across the six Army installations we examined in terms of commuting travel time, school quality, violent crime, and property crime for military personnel suggest that these amenities are not equalized across locations (Figures S.1–S.4). Army personnel have shorter commutes than civilians across the six installations, while the violent and property crime rates tend to be above the national average for military personnel, though our analysis does not screen out high-crime areas, as the BAH methodology does. School quality differs dramatically across locations.

Figure S.1. Differences in Average Travel Time to Work Between and Within MHAs



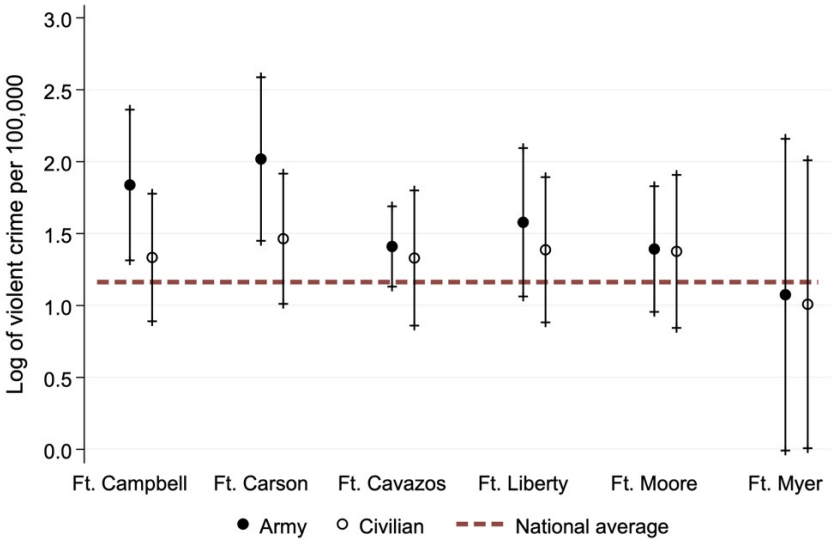
SOURCE: Authors' calculations using ACS (National Historical Geographic Information System [NHGIS]; work commute time) and Defense Travel Management Office (zip code to MHA crosswalk) using population weights from ACS (NHGIS). Data were joined based on their zip code identifier.

Figure S.2. Differences in School Quality Between and Within MHA



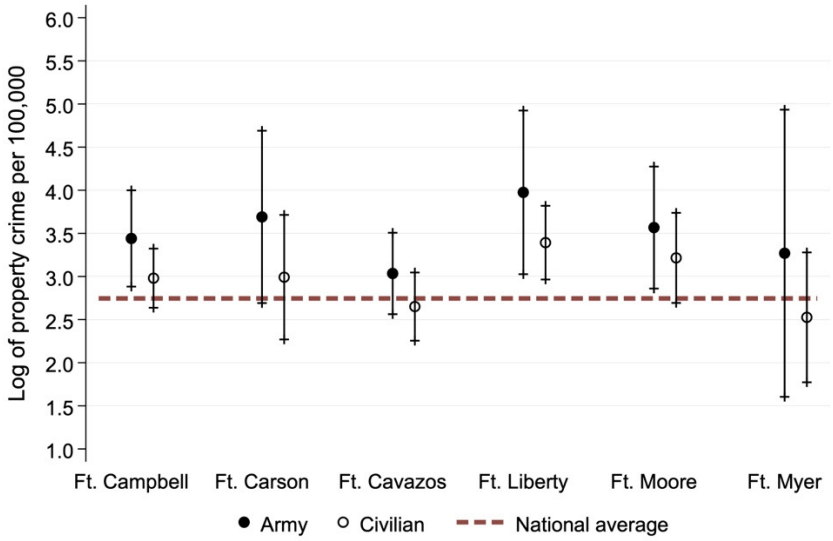
SOURCE: Authors' calculations using Stanford Education Data Archive (school quality) and Defense Travel Management Office (zip code to MHA crosswalk) data.

Figure S.3. Differences in Violent Crime Rates Between and Within MHAs



SOURCE: Authors' calculations using CrimeGrade.org (violent crime rates) and Defense Travel Management Office (zip code to MHA crosswalk) data using population weights from ACS (NHGIS). Data were joined based on their zip code identifier.
NOTE: The scatter plot points represent the population-weighted average of each MHA's logged violent crime rate using either the zip code's Army or civilian population. The national average of the log of violent crime across all zip codes, using the civilian population weights, is 1.163.

Figure S.4. Differences in Property Crime Rates Between and Within MHAs



SOURCE: Authors' calculations using CrimeGrade.org (property crime rates) and Defense Travel Management Office (zip code to MHA crosswalk) using population weights from ACS (NHGIS). Data were joined based on their zip code identifier.
NOTE: The scatter plot points represent the population-weighted average of each MHA's logged property crime rate using either the zip code's Army or civilian population. The national average of the log of property crime across all zip codes using civilian population weights is 2.746.

- While we observe differences across locations for military personnel in amenities, we often find similar variation in amenities across the same locations for civilians. This suggests that some of these differences across installations may reflect differences in the local availability of amenities for both military and civilian households.
- From 2020 to 2022—the period of the COVID-19 pandemic, when the housing market experienced unprecedented increases in both rental prices and home sale prices—the changes in BAH relative to 2019 fell short of the increases in the two Zillow price indexes across most locations we analyzed, and the divergence between BAH growth and housing cost growth was substantial in some locations. Understanding why BAH rate changes did not keep up requires more in-depth information about the BAH rate-setting methodology, but it is possible that the BAH methodology was more likely than the Zillow methodology to capture a potentially lower-quality housing stock, resulting is slower rate growth in BAH rates relative to the Zillow indexes. Other possible reasons are the use of housing profiles in the BAH methodology that are often not congruent with the local housing stock and the requirement that the BAH rates associated with these profiles must increase monotonically with pay grade.
- Surveys of active duty personnel by DoD between 2010 and 2019 indicate that a significant fraction of Army personnel, albeit a minority—between 20 and 30 percent in 2019—reported being very dissatisfied or dissatisfied with BAH. These surveys were taken before the dramatic run-up in housing prices during the COVID-19 pandemic but during a period of rising housing prices. Furthermore, the years 2016–2019 cover the period when Congress reduced

the share of housing costs covered by BAH to 95 percent, potentially explaining dissatisfaction among some members.

Conclusions

These findings lead to the following conclusions:

- The definitions of MHAs and the zip codes included in MHAs are generally accurate in terms of where members choose to live.
- The housing profiles that DoD assigns based on grade and dependent status do not reflect the housing choices made by members. Members' housing choices differ across locations and differ from those of similar civilians. This suggests that DoD's housing profiles may need to be adjusted and perhaps be region- or location-specific to reflect the housing stock available to members in different areas, though additional analysis would be needed to assess housing stock in each area.
- The current BAH methodology allows members to procure housing that is at least as good, in terms of expenditures, as that of civilians with comparable incomes.
- Neighborhood amenities vary considerably across Army installations, though the location amenities achieved by military personnel through their housing choices are broadly similar to the amenities experienced by civilians in the same location.
- The BAH rate-setting methodology does not appear resilient to rapid and dramatic changes in the housing market as occurred during the pandemic; BAH rates did not increase as dramatically as either rental rates or housing prices as reflected in the Zillow data in the six locations we examined.

Overall, our analysis suggests that, in many ways, BAH is generally adequate for Army personnel, though not necessarily when the housing market is changing rapidly and dramatically, as it has in recent years. Furthermore, while our analysis of housing choices and expenditures among military personnel and of their locational amenities points to an overall positive picture with respect to BAH, a substantial, though minority, share of members report dissatisfaction with BAH.

Recommendations and Areas for Further Study

The analysis suggests four recommendations, each of which will require for further study. First, DoD should investigate the feasibility and desirability of using housing profiles in setting BAH rates that are region- or location-specific and better reflect the housing choices of comparable civilians and the housing stock available in different regions of the country. Second, the Army and, more generally, DoD should investigate further why a significant fraction of personnel express dissatisfaction with BAH. Third, DoD should consider using demographic characteristics rather than income to define comparability in the BAH methodology. Finally, DoD should identify ways to improve the resiliency of the BAH methodology when the housing market is changing quickly and dramatically, such as occurred during the COVID-19 pandemic and thereafter.

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Chapter 1

Introduction

Rapidly rising housing prices beginning in 2020, together with increasing inflation more broadly since 2020, have put a spotlight on the adequacy of the housing allowance for military personnel (Angell, 2021; Federal Reserve Bank of St. Louis, undated-a). Nearly half of households in Texas, Florida, North Carolina, and other locations of major Army installations are *rent burdened*—meaning they spend more than 30 percent of their income on rent—while around one-quarter are *severely rent burdened*—meaning they spend 50 percent or more of household income on rent (Joint Center for Housing Studies, undated). The Basic Allowance for Housing (BAH) is an allowance that is intended to offset service members' costs of housing for those who do not receive government-provided housing (U.S. Department of Defense [DoD], undated). BAH rates are set based on geographic location, the member's rank, and the member's dependency status (i.e., whether the member has dependents). The specific BAH rates are based on surveys of rental properties in each location.[4] In 2015, Congress changed how BAH rates are calculated, from covering 100 percent of a given location's housing costs to covering 95 percent, implying a 5 percent out-of-pocket cost to members.

In 2021, the U.S. Government Accountability Office (GAO) expressed concerns about the BAH data collection methodology, noting that members of Congress have noted their interest in ensuring that BAH rates facilitate the ability of members to live near high-quality schools and have access to other amenities (GAO, 2021). Adding to these concerns have been documented cases of mold, rodents, and other indicators of substandard privatized Army housing projects (Beynon and Kheel, 2022; Pell and Nelson, 2018; Horton, 2019). Because rental rates in privatized housing are set to BAH rates, concerns about the quality of such housing contribute to concerns about the BAH rate-setting methodology in general.

The Seventh Quadrennial Review of Military Compensation (QRMC) in 1992 set forth two objectives for the military housing allowance (DoD, 1992, p. 7):

1. "The housing allowance should be sufficient to procure housing commensurate with that occupied by civilians at similar income levels and
2. A service member should be unaffected by the housing price variations between locations."

That is, the methodology should result in rates that are accurate in terms of reflecting housing prices in each area where members live, reliable in terms of using a consistent methodology in each area to assess prices, and fair across locations by holding members harmless in terms of housing prices when they move.

The current BAH methodology was established in 1998, and its objectives are discussed in the 2018 BAH Primer produced by the Defense Travel Management Office (DTMO) and embedded in

[4] We provide a detailed discussion of how BAH is set in Chapter 2.

U.S. Code Title 37, Section 403, defining BAH. Specifically, the code states that the determination of rates should be based on "the costs of adequate housing for civilians with comparable income levels in the same area" and that the rates should be based on the "costs of adequate housing determined for the area" for members in "the same pay grade and with the same dependency status." But the methodology has not been reviewed since it was established. Consequently, the extent to which these objectives are being achieved in the current housing market is unknown. The 14th QRMC charter in 2023 included a requirement to review BAH from a service-wide perspective (White House, 2023).

The Army requested that RAND Arroyo Center assess the adequacy of BAH and the BAH rate-setting methodology from the standpoint of the Army and recent changes in the housing market.[5] This report summarizes that assessment. The analysis addresses three research questions:

1. What is the fit between BAH rates and area housing costs faced by Army personnel?
2. What are the implications of that fit for the adequacy of the BAH rate-setting methodology?
3. What are the implications of that fit for the adequacy of housing for Army personnel?

The research questions and analysis focus on assessing the adequacy of BAH from the standpoint of Army personnel. It does not focus on assessing courses of actions for addressing areas where BAH may fall short, a topic left for future research including by the 14th QRMC. It also does not consider the adequacy of the overseas housing allowance for members stationed outside the United States.

Overview of Approach

Our approach involves using Army pay and personnel data together with housing and other data for the U.S. population, including both military personnel and civilian, to address these questions from three perspectives. First, we assess the BAH methodology by considering the housing choices made by members. Military members are free to choose where they live, the type of housing they procure, and how much they spend on housing. That said, the BAH rate-setting methodology uses information on rental rates in military housing areas (MHAs), which are a set of zip codes surrounding military installations for six specific housing profiles assigned by DoD based on a member's grade and dependency status. For example, an E-5 with dependents is assigned a two-bedroom townhouse housing profile. While members can choose to live outside the MHA and choose a different housing type, the validity of the methodology presumes that the MHA zip codes and the housing profiles chosen by grade and dependent status are relevant to military personnel living in each area. We use Defense Manpower Data Center (DMDC) data and U.S. Census Bureau data to assess the extent to which the housing choices of Army personnel are consistent with the housing profile assignments and the MHA zip code definitions. Specifically, we tabulate the extent to which Army personnel live in the areas used to calculate BAH rates and the extent to which the housing procured by Army personnel in an area corresponds to the housing stock in that area as revealed by the choices of similar civilians and to the DoD housing profiles. To assess the extent to which BAH rates reflect Army personnel's housing expenditures in each area, we also use the data to compare their housing expenditures with the BAH rates they receive in the MHAs used to define BAH.

[5] This study began in October 2022, before the QRMC charter was established in January 2023 requiring a review of BAH.

Second, we assess the adequacy of BAH and the housing procured by members by considering the housing that members procure and the local amenities they experience across locations. While the objectives of BAH articulated by the Seventh QRMC focus on holding members harmless in terms of housing costs across locations when they move, and not specifically amenities, military families have expressed concern about school quality for military children and crime near military installations (Henry, 2022; Thayer, 2020). Furthermore, the National Defense Authorization Act of 2023 directed DoD to consider whether school quality data should be collected as part of the BAH rate-setting process (Hadley, 2022).

We use the DMDC and census data to compare the housing procured by Army personnel with that procured by comparable civilians; we define comparability in terms of income and then in terms of demographic characteristics. We also use the data to compare the housing types procured by soldiers to assess the extent to which Army personnel can procure the same housing type across locations. In addition, we use data on commuting distances, public school quality, and property and violent crime rates to compare location amenities across areas for military personnel to assess whether Army personnel can achieve the same level of amenities regardless of location. We also assess the extent to which the amenities experienced by Army personnel in a location are comparable to the amenities experienced by civilians in that area.

Third, we consider the extent to which the BAH methodology is adequately capturing changes in housing prices, particularly given the dramatic increases in both rents and home sale prices in the years since the start of the coronavirus disease 2019 (COVID-19) pandemic. Specifically, we compare changes in BAH rates in recent years to changes in rental rates and housing prices using data from Zillow, the online real estate marketplace.

Many analyses in this study focus on six Army major installations across the continental United States (CONUS) shown in Table 1.1.[6] We took this case study approach because the census data only identify active duty military, not specific service. We assume that most active duty personnel near those large installations are Army personnel. We selected these specific installations and their surrounding MHAs because (1) they house a large share of soldiers stationed within CONUS, allowing us to examine broad trends or relationships across the nation, and (2) the use of exemplars spread around the United States is necessary to consider our research questions concerning differences across installations. These installations account for 50.4 percent of Army active duty members receiving BAH between 2017 and 2021 in DMDC data. Our assumption is less tenable for Joint Base Myer-Henderson Hall (hereafter Fort Myer), which is within an MHA that includes the Washington, D.C., metropolitan area and, thus, likely includes active duty personnel from other branches stationed at other area locations. But we felt that including one major metropolitan area was important for understanding the breadth of communities in which Army personnel may have to obtain housing.

[6] In other analyses, we considered military personnel stationed across the United States when issues such as sample size limited our ability to focus solely on these Army installations.

Table 1.1. List of Exemplar Army Installations

Army Installation	Formerly Known as	State
Fort Campbell	-	Kentucky
Fort Carson	-	Colorado
Fort Cavazos	Fort Hood	Texas
Fort Liberty	Fort Bragg	North Carolina
Fort Moore	Fort Benning	Georgia
Fort Myer	-	Virginia

NOTE: Fort Hood, Fort Liberty, and Fort Benning were renamed in 2023. We include their former names in the second column. In this table and in the remaining text, we refer to Joint Base Myer-Henderson Hall as Fort Myer for brevity's sake.

Organization of This Report

The next chapter describes the current methodology that DoD uses to set BAH rates, as background to the rest of the report. Chapter 3 provides an assessment of BAH from the standpoint of the housing choices members make, and Chapter 4 assesses BAH from the standpoint of the two objectives of the Seventh QRMC. Chapter 5 assesses the extent to which BAH rates in our exemplar Army locations are congruent with commercial data on rental prices and home sale prices over recent years. We summarize our findings, discuss our conclusions, and consider other areas for future research in Chapter 6. Appendix A shows additional tabulations, and Appendix B provides greater detail about our data and methodology.

Chapter 2

Overview of the BAH Rate-Setting Methodology

As background to our analysis of the adequacy of BAH rates and the BAH rate-setting methodology for Army personnel, this chapter reviews the current methodology for setting BAH. As noted in the previous chapter, BAH rates for active duty members and for reservists on active duty for more than 30 days vary by pay grade (i.e., rank), whether the member has dependents, and geographic location.[7] BAH is based on market data for rentals in the private sector and specifically on the results of local housing surveys of the rental costs associated with six different housing profiles: one-bedroom apartments, two-bedroom apartments, three-bedroom townhouses, and so forth. As we discuss in this chapter, the different housing profiles are assigned or imputed to military personnel by pay grade and dependency status. Rather than directly reimbursing military service members for their housing costs, DoD sets BAH rates equal to the sum of local median rental costs and average utility costs (i.e., electricity, heating fuel, water, and sewer) for each of the housing profiles in every MHA. While the local rental prices of their duty station and housing type determine BAH rates paid to members, service members remain free to select housing with costs above or below the estimated median rental costs, may live outside their prescribed MHA, and may purchase, rather than rent, their housing.

Because housing markets may fluctuate rapidly, DoD updates its BAH rates annually to reflect current housing costs, and the process is complex. DoD must estimate local median rental prices and average utility costs for each of its six housing profiles across all 340 MHAs—2,040 unique estimates in total. This chapter begins with a description of the assignment of housing profiles to personnel by pay grade and dependency status. It then describes how BAH is set across geographic areas, including the data collection methodology for setting BAH rates.[8]

Pay Grade and Dependency Status

Both pay grade and dependency status affect the BAH rate paid to members by determining the housing profile to which they are assigned. The six housing profiles are listed in Table 2.1 along with each profile's pay grade and dependent status assignment. These six profiles and their associated pay grade assignments are considered anchor points for determining the BAH rate for other pay grades, as we discuss in this subsection. Because U.S. Code Title 37, Section 403, dictates that BAH rates must

[7] A reserve component member who is on active duty for less than 30 days receives a partial allowance that does not vary by location.

[8] The material in this chapter draws from the DTMO website, which provides detailed information about BAH as well as the DTMO "BAH Primer" (DTMO Office, undated-a; DTMO, 2023).

be based on the housing costs of "civilians with comparable incomes" to service members, DoD assigns service members with dependents larger housing profiles and thus higher BAH rates. To illustrate how anchor point housing profiles affect BAH, consider two enlisted service members, an E-5 and an E-6, both with dependents in 2021 who share a duty station in San Diego (MHA: CA038). As both pay grades are anchor points, the enlisted members would receive different BAH rates corresponding to their respective housing profiles: The E-5 receives BAH equal to the median local rental price and average utilities of a two-bedroom townhouse ($2,949 in 2021), while the E-6 receives a rate equal to the median rental price and average utilities of a three-bedroom townhouse ($3,192).

Table 2.1. Housing Profiles

Housing Profile	Grade (with Dependents)	Grade (without Dependents)
1-bedroom apartment		E-4
2-bedroom apartment		O-1
2-bedroom townhouse/duplex	E-5	O-1E
3-bedroom townhouse/duplex	E-6	O-3E
3-bedroom single-family detached house	W-3	O-6
4-bedroom single-family detached house	O-5	

SOURCE: Features information from DTMO, 2023.
NOTE: The suffix "E" indicates a prior enlisted officer.

BAH rates for pay grades between anchor points are computed through interpolation. This is to ensure that rates increase with grade while decreasing survey costs by limiting the number of housing profiles that must be surveyed in each location. Specifically, pay grades between the anchor points receive BAH rates equal to a percentage of the difference between rates of the housing profiles "above" and "below" them. Table 2.2 lists each grade, its housing profile, and, if it is not an anchor point, the interpolation percentage used to calculate its BAH rate. Returning to the previous example, consider a third service member, an E-7, who also resides in San Diego with dependents. Although higher ranking, they are assigned the same housing profile for computing BAH at the E-6, but they receive the E-6 BAH plus 36 percent of the difference between the median rental rate for a three-bedroom townhouse (the "lower" E-6 housing profile) and a three-bedroom single-family detached house (the next "higher" housing profile) in the local housing market. In San Diego in 2021, the BAH for an E-7 with dependents was $3,225 (i.e., $3,192 + 0.36 × ($3,291 – $3,192)).

Table 2.2. Interpolated BAH Rates

Panel A. BAH Rates with Dependents		
Grade	**Housing profile**	**Interpolation**
E-1	2BR	Midpoint: 2BR APT and 2BR TH
E-2	2BR	
E-3	2BR	
E-4	2BR	
E-5	2BR TH	Anchor
O-1	2BR TH	11%
O-2	2BR TH	98%
E-6	3BR TH	Anchor
W-1	3BR TH	1%
E-7	3BR TH	36%
O-1E	3BR TH	44%
W-2	3BR TH	52%
E-8	3BR TH	75%
O-2E	3BR TH	93%
O-3	3BR TH	98%
W-3	3BR SFD	Anchor
E-9	3BR SFD	16%
W-4	3BR SFD	22%
O-3E	3BR SFD	26%
W-5	3BR SFD	48%
O-4	3BR SFD	58%
O-5	4BR SFD	Anchor
O-6	4BR SFD	1%
O-7	4BR SFD	2%

Panel B. BAH Rates without Dependents		
Grade	**Housing Profile**	**Interpolation**
E-1	1BR APT	= E-4
E-2	1BR APT	= E-4
E-3	1BR APT	= E-4
E-4	1BR APT	Anchor
E-5	1BR APT	67%
O-1	2BR APT	Anchor
E-6	2BR APT	7%
W-1	2BR APT	31%
E-7	2BR APT	53%
O-2	2BR APT	83%
O-1E	2BR TH	Anchor
W-2	2BR TH	19%
E-8	2BR TH	20%
O-2E	2BR TH	44%
E-9	2BR TH	51%
W-3	2BR TH	54%
O-3	2BR TH	64%
O-3E	3BR TH	Anchor
W-4	3BR TH	9%
O-4	3BR TH	40%
W-5	3BR TH	45%
O-5	3BR TH	63%
O-6	3BR SFD	Anchor
O-7	3BR SFD	2%

SOURCE: Features information from DoD, 2022.
NOTE: BR = Bedroom; APT = apartment; TH = townhouse/duplex; SFD = single-family detached house; the suffix "E" indicates a prior enlisted officer.

Note that the BAH rates have both floors and ceilings. The floor is the rate for an E-4; E-1s to E-3s receive the same BAH rate as an E-4. This reflect the sentiment that service members without dependents are not expected to live in studio apartments or with roommates and that those with dependents reside in a multi-bedroom residence. An additional floor embedded in the methodology applies to the "without dependents" BAH rates. Service members without dependents receive either the BAH for their housing profile (plus any interpolation percentage, if it applies) or 75 percent of the "with dependents" rate for their pay grade—whichever is higher.

The ceiling is 1 or 2 percent above the O-5 rate for those with dependents and 2 percent above the O-6 rate for those without dependents. Thus, general and flag officers (O-7 and above) receive BAH rates that are capped at just above either the O-5 or O-6 rate, though these officers may be more likely to receive government-provided housing on-base and therefore not receive BAH.

Downturns in a given area's rental market could result in BAH rates in a given MHA falling from one year to the next. Such a change could adversely affect members who entered multiyear leasing agreements based on the higher BAH rate. To address this issue, service members receive individual

rate protection such that their BAH only decreases because of (1) permanent change of station (PCS), (2) reduction in pay grade, or (3) change in dependency status.[9]

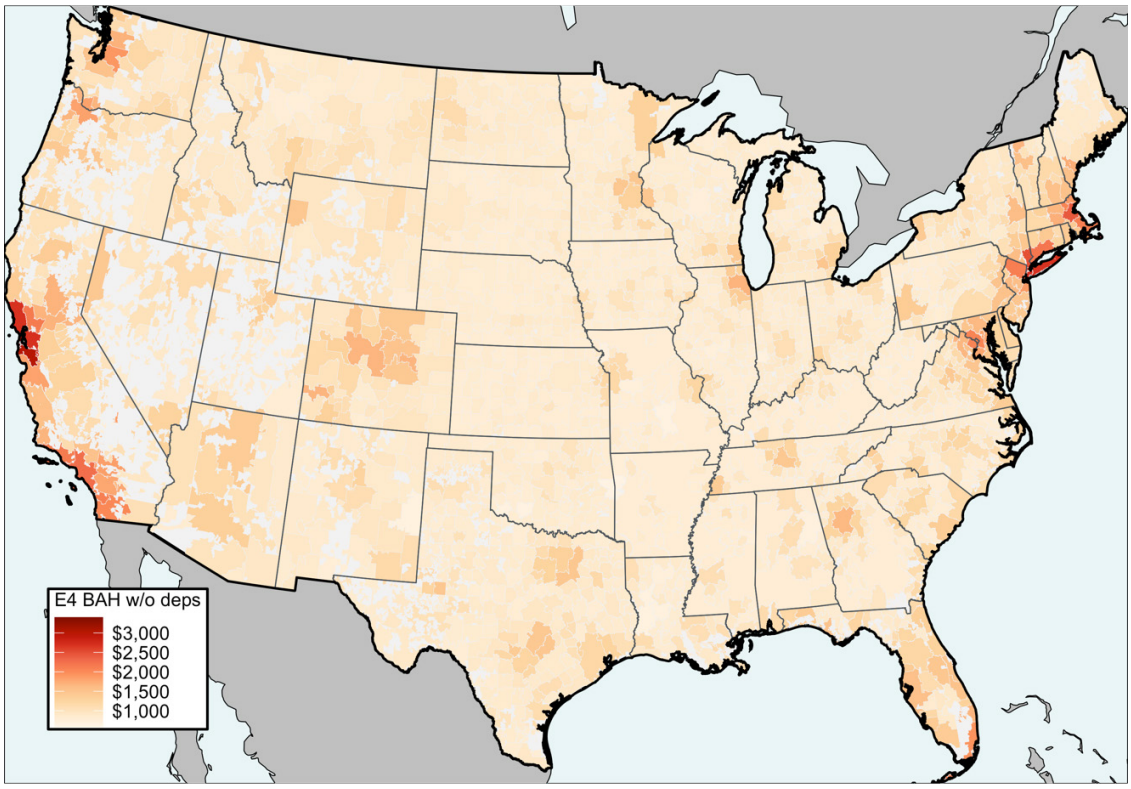
Geographic Location

DoD captures the differences in median rental prices and utility costs across the United States by surveying costs at each of the 340 MHAs. An MHA is a collection of zip codes that represents a rental market surrounding a duty area, such as Fort Carson. While zip codes are collections of mail delivery routes, not geographic features per se, their boundaries can be mapped using zip code tabulation areas (ZCTAs) from the U.S. Census Bureau. We match ZCTAs to MHAs using a crosswalk from the DTMO website (DTMO, undated-a) and plot BAH rates for each MHA in CONUS, as shown in Figure 2.1 for service members of pay grade E-4s who do not have dependents. The gaps in the MHA map (shown in white) are not because of missing or unmatched data, but rather because the area lacks ZCTA assignment in the U.S. Census Bureau's native data file.[10]

[9] More specifically, if BAH rates are lowered in an area relative to the rate paid in the preceding year, this reduction does not apply to a member continuing in the same duty station and who has not had a reduction in grade or a change in dependency status. It is also worth noting that rate protection applies to Military Housing Privatization Initiative contractors (providers of on-base housing) because the revenue stream of these providers is essentially the BAH rate of residents.

[10] In the process of aggregating the ZCTAs to a map of MHAs, as shown in Figure 2.1, we also "fill in" gaps within MHAs. That is, if a gap remains after aggregating the zip code–level data to the MHA-level and the gap is completely surrounded by an MHA, then the gap is "filled in" and the entire area assigned to the surrounding MHA. We detail this process in greater detail in Appendix B.

Figure 2.1. BAH Rates for an E-4 without Dependents, by MHA, 2021



SOURCE: Author calculations using data from DTMO, undated-b. The regions in white do not belong to a ZCTA.

About half of U.S. counties have relatively small military populations. Given that these regions tend to be rural and many share comparable living costs, DoD groups these zip codes into 30 separate County Cost Groups (CCGs), a unique class of MHA. Although they span large areas, few service members reside in them. In the DTMO raw data, MHAs denoted by a "ZZ" prefix indicate a CCG (Veteran.com Community, 2022).

Data Collection

This section describes DoD's annual process for collecting rental and utility costs data for each housing profile and MHA.

Rent

DoD and its contractors gather rent price data in the spring and summer, when housing markets are most active.[11] According to the DTMO BAH Primer (DTMO, 2023), DoD's objective is to estimate the true median rental price of each housing profile–MHA pair, but the accuracy of its estimates depends on the number of units in its data samples. DoD aims to gather enough data to generate an estimated median rent measure that is within 10 percent of the true median rent in the

[11] As of 2022, DoD employed Robert D. Niehaus, Inc. as its BAH contractor.

MHA housing market at the 95 percent confidence level in terms of statistical inference. This typically requires between 30 and 75 observations per housing profile for each MHA.[12] DoD casts a wide net in its search for rental units, drawing from five main data sources:

1. online multiple listing services
2. subscription-based commercial rental housing datasets
3. trusted web-based platforms
4. real estate property management companies
5. landlords.

Local military housing offices (MHOs) and command leadership at local duty stations also can contribute to the data collection efforts by providing local rental housing referrals and reviewing and, if necessary, flagging rental units that they deem unsuitable. DoD stipulates that rental properties must be both available (i.e., listed on the market) and adequate to be included in the rental dataset. Use of these criteria excludes mobile homes, efficiency apartments, furnished units, income-subsidized complexes, age-restricted facilities, seasonal units, and housing in high-crime areas (i.e., census tracts with over two times the national average crime rate).

In cases where DoD fails to gather enough available and adequate rental units to meet its minimum sample size, it attempts to improve its estimate either by increasing the sample or employing statistical methods to impute an estimate. For example, to boost sample size, local landlords of seasonal units, which are omitted in the primary data collection efforts, may be asked to price their units as if offered under a year-round lease. In cases where there remain too few available rental units to produce an accurate estimate for a particular housing profile–MHA pair, statistical methods may be employed to adjust the imprecise estimate by analyzing trends in price differences between housing profiles in MHAs that have sufficient data.

To bolster the accuracy of its data, DoD undergoes a three-step quality assurance process:

1. Ensure that rental units are adequate and in good repair and that their geographic distribution approximates the distribution of service member population. Local MHOs and command leadership are often tasked with ensuring that prospective rental observations meet these criteria.
2. Remove rental units from high-crime areas—i.e., census tracts with over two times the national average crime rate.
3. Remove rental units in locations where the typical civilian income is not comparable to that of military service members (military income is calculated as the sum of basic pay, average BAH, and Basic Allowance for Subsistence [BAS] and the tax advantages gained by both BAH and BAS being untaxed).

[12] A 2021 GAO report found that DoD often fails to meet its minimum sample size targets (GAO, 2021). Specifically, GAO found that 44 percent of MHA-housing type combinations had fewer than the minimum sample-size target, although the number of service members affected by these suboptimal sample sizes is unknown.

Utilities

To estimate the average utility costs for each MHA and housing profile, DoD uses data from the U.S. Census Bureau's American Community Service (ACS), which identifies respondents' housing type and a breakdown of their utility costs. BAH compensates military personnel for their electricity, heating fuel, water, and sewer services.

Chapter 3

Assessment of BAH Methodology from the Standpoint of the Housing Choices of Army Personnel

This chapter assesses the BAH methodology by considering three questions using data on the housing choices made by members. These questions provide insight into the adequacy of the BAH methodology in terms of whether soldiers are making choices consistent with the way the allowance is set. Specifically, we expect BAH rates to adequately fit the housing costs paid by soldiers if soldiers choose to live in the MHAs used to determine their BAH rate; they live in the housing profile that DoD assigns to their location, grade, and dependency status; and their housing expenditures are covered by their BAH. While we do not explicitly assess whether member housing expenditures are covered by their BAH, the three questions we do address are as follows:

1. To what extent do soldiers live in the MHAs used to determine BAH rates?
2. To what extent do soldiers in a location live in the housing profile assigned by DoD to members based on their grade and dependency status?
3. To what extent is the amount that soldiers spend on housing equal to their BAH rate in their location?

We note that if most soldiers choose not to live in the MHA or choose not to live in their assigned profile or choose to spend a different amount on housing than their BAH, it does not necessarily follow that they are worse off. Their choices are made to optimize their specific circumstances, and we investigate soldier satisfaction with their BAH in Chapter 6 using available survey data. Rather, answers to these three questions provide insight into whether the assumptions underlying the BAH methodology about where soldiers live, the type of housing they acquire, and how much they spend on housing in their local area are consistent with soldier behavior, thereby lending credibility to that methodology.

The chapter considers each of these three questions in turn. To address them, we make use of DMDC data on soldier locations and demographic characteristics, and we use the ACS data from the U.S. Census Bureau for 2017–2021 on the housing choices and expenditures of active duty personnel. We describe the data and variable construction in detail before we present results.

Data and Variable Construction

The two key sources of data for our analysis are the Active Duty Master File and the Defense Enrollment Eligibility Reporting System data sets from DMDC and the ACS 1-year microdata from

the U.S. Census Bureau that are provided by the Integrated Public Use Microdata Series (IPUMS; Ruggles et al., 2023).

Defense Manpower Data Center Data

We primarily used the DMDC data to identify the geographic location of Army personnel and specifically their duty station and where they lived. These data list the members' mailing address zip code, which we use as a proxy for their residential zip code. In some cases, the mailing address may not accurately capture the member's current residence. For example, a recent move to a new duty location may not yet be reflected in the DMDC administrative data. Junior service members may use a more permanent mailing address (e.g., their parents' address) to receive mail if their duty station or residence is changing frequently. However, on average, the mailing address zip code seems to reflect members' current residence, as most are within the MHA of their assigned duty location, as we show later in the chapter.

While DMDC has information on the MHA used for assigning BAH for those members who receive it, we are interested in identifying whether soldiers live in the MHA near their duty station. We impute the MHA associated with their duty station by using a zip code–MHA crosswalk from DTMO.

American Community Survey Data

The ACS data include a rich set of variables on households and individuals in the household, including the size of the household and its structure and the age, gender, income, and education for each household member. Importantly for this study, the data also indicate active duty military status. Many of our analyses use characteristics of these active duty service members and their households, including their expenditures on housing. We also compare military households with civilian households using these data.

The ACS data represent a 1 percent random sample of the U.S. population that is meant to be approximately representative at the smallest geographic area provided, which is the public use microdata area, or PUMA.[13] We use these data for years covering 2017 through 2021, and in some cases we pool the five years of data to increase the sample size, especially for the analyses of case studies of Army locations.

Matching PUMAs to MHAs

One challenge in comparing the housing choices of Army personnel and civilians is that the data come from two different sources (ACS and DMDC) at two different geographic levels (PUMAs and MHAs). To make comparisons between these two groups, we must match census data geographies

[13] PUMAs are geographies generated by the U.S. Census Bureau each decade for the decennial censuses that attempt to develop geographies that are congruent with certain existing community characteristics, and each contains a minimum of 100,000 people. PUMAs do not, however, always coincide strongly with other boundaries, including municipal boundaries, county lines, and so forth, though they do not cross state boundaries and typically do not cross the boundaries of core-based statistical areas (U.S. Census Bureau, 2021).

(PUMAs) to their military counterparts (MHAs). We do so based on a combination of their spatial characteristics and population distributions.[14]

We begin the process of creating the geographic crosswalk using census tracts, very small geographies that typically contain between 1,200 and 8,000 people (U.S. Census Bureau, undated). PUMAs, the smallest geography available for individual-level survey data in the ACS, are simply a collection of census tracts. Along with the geography of the tracts, the data include estimates of each tract's total population. We match census tracts to MHAs based simply on their geographic proximity (i.e., the "nearest" MHA is assigned to the tract). Then, using the population estimate of the tracts in each PUMA, we assign each PUMA to a single MHA only if the MHA covers 80 percent or more of the PUMA's total census-tract-level population. This methodology results in our successfully matching 74 percent of roughly 2,400 total PUMAs to an MHA for 2017 through 2021.[15]

Imputing Service Member Characteristics in the Census Data

An important limitation of the ACS microdata for our analysis is that, while we can see active duty military status, we cannot see any specific characteristics of the member, such as branch of service or pay grade, including whether a member is enlisted or officer. For this reason, we use a combination of age and education level to proxy for whether a member is likely to be an enlisted member or an officer and, for each of these imputed statuses, the broad stage of a military career that the member is in when observed, junior or mid-career. For purposes of matching to BAH rates, we consider junior enlisted grades to include up to E-4, since this is the lowest anchor point for enlisted without dependents, while midcareer enlisted comprises grades E-5 through E-7. We include O-1 and O-2 in our definition of junior officers and O-3 and O-4 as mid-career. Because we do not observe service branch and whether an active member is in the Army specifically, we focus on geographic areas around significant Army installations as a proxy for Army status under the assumption that active members living near an Army installation are likely Army members.[16]

We operationalized the definitions of junior versus mid-career enlisted and officer in the ACS by tabulating the age and education distributions of active duty Army personnel in the DMDC data. We then approximate the age range of junior versus mid-career personnel by considering the 25th and 75th percentiles of the empirical distributions of junior versus mid-career grades in the DMDC data. The definitions we use to classify military personnel and comparable civilians into these military career "types" are given in Table 3.1.

[14] An alternative method of addressing incompatible geographies is through the development of pseudo-geographies, which aggregate geographies up to the minimum level at which none of the underlying geographies are split. Goldberg et al. (2018) use this approach to create pseudo-counties, which are a unique PUMA-county geography.

[15] A more detailed explanation of this process can be found in Appendix B.

[16] One caveat to this approach is our focus on Fort Myer, which is in the greater Washington, D.C., area and includes numerous other installations within the MHA, including the Pentagon. It is, thus, likely that we capture members from multiple services in this case study area.

Table 3.1. Demographic Characteristics Used to Impute Active Duty Types in Our Analysis of American Community Survey Data

Imputed Type	Age Range	Educational Attainment	Grades Used to Derive Demographic Characteristics
Junior enlisted	21–25	High school credential up to one year of college completed	E-1 through E-4
Mid-career enlisted	26–35	High school credential up to associate's degree	E-5 through E-7
Junior officer	23–28	Bachelor's degree	O-1 and O-2
Mid-career officer	29–41	Bachelor's degree or master's degree	O-3 and O-4

NOTE: As described later in the text, we limit our use of these military career status types to males only.

Our analysis makes comparisons of active duty members with demographically similar civilians where the demographics in question are these combinations of age and education, along with, potentially, other characteristics for both active duty military and civilians, such as dependency status. In our civilian tabulations of the ACS, we exclude individuals with a Ph.D. or professional degree above the master's level, since these education levels are not well represented among the bulk of military personnel.

One important limitation of the analyses we undertake using these imputed military "types" is that we must limit our comparisons to males. This is because there are large differences in earnings among men and women in the civilian labor market and the sex composition of the civilian workforce is roughly evenly divided, whereas earnings differences in the military are much smaller and the composition of the military workforce is disproportionately male.[17]

In this and subsequent chapters, we consider differences between (male) military personnel and civilians at the national level and for the six exemplar installations. Because of smaller active duty military sample sizes for some locations, notably Fort Moore and Fort Myer as shown later in Table 3.3, our analyses at the installation level considers only the enlisted types in Table 3.1 and excludes officers.

Deriving DoD Housing Profiles from the Census Data

The ACS contains data on housing characteristics that we combine to generate imputations of the housing profiles used by DoD in differentiating BAH rates by pay grade and dependency status. The variables we use for this purpose are *number of bedrooms* and *units in structure*, the latter of which is a categorical variable containing not only the number of units but other descriptive characteristics, such as "1-family house, detached" or "5–9-family building" or "mobile home." Our mapping of these variables to DoD housing profiles is shown in Table 3.2.

[17] For example, in the 2021 ACS data, male active duty members have an average annual personal income of $66,000 and female active duty members have an average annual personal income of $60,000, whereas male civilians have average earnings of $74,000 and female civilians have average earnings of $42,000.

Table 3.2. Correspondence Between American Community Survey Variables and DoD Housing Profiles

DoD Housing Profile	Units in Structure	Number of Bedrooms
1-BR apartment	Multifamily building of 3 to 50+ units	1
2-BR apartment	Multifamily building of 3 to 50+ units	2
2-BR townhome	1-family house, attached or 2-family building	2
3-BR townhome	1-family house, attached or 2-family building	3
3-BR single-family home	1-family house, detached	3
4-BR single-family home	1-family house, detached	4

NOTE: BR = bedroom.

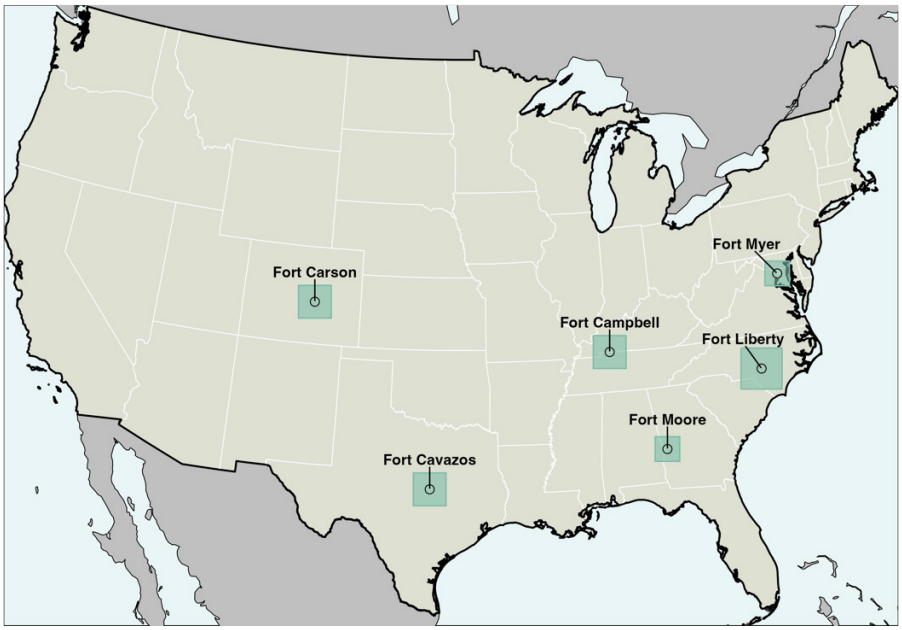
Other housing types that we group into the single category "Not a DoD Housing Profile" include mobile homes or trailers, apartments with more than two bedrooms, townhomes with one bedroom or more than three bedrooms, and single-family homes with fewer than three bedrooms or more than four bedrooms.

We next turn to our results on the extent to which soldiers live in their designated MHA, the extent to which they live in their designated housing profile, and the extent to which BAH covers their housing expenses, focusing on our six exemplar installations for the active duty personnel types shown in Table 1.1.

The Extent to Which Soldiers Live in Their Designated MHA

Throughout this report, rather than studying the entirety of the nation's housing markets or all geographic regions with an Army installation, we focus the analysis on the six exemplar Army installations listed in Table 1.1. Figure 3.1 plots the six locations across CONUS.

Figure 3.1. Map of Exemplar Army Installations



SOURCE: Latitude and longitude coordinates for each installation drawn from Google Maps.
NOTE: The green boxes show the extent of each installation's individual map below and are sized to show the majority of its MHA and its surrounding areas.

An important step in the BAH methodology is defining the MHA surrounding the military installation over which rental data will be collected for the purpose of computing BAH. This section provides tabulations to assess the extent to which Army active duty members choose to reside in the MHA defined for their installation by considering the distribution of service members' residences for each of the six exemplar Army installations.

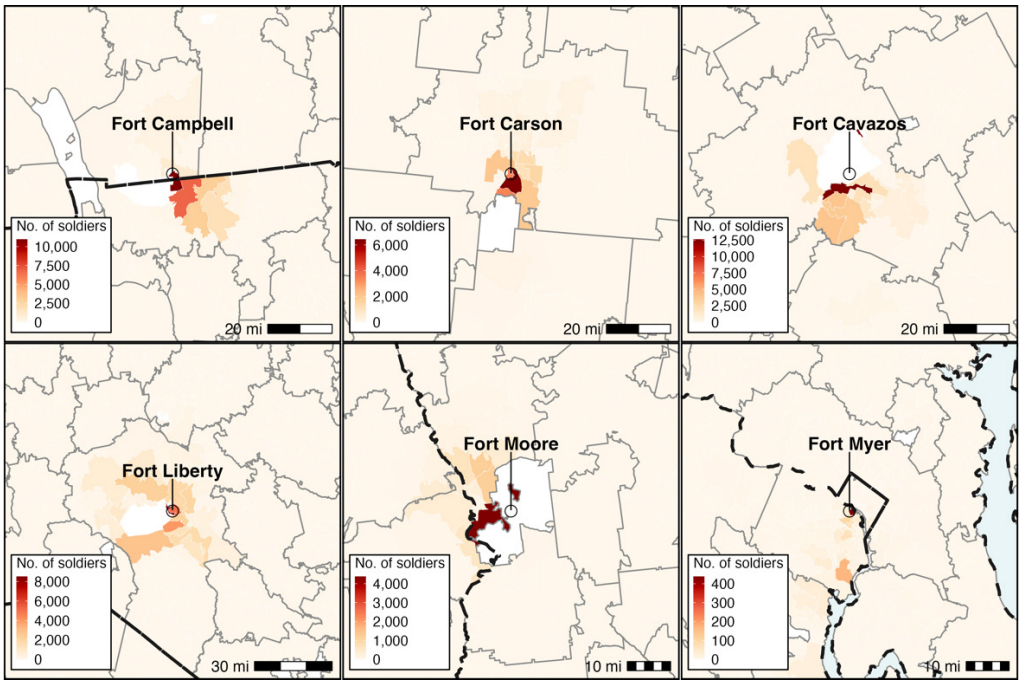
In this section, we consider the distribution of members' residences for each of the six Army bases. Figure 3.2 presents the distributions of the zip code of residence of soldiers in each installation's MHA. The solid gray lines denote MHA boundaries. Fort Campbell, Liberty, Moore, and Myer either border a neighboring state or have a state boundary intersecting their MHA; state borders are represented with dashed black lines. In the upper-left panel of Figure 3.2, we see that nearly 11,000 soldiers live in the zip code adjacent to Fort Campbell itself, while another 7,000 live in the neighboring zip code to the southeast. In total, 90.6 percent of the soldiers stationed at Fort Campbell that receive BAH in the DMDC data have a mailing address within the MHA.

We see a similar pattern across the remaining five installations. For example, those stationed at Fort Carson, which is just outside Colorado Springs and shown in the upper-middle panel of Figure 3.2, also tend to live near their assigned duty location. In fact, we find that most soldiers live within 20 miles of the station and that 93.9 percent have mailing addresses in Fort Carson's MHA. Table 3.3 lists each installation, the number of personnel assigned to the station receiving BAH, and the number and percentage of personnel living within their assigned MHA in the last two columns. Fort Moore and Myer have the lowest share of their assigned personnel residing within their MHAs, at 73.46 percent and 76.56 percent, respectively. Fort Myer's dispersion may reflect the high cost of the

Washington, D.C., metropolitan area and a higher propensity for people to live in more distant areas because of the significant variation in housing costs or amenities such as schools, crime rates and other characteristics. We note, importantly, that the MHA assigned to personnel stationed at Fort Myer also encompasses personnel from the Army and other services assigned to different area duty stations, including Fort Belvoir and the Pentagon, among others.

The overall conclusion from these tabulations is that the Army personnel receiving BAH for the most part live in their assigned MHA, at least for the six installations we considered. The implication is that the zip codes that are used to define MHAs in the BAH methodology do a reasonable job of covering the zip codes where Army personnel live. According to the BAH (DTMO, 2023, p. 6): "The Department targets rental data collection within an MHA to the set of zip codes in which 90 percent of service members assigned to the MHA live. . . ." Our tabulations for Army personnel around these installations suggest that DoD is broadly successful in meeting this criterion.

Figure 3.2. Distribution of Service Members' Residential Zip Codes, by Army Installation



SOURCE: Joined DMDC (mailing address zip codes) and DTMO (MHA to zip code crosswalk) data.
NOTE: These figures present the distribution of soldiers' mailing address zip codes, which we use as a proxy for their current residence, with the legend in each figure showing the relative density of soldiers residing in each zip code in an MHA. The solid gray lines indicate MHA boundaries. The thick, dashed black lines represent state boundaries. The fort's exact location is denoted by a black circle and label. The regions in white do not belong to a ZCTA.

Extent to Which Soldiers Live in the Housing Profile Assigned to Their Grade and Dependency Status

The BAH Primer (DTMO, 2023, p. 8) also states that ". . . DoD uses housing standards that correlate to the average types of housing rented by civilians who earn similar amounts to service

members in different pay grades." As noted earlier, service members can choose to live in a different housing profile, but housing profiles are set based on the typical housing choices of civilians with similar incomes. In Chapter Four, we compare housing expenditures of military personnel and civilians with comparable income. In this section, we show tabulations of the extent to which military personnel live in their assigned housing profiles in the six exemplar Army installations and compare the housing profile choices of military personnel to that of civilians with similar demographic characteristics. The main finding is that military personnel typically do not choose to live in the housing profile assigned to them by DoD, and in several locations military personnel do not even choose to live in any of the housing profiles defined by DoD.

Comparing Housing Choices of Army Personnel and Comparable Civilians Around Fort Liberty and Fort Cavazos

We begin by focusing on the housing choices of Army personnel and demographically comparable civilians around the two largest installations among our exemplar locations, Fort Liberty in North Carolina and Fort Cavazos in Texas, and show the housing choices for all locations in tables. We focus on these locations because the sample sizes are among the largest for them (Table 3.3) and we have more confidence in the tabulations for subgroups such as junior enlisted and mid-career enlisted at these locations.

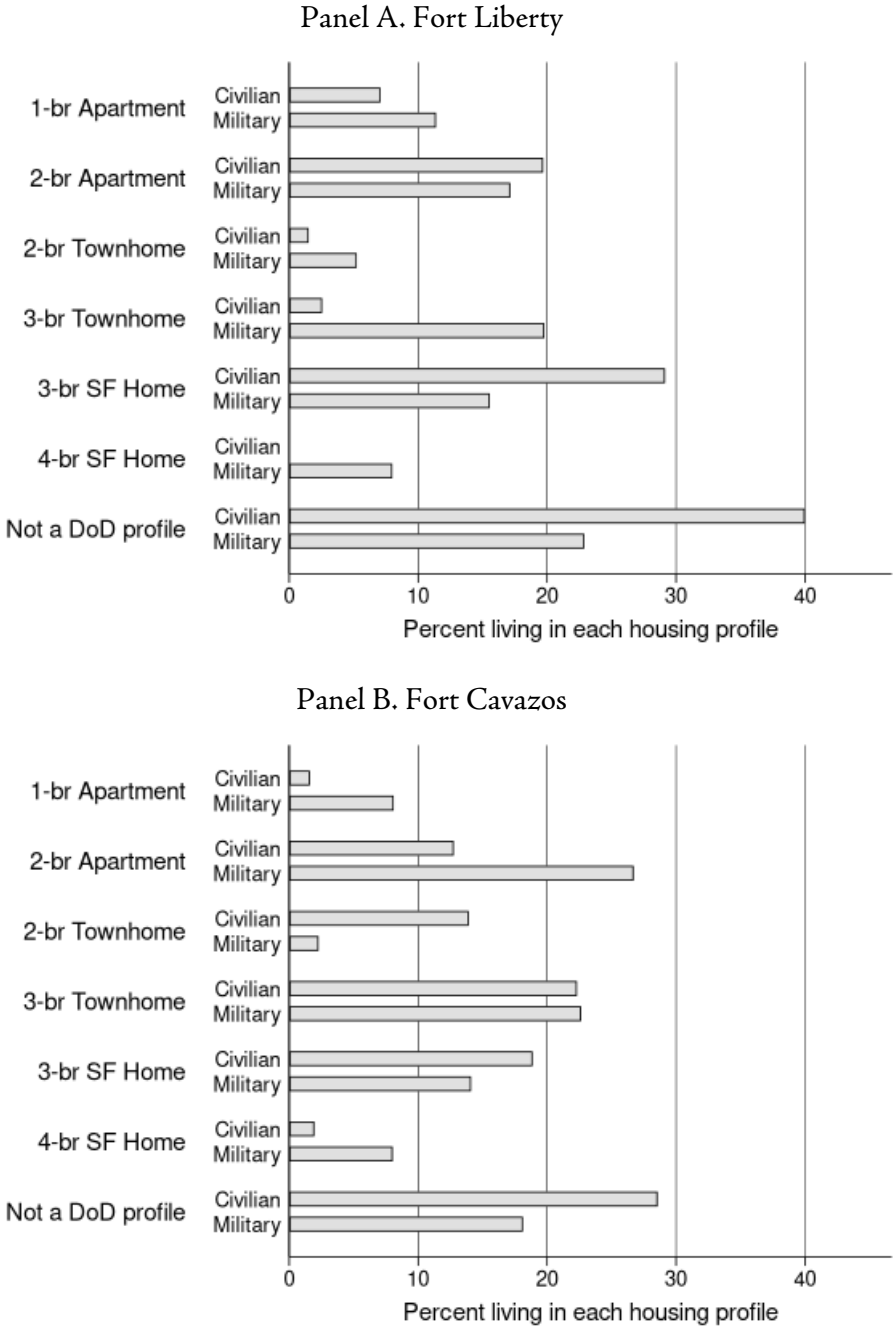
Table 3.3. Total Active Duty Military Personnel and the Share of Military Personnel Living within Assigned MHA, by Installation, 2021

Army Installation	Total Personnel	Personnel in MHA	% in MHA
Fort Campbell	27,225	24,658	90.57%
Fort Carson	25,695	24,138	93.94%
Fort Cavazos	33,839	29,157	86.16%
Fort Liberty	44,003	39,469	89.70%
Fort Moore	13,898	10,209	73.46%
Fort Myer	1,954	1,496	76.56%

SOURCE: Authors' calculations using DMDC and DTMO data.
NOTE: The total personnel include only those observations from the DMDC data that are recorded as BAH recipients.

Figure 3.3 presents these results for junior enlisted types at the two installations, and Figure 3.4 presents results for mid-career enlisted. All enlisted below the pay grade E-5 (our cutoff point for junior enlisted) with dependents are assigned to a two-bedroom apartment as their housing profile (Table 2.2). Thus, it is notable that only 17 percent of the service member households we identify as junior enlisted living in the vicinity of Fort Liberty and 27 percent of households around Fort Cavazos live in this profile. Around Fort Liberty, roughly a quarter of these households live in either a three- or four-bedroom single-family house; around Fort Cavazos, roughly 40 percent live in either a three-bedroom townhome or single-family house. Thus, many are choosing larger homes than their assigned profile.

Figure 3.3. Housing Types Among *Junior Enlisted with Dependents* and Demographically Similar Civilians Around Fort Liberty and Fort Cavazos, 2017–2021



SOURCE: Author calculations from ACS data (1-year samples) from IPUMS (Ruggles et al., 2023).
NOTE: We define "junior enlisted" type as individuals ages 21 to 25 with education between a high school degree and one year of college. We define "mid-career enlisted" type as ages 26 to 35 with a high school to an associate's degree. We classify housing characteristics in the ACS data as described in Table 3.2. Tabulations use five years of ACS data (2017–2021) to reach reasonable minimum sample sizes across the case study areas we focus on.

For both locations, we find that that a larger share of civilian households than military households are living in non-DoD housing profiles. The share among military households is around half the magnitude of the share among civilian households. Thus, most junior enlisted active duty members live in a DoD housing profile in these two locations, but not in their assigned profile. We further break down the non-DoD housing category in Figures A.1 and A.2 in Appendix A and show that for civilians, between 30 and 50 percent of households who are "junior enlisted" type live in mobile homes, whereas less than 5 percent of military households in a non-DoD profile live in this housing type. Most of the Army households not living in a DoD profile in the Fort Liberty areas live in larger housing types, specifically apartments of greater than two bedrooms or single-family houses of more than four bedrooms. Around Fort Cavazos, many also live in two-bedroom single-family houses.

Figure 3.4 presents results for mid-career enlisted types with dependents. As shown in Table 2.2, enlisted members with dependents in the grades of E-6 to E-8 are assigned to a three-bedroom townhome. We find that in both locations, only 13 percent (Fort Liberty) and 7 percent (Fort Cavazos) of Army households live in this housing type. Around Fort Liberty, 67 percent live in either a three- or four-bedroom single-family house, while around Fort Cavazos, nearly half live in a four-bedroom single-family house. We also find that over one-quarter of households living around Fort Cavazos live in a non-DoD housing profile, which Figure A.2 suggests are primarily houses, apartments, and townhomes with more bedrooms than the respective DoD profiles for these housing typologies. Notably, the share of demographically similar civilian households living in four-bedroom houses is much smaller at each of these locations. Thus, in these two locations, military households tend to choose more housing than demographically similar civilians in those locations.

Figure 3.4. Housing Types Among *Mid-Career Enlisted with Dependents* and Demographically Similar Civilians Around Fort Liberty and Fort Cavazos

SOURCE: Author calculations from ACS data (1-year samples) from IPUMS (Ruggles et al., 2023).
NOTE: We define "junior enlisted" type as individuals ages 21 to 25 with education between a high school degree and one year of college. We define "mid-career enlisted" type as ages 26 to 35 with a high school to an associate's degree. We classify housing characteristics in the ACS data as described in Table 3.1. Tabulations use five years of ACS data (2017–2021) to reach reasonable minimum sample sizes across the case study areas we focus on.

Tables 3.4 and 3.5 presents shares for all six exemplar installations for junior and mid-career types with dependents, respectively, though we caution that some locations have smaller sample sizes than either Fort Liberty and Fort Cavazos and may, thus, be more subject to sampling error.[18] The results for the other installations are broadly similar those for Fort Liberty and Fort Cavazos. Near the other four installations, relatively few military households that are of the junior enlisted type or the mid-career enlisted type live in the assigned DoD profiles for junior and mid-career enlisted members, respectively. Except for Fort Myer, military households tend to choose larger housing types among the DoD profiles than their assigned profile or choose a non-DoD profile. Fort Myer is in the metropolitan Washington, D.C., area and, like their civilian counterparts, military households in the Fort Myer area tend to choose smaller housing types than their DoD assigned profile. For example, among military households in the mid-career enlisted type with dependents (Table 3.5), 30 percent live in a two-bedroom apartment rather than the larger three-bedroom townhome which is their DoD housing profile assignment. We find that 24 percent of demographically similar civilians near Fort Myer choose a two-bedroom apartment, and 23 percent choose a one-bedroom apartment.

Together, these analyses indicate that military families tend to live in housing types that differ from the type they are "assigned" in terms of their BAH amount. While members are not required to live in the profile assigned to their grade and dependency status, the small share of soldiers living in the assigned profile challenges the face validity of using these profiles to set BAH rates for Army personnel in these locations. This is particularly true because assignments of BAH amounts using this hierarchy of housing profiles is how the goal of allowing members to procure housing that is comparable to housing procured by civilians with similar incomes is put into practice.

It may be that these differences in housing choice reflect important differences in the available housing stock in these areas, something that the system of DoD housing profiles does not consider. Additionally, more granular differences in family structure may also lead to different housing choices (for example military households with dependents having more children, on average, than civilian households). But to the extent the "quantity" of housing differs between military and civilian households—both in terms of more bedrooms given the assigned profile and, for example, single-family houses tending to be larger than apartments—the results of this analysis suggest that military households tend to consume more housing than civilian households of comparable age, education status, and dependency status.

There may be important differences between military members and demographically similar civilians that are unobservable to the research team that drive differences in the type of housing sought by military households. For example, military members are a selected subsample of the general population on a range of characteristics including cognitive testing, health conditions, criminal history, and other factors. Military spouses have lower rates of labor force participation, which may lead to different preferences over housing. Also, military service members may have reasonable expectations that their employment will be stable over time and can also expect to promote to higher pay grades with known increases in income over a generally predictable time period. Such factors highlight the challenges of making appropriate assumptions about what it means to use comparable civilians in determining housing adequacy.

[18] As noted earlier in the context of Table 3.1, we do not analyze housing choices for officers at the six installations because of small sample sizes.

Table 3.4. Distribution of Housing Profiles for *Junior Enlisted Military Personnel with Dependents* and Comparable Civilians

	Fort Moore		Fort Liberty		Fort Campbell		Fort Carson		Fort Cavazos		Fort Myer	
	Military	**Civilian**	**Military**	**Civilian**	**Military**	**Civilian**	**Military**	**Civilian**	**Military**	**Civilian**	**Military**	**Civilian**
1-BR apartment	14%	0%	11%	7%	8%	0%	14%	14%	8%	2%	51%	19%
2-BR apartment	**17%**	**14%**	**17%**	**20%**	**17%**	**4%**	**5%**	**22%**	**27%**	**13%**	**0%**	**30%**
2-BR townhome	0%	0%	5%	2%	13%	4%	11%	0%	2%	14%	0%	5%
3-BR townhome	3%	0%	20%	3%	22%	0%	20%	5%	23%	22%	23%	6%
3-BR single-family home	4%	50%	16%	29%	26%	39%	0%	18%	14%	19%	19%	7%
4-BR single-family home	0%	22%	8%	0%	3%	0%	8%	10%	8%	2%	0%	6%
Not a DoD profile	62%	13%	23%	40%	11%	53%	42%	31%	18%	29%	7%	27%
Weighted sample size	540	713	5,780	3,245	6,044	2,535	1,713	2,208	3,949	3,692	271	3,533

SOURCE: Author calculations from ACS microdata from IPUMS (Ruggles et al., 2023). Tabulations use PUMA to MHA crosswalk as described in report and household level survey weights.
NOTE: BR = bedroom. The row for 2-BR apartment is in bold because this is the housing profile DoD assigns to enlisted personnel in grades below E-5 who have dependents.

Table 3.5. Distribution of Housing Profiles for *Mid-Career Enlisted Military Personnel with Dependents* and Comparable Civilians

	Fort Moore		Fort Liberty		Fort Campbell		Fort Carson		Fort Cavazos		Fort Myer	
	Military	**Civilian**	**Military**	**Civilian**	**Military**	**Civilian**	**Military**	**Civilian**	**Military**	**Civilian**	**Military**	**Civilian**
1-BR apartment	0%	0%	0%	2%	0%	0%	0%	1%	10%	3%	5%	23%
2-BR apartment	10%	4%	7%	5%	3%	13%	2%	18%	7%	12%	30%	24%
2-BR townhome	0%	3%	0%	0%	0%	0%	22%	6%	1%	1%	0%	3%
3-BR townhome	**18%**	**3%**	**13%**	**1%**	**14%**	**2%**	**8%**	**13%**	**7%**	**6%**	**22%**	**10%**
3-BR single-family home	22%	38%	34%	38%	70%	42%	30%	25%	4%	41%	0%	8%
4-BR single-family home	18%	31%	33%	19%	3%	19%	7%	7%	45%	13%	2%	13%
Not a DoD profile	31%	22%	13%	34%	10%	25%	31%	21%	26%	23%	40%	18%
Weighted sample size	1,227	3,172	4,975	10,115	3,131	6,737	3,696	11,343	2,958	10,306	1,427	27,582

SOURCE: Author calculations from ACS microdata from IPUMS (Ruggles et al., 2023). Tabulations use PUMA to MHA crosswalk as described in report and household level survey weights.
NOTE: BR = bedroom. The row for 3-BR townhome is in bold because this is the housing profile DoD assigns to enlisted personnel in grades E-6 to E8 who have dependents.

Extent to Which Housing Expenses Equal BAH Rates

To assess the extent to which BAH amounts appear to be sufficient to cover the housing costs of service members, we present graphical evidence on the correlation between their monthly BAH amounts and housing expenditures using ACS data. While we believe these analyses are informative, we reiterate the limitations associated with matching PUMAs with MHAs discussed above.

A second limitation of this analysis is that we do not directly observe the grade of military personnel in the census data. To address this issue, we use demographic characteristics of active duty military in the data to impute the individual service member's approximate grade according to broad "types," as we showed in Table 3.1. We then assign these individuals a BAH amount according to their type and their dependency status. For the junior enlisted type, we assign the E-4 BAH amount for the relevant MHA according to whether a service member in the data has dependents or not. For the mid-career enlisted type, we use a BAH that is the weighted average of the BAH amount for E-5, E-6, and E-7, with the weights reflecting the relative share of individuals in the Army's active force at these grades. For junior and mid-career officer types, we also use weighted averages of grades that reflect the Army-wide distribution of these grade groupings. [19] Using these imputed military career status assignments and BAH amounts, we collapse the individual microdata (household observations) down using the included household survey weights to generate MHA-level averages of BAH amounts and housing expenditures. These results are in shown in Figures 3.5 through 3.8.

Each figure has two scatter plots, one for households with dependents and one for households without, showing the monthly housing expenditure reported in the ACS data on the y-axis and the monthly BAH amount on the x-axis.[20] A diagonal dashed line in each figure traces out the set of points where the BAH amount matches the housing expenditure exactly. The interpretation of the scattered points, each representing an MHA average across the United States, is as follows: If a point is above the diagonal dashed line, then the service members in that MHA are spending more than the BAH amount, on average. If the point is below the line, then service members in that MHA are spending less than the BAH amount, on average. Note that—because of limitations in our matching of PUMAs to MHAs, as well as sample size limitations from the 1 percent sampling approach of the ACS data, which limits the number of service members we observe in the data—these analyses are generally using 30 to 80 MHAs (from among a total of 340 MHAs).

The results for junior enlisted (Panel A of Figure 3.5) and mid-career enlisted (Panel A of Figure 3.6) *with dependents* are broadly similar, with 71 percent of junior enlisted and 67 percent of mid-career enlisted spending less than or equal to the BAH amount on housing each month.

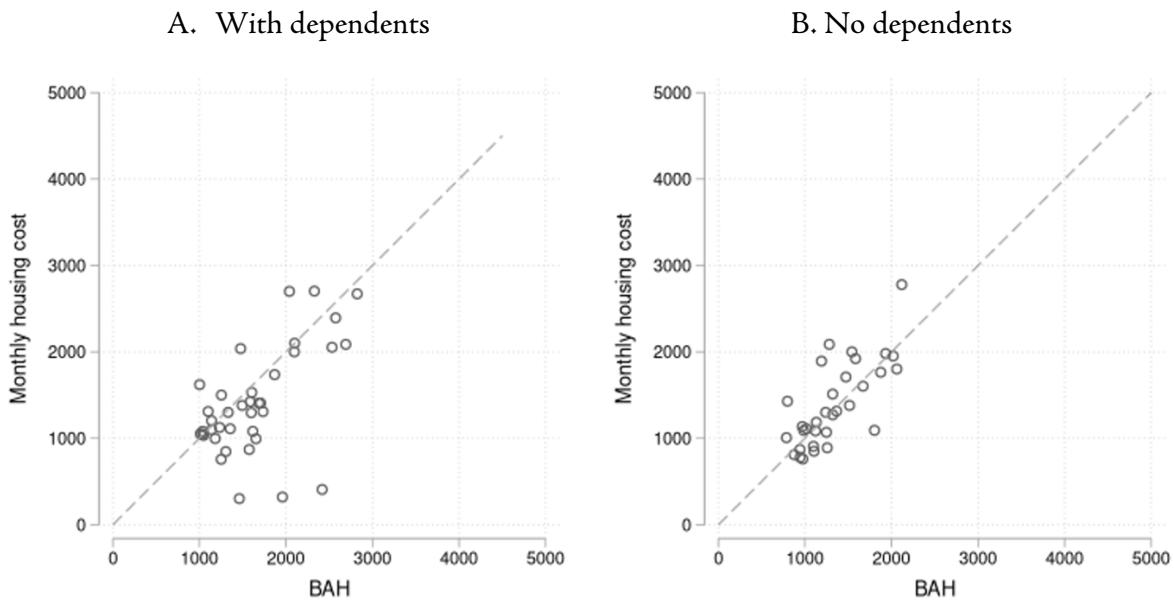
We find that junior enlisted households without dependents (Panel B of Figure 3.5) are less likely to have housing expenditures equal to or less than BAH, though it is still the case that 53 percent of MHA-level averages met this criterion. Mid-career enlisted without dependents (Panel B of Figure 3.6) are also less likely than their counterpart households with dependents to have average housing expenditures below BAH at the MHA average level, at 62 percent.

[19] The weights are 43 percent for E-5, 35 percent for E-6, and 22 percent for E-7. For junior officers, we use 45 percent for O-1 and 55 percent for O-2. For mid-career officers, we use 75 percent for O-3 and 25 percent for O-4.

[20] We divide the annual housing expenditure reported in the ACS data by 12 to make this amount comparable to the monthly BAH rate.

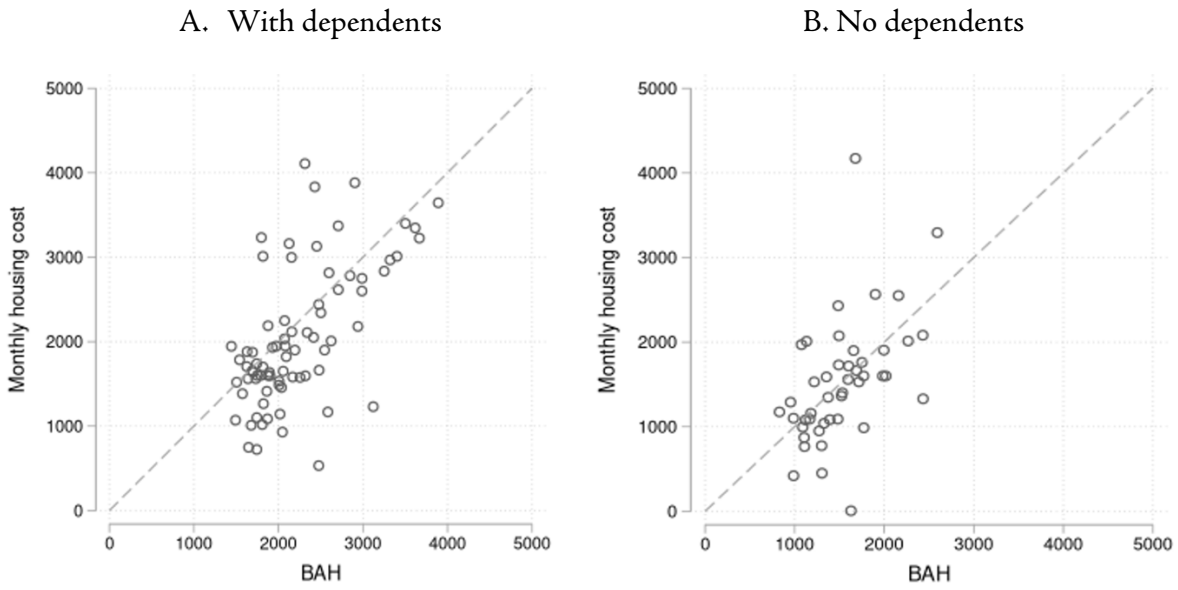
However, among the households of junior enlisted service members *with no dependents*, 34 percent have a resident classified as a sibling, partner, friend, or visitor, while this same rate for the households of mid-career enlisted service members without dependents is 26 percent. If this household composition indicates a greater likelihood of having other residents contributing to housing costs, then our measurement of a member's specific housing expenditure is likely biased upward for these two service member household types. This is because the figures show household expenditures and not the service member's individual contribution to those expenses when there are roommates.

Figure 3.5. MHA-Level Housing Spending Versus BAH for "Junior Enlisted" Type



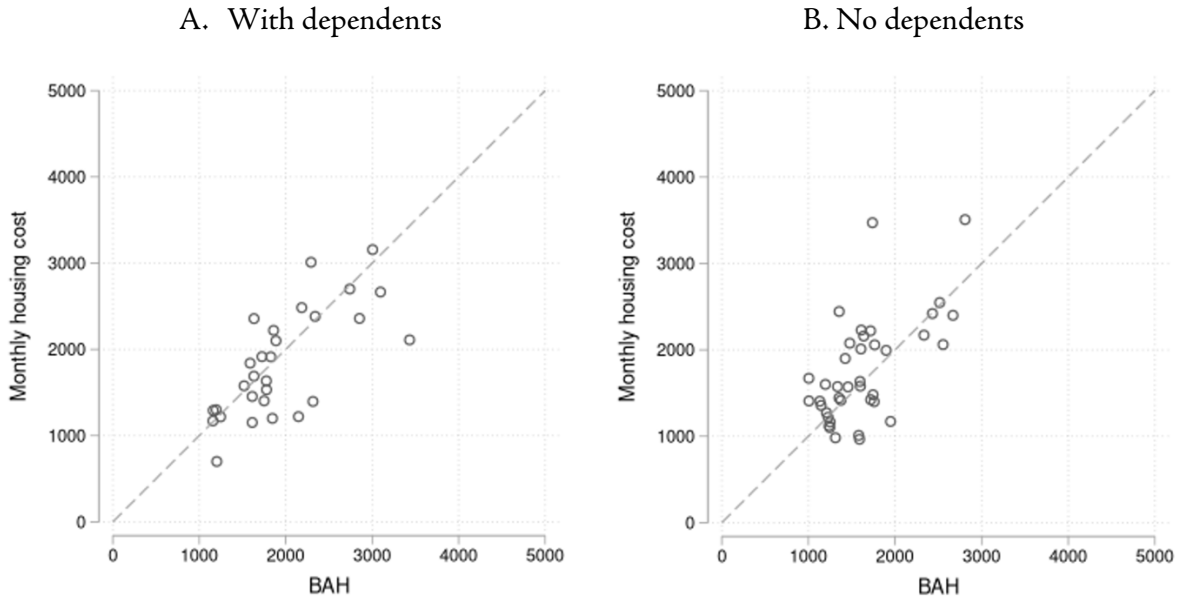
SOURCE: Author calculations using ACS microdata from IPUMS (Ruggles et al. 2023) and DTMO (undated-b).
NOTE: The monthly housing expenditure reported in the ACS data is shown on the y-axis and the monthly BAH amount is shown on the x-axis. The diagonal dashed line traces out the set of points where the BAH amount matches the housing expenditure exactly. Each point in the graphic represents an MHA.

Figure 3.6. MHA-Level Housing Spending Versus BAH for "Mid-Career Enlisted" Type



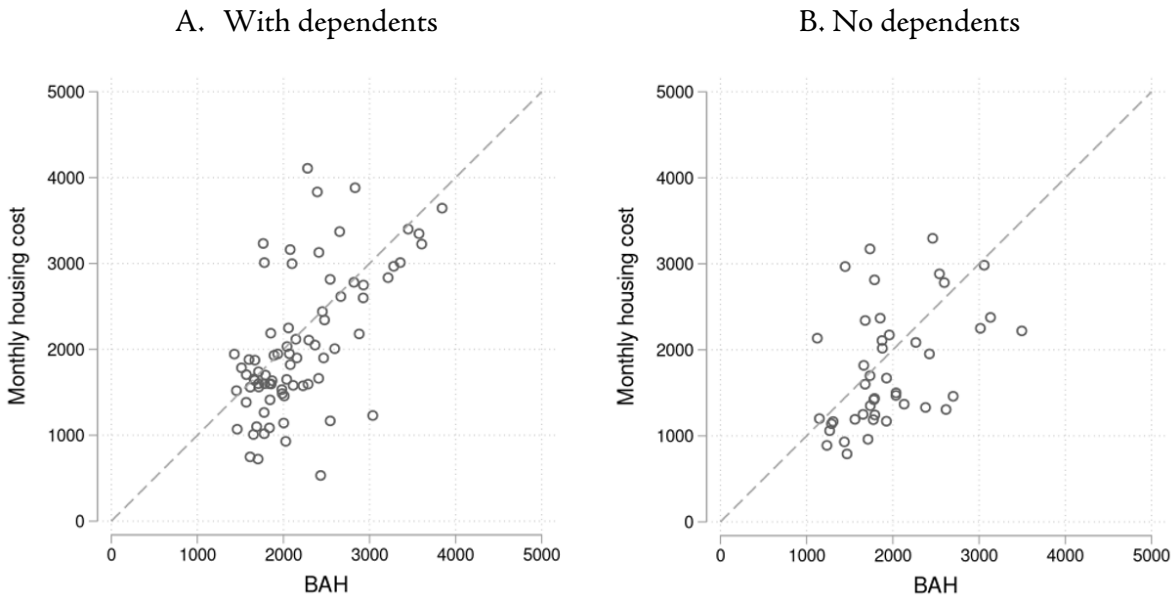
SOURCE: Author calculations using ACS microdata from IPUMS (Ruggles et al. 2023) and DTMO (undated-b).
NOTE: The monthly housing expenditure reported in the ACS data is shown on the y-axis and the monthly BAH amount is shown on the x-axis. The diagonal dashed line traces out the set of points where the BAH amount matches the housing expenditure exactly. Each point in the graphic represents an MHA.

Figure 3.7. MHA-Level Housing Spending Versus BAH for "Junior Officer" Type



SOURCE: Author calculations using ACS microdata from IPUMS (Ruggles et al. 2023) and DTMO (undated-b).
NOTE: The monthly housing expenditure reported in the ACS data is shown on the y-axis and the monthly BAH amount is shown on the x-axis. The diagonal dashed line traces out the set of points where the BAH amount matches the housing expenditure exactly. Each point in the graphic represents an MHA.

Figure 3.8. MHA-Level Housing Spending Versus BAH for "Mid-Career Officer" Type



SOURCE: Author calculations using ACS microdata from IPUMS (Ruggles et al., 2023) and DTMO (undated-b).
NOTE: The monthly housing expenditure reported in the ACS data is shown on the y-axis and the monthly BAH amount is shown on the x-axis. The diagonal dashed line traces out the set of points where the BAH amount matches the housing expenditure exactly. Each point in the graphic represents an MHA.

Junior officer households both with and without dependents are the least likely to have MHA-average housing expenditures that are equal to or less than BAH (48 percent of MHAs for junior officers with dependents and 41 percent of MHAs for junior officers without dependents). But the results are quite different for mid-career officers, with 75 percent of MHAs for households with dependents and 68 percent for households without dependents having average housing expenditures below the average BAH level.

Table 3.6 shows the results for military personnel from Figures 3.5–3.8 in tabular form and shows the share of MHAs with average housing expenditures that are equal to or below the average BAH level for civilians who are demographically similar to active duty service members (in other words, the same "type" in terms of age, education, and dependency status that we use to classify service members as junior enlisted and so on). We note that in every case, civilians in these same MHAs are substantially more likely to have housing expenditures that are equal to or less than the BAH level of their demographically similar active duty households—between 13 and 32 percentage points higher, depending on the comparison group. In other words, civilians who are demographically similar to military personnel were, in all cases, more likely to cover their housing expenses with BAH than military personnel in the same MHAs. These results are consistent with results presented in Chapter 4 that show that active duty military households consistently spend more on housing than civilians of similar income. That said, except for junior officers with or without dependents, we find that BAH covers or exceeds average housing expenditures in most MHAs in our analysis and that, even for these junior officers, the share of MHAs where BAH covers housing expenditures is above 40 percent.

Table 3.6. Share of MHAs Where Average BAH Rate Is Equal to or Higher than Housing Expenditures for Active Duty Member Type

Service Member Type	Share of MHAs for Which Average BAH Rate Equals or Exceeds Average Housing Expenditure	Number of MHAs in Analysis
Junior enlisted type with dependents		
Active duty service members	71%	38
Civilians	84%	34
Junior enlisted type without dependents		
Active duty service members	53%	32
Civilians	71%	28
Mid-career enlisted type with dependents		
Active duty service members	67%	61
Civilians	93%	59
Mid-career enlisted type without dependents		
Active duty service members	62%	45
Civilians	89%	44
Junior officer type with dependents		
Active duty service members	48%	29
Civilians	77%	26
Junior officer type without dependents		
Active duty service members	41%	39
Civilians	78%	37
Mid-career officer type with dependents		
Active duty service members	73%	77
Civilians	91%	77
Mid-career officer type without dependents		
Active duty service members	68%	44
Civilians	100%	44

SOURCE: Author calculations as described in text.
NOTE: We limit our calculation of the shares above for civilians to matched PUMA-MHAs that provided a valid estimate for service members. Because some MHAs did not have analogous civilians of some types (this is most prominent for junior enlisted because civilians with their age and education level are less likely to be heads of household), the number of MHAs used to generate the shares above for civilians is sometimes smaller than the number of MHAs used to generate the shares for service members.

Summary

We used DMDC together with ACS data on military and civilian households to assess whether soldiers are making choices consistent with the way that BAH is set. Specifically, we expect BAH rates to adequately fit the housing costs paid by soldiers if soldiers choose to live in the MHAs used to determine their BAH rate, they live in the housing profile that DoD assigns to them, and their housing expenditures are covered by their BAH.

We found that Army personnel receiving BAH generally live in their assigned MHA, indicating that the zip codes used to define MHAs in the BAH methodology were effective in covering the zip codes where Army personnel reside in the period of our analysis (2021). This finding is consistent with the Department's target of collecting rental data within an MHA to the set of zip codes where 90 percent of service members assigned to the MHA live.

We also found that military personnel tend to live in housing types that differ from the type they are "assigned" in terms of how their BAH amount is set, and specifically military households tend to consume more housing than civilian households of comparable age, education status, and dependency status. This difference in housing choice may reflect differences in the available housing stock in these areas and more granular differences in family structure, such as the number and ages of children, and, more broadly, may simply reflect the fact that military service members are a selected subpopulation that may have housing needs and preferences that differ, on average, from observably similar civilians. Finally, we found that civilians in the same MHAs are more likely to have housing expenditures that are equal to or less than the BAH level compared with demographically similar active duty households in the same MHA. While we do not explicitly assess whether member housing expenditures are covered by their specific BAH rate, we found that BAH covers or exceeds average housing expenditures for military households in most MHAs included in our analysis, except for junior officers, and even for this group, the share of MHAs where BAH covers housing expenditures is over 40 percent.

That BAH rates tend to cover average housing expenses across MHAs does not imply that BAH rates are too high. Ultimately, BAH is an element of cash compensation that members can use for any purpose, and the overall level of compensation for active members must be judged in terms of such factors as the ability of the Army to attract and retain the quality and quantity of personnel it needs. Our intent was to assess whether housing choices revealed whether the BAH rate-setting methodology resulted in BAH rates that generally enabled members to cover their housing expenses, and we found that to be the case.

Chapter 4

Assessment of BAH from the Standpoint of Meeting the Objectives of the Seventh QRMC

As noted in Chapter 1, the Seventh QRMC stated that the housing allowance should enable members to acquire housing that is equal to what civilians with comparable income acquire and that members should be unaffected by housing price variation across locations. In the previous chapter, we compared active duty member housing expenditures to BAH rates. In this chapter, we use 2017–2021 ACS data to assess the extent to which the housing expenditures of active duty military members is comparable to those of income-matched civilians, as well as to the housing expenditures civilians with comparable demographic characteristics. Although the Seventh QRMC and U.S. Code Title 37, Section 403, define comparability in terms of income, we consider comparability in terms of demographics as an alternative because assessments of military pay typically compare military personnel with civilians who are similar in terms of demographics (DoD, Office of the Under Secretary of Defense for Personnel and Readiness, 2020; Asch et al., 2019).

We then assess whether we observe differences in location amenities across the MHAs surrounding the six exemplar installations for military personnel versus civilians. The location amenities we consider are commuting distance, school quality, and violent and property crime rates, and the chapter describes the data sources we use to measure them and the limitations of the data and our analysis. While the objectives of the Seventh QRMC nor the enabling BAH legislation mention equalizing amenities across locations as an objective of BAH, Congress has raised the possibility of accounting for amenities in the BAH rate-setting methodology in the 2023 NDAA owing to military family concerns regarding school quality. Thus, our analysis examines the extent to which amenities differ across the six exemplar locations in the available data and the extent to which the differ for military personnel versus civilians.

Comparison of Housing Expenditures of Military Personnel with Income-Matched Civilians

An underlying component of the BAH framework is the concept that BAH rates should correlate with what civilians of comparable incomes spend on housing (DTMO, undated-b). In practice, this goal is operationalized by assigning housing profiles that are considered increasingly generous rather

than the approach of directly comparing the housing of service members and income-matched civilians in each of the 340 MHAs each year.[21]

We generate evidence on how well this indirect approach works in two ways. The first approach, covered in Chapter 3, compared the basic characteristics of the housing of service members of a given "type" (for example, mid-career enlisted with dependents) with demographically similar civilians across our case study areas. We found evidence of substantial differences both among military service members of a given type across locations and relative to demographically similar civilians within a location, suggesting that this indirect approach to defining housing comparable with civilians with similar incomes may be problematic.

In the second approach, discussed below, we compare the level of housing expenditures between service members and civilian heads of household who are matched on personal income, and among service members and civilians matched on the demographic characteristics. The goal of this approach is to shed light on whether the underlying goal of providing housing comparable with civilians of similar incomes is reflected by observing similar housing expenditures, while controlling for housing characteristics and the local housing market (small geographic areas).

We use ACS data to compare active duty military members and civilians in terms of both total housing expenditures and the share of income that is spent on housing. We consider income share to estimate whether the rent burden for military personnel is similar with that of comparable civilians in the same location and who are procuring the same housing type. We first generate these comparisons using national data using the most recent year of ACS data, 2021. Because we cannot identify service branch in the ACS data, the national analysis focuses on differences in housing expenditures and share of income spent on housing for all active duty members, not just Army personnel. We also generate comparisons using only our six exemplar Army locations, but for these analyses, it is necessary to aggregate data from 2017 to 2021 to reach sample sizes large enough for this small area analysis.

To compare how both overall housing expenditures and the share of income spent on housing compare for service members and civilians, we first divide up the levels of personal income among military personnel in the ACS data into eight bins (octiles). To reduce the effects of significant outliers in terms of income on these comparisons, which could skew what we observe among civilians because they have much more variation in income at both the high and low end of the income distribution, we set the low end of the 1st octile to the 25th percentile of that income group and the high end of the 8th octile to the 75th percentile of income observed in that group. We then divide up civilians by these same income levels and estimate a series of regression models to compare differences in housing spending.

To ensure that we are accounting for potentially important differences in the type of housing service members and civilians may choose, we use controls for each DoD housing profile so that each comparison is made among households in the same type (for example, a two-bedroom apartment). To account for the large variation in housing costs around the country, we also use controls for small geographical areas (PUMAs). Thus, we are making comparisons of households with similar incomes living in similar housing types in the same geographic area.

[21] We conjecture that this approach would likely be infeasible because of the significant data demands involved in observing both household income and specific housing types, including measures of the quality of a housing unit, at the individual level for large samples across all MHAs on an annual basis.

Results from National Comparisons of Housing Expenditures

Though the BAH methodology uses rents as the exclusive measure of area housing costs, the regression model estimates presented in Tables 4.1 and 4.2 consider results for renters and homeowners separately because there may be important differences in the choices determining housing expenditures across these two types of housing tenure. For example, homebuyers accrue the tax advantage associated with being able to deduct mortgage interest, and service members who are homeowners are eligible for this deduction even if they receive BAH, which is a tax-free allowance (Internal Revenue Service, 2022). Service members also typically have access to favorable home financing, including low interest rates and zero or low down-payment requirements (U.S. Department of Veterans Affairs, undated). In addition to cost differences that may differentially affect active duty personnel and civilians, homebuying among service members may reflect a preference to reside to a given area after military service is complete or it may reflect an investment motive on the part of the service member, and these factors may not be part of the decision process of renters.

In Table 4.1, which focuses on homeowners, we find that, relative to being a civilian, being an active duty member is positively associated with housing expenditures and that the estimates are highly statistically precise in every income octile. Put differently, military households spend more than civilians who are comparable in terms of income, housing type, and geographic area. These differences in terms of housing expenditures are largest for the lowest income levels and become generally smaller as we consider higher incomes. For those in the lowest income octile, civilians spend, on average, $12,491 annually, compared with $17,993 (or $5,502 more) annually for active duty military members with comparable incomes. We note that the subsample of active duty military households is quite small for the lowest income octiles, making it all the more notable that the estimates of spending differences are highly statistically precise. The number of active duty homeowner households increases almost monotonically across the income octiles.

When we consider housing costs as a share of total household income (which accounts for potential differences in spousal earnings in non-single households), results are similarly larger for the lowest income groups. In the lowest octile, active duty households spend almost 15 percent more than comparable non-military households, which spend around 30 percent of their gross income on housing. This difference declines to under 4 percent for the highest octile, with civilian households spending only around 15 percent of their gross income on housing.

For renters (Table 4.2), the pattern is somewhat different. While the results indicate positive, statistically precise differences in housing expenditures for active duty military relative to income-matched civilians in the same housing type and geographic area, the largest differences are among higher-income households, with the additional spending for active duty households in the highest (8th) octile being nearly double that of the lowest (1st) octile, $4,348 versus $2,703 annually in Table 4.2. In terms of the share of income, however, service members in the 1st octile are spending well over twice the share of their total income on housing relative to service members in the 8th octile.

The results in Tables 4.1 and 4.2 on the share of income devoted to housing expenses raise questions about the housing cost burden of service members versus comparable civilians. The U.S. Department of Housing and Urban Development (HUD) defines being "cost burdened" as spending more than 30 percent of gross income on housing costs and being "severely burdened" as spending over 50 percent of gross income on housing costs (Larrimore and Schuetz, 2017). According to this

definition, homeowners in the lowest income octile and renters in the bottom two octiles are housing cost burdened. The results also indicate that active duty service member homeowners in the bottom three octiles and active duty service member renters in the bottom four octiles meet this definition, with both the bottom octiles either actually or very nearly meeting the threshold of "severe" housing cost burden.

It is unclear, however, whether this approach to measuring unduly high housing costs is appropriate for service members, because BAH is set to absorb (virtually) all the growth in their housing costs. If, for example, a civilian household has income of $60,000 per year and annual housing costs increase from $15,000 per year to $25,000 per year, this household will become rent-burdened because their housing expenditure will increase from 25 percent to 42 percent. Under an effectively implemented BAH policy, an active duty service member household with non-BAH income of $45,000 per year and a BAH of $15,000 per year when this housing cost change occurs will see total income increase to $70,000. And we reiterate that BAH is, itself, tax exempt, making this income increase even larger if we incorporate this tax advantage relative to a pay raise for a civilian household, which would be subject to the household's full marginal tax rate. This household will also be considered housing cost–burdened due to spending 36 percent of income on housing though the BAH policy left the amount of non-housing income available to the household unchanged. Considering how to measure housing cost burden among active duty military personnel in the context of the BAH program is an important policy question, and this is even more true if service members are choosing housing that is more expensive than housing chosen by comparable civilians.[22]

To assess whether these results for 2021 are a recent phenomenon related to, for example, the COVID-19 pandemic that began in 2020, we also conducted this same analysis on ACS data from 2017. These results are in Tables A.1 and A.2 in Appendix A. We find that the patterns we see in the 2017 data are very similar to the results using 2021 data and shown in Tables 4.1 and 4.2, suggesting that the main conclusion, that active duty military households consistently spend more on housing than comparable civilian households, is not strongly related to the pandemic's effects on the real estate market or any other transitory phenomenon in the past few years.

Results from Comparisons of Housing Expenditures at Exemplar Army Locations

Because the national results shown in Tables 4.1 and 4.2 are for active duty military personnel in all services rather than specifically the Army, we also investigated how housing expenditures for personnel we believe are more likely to be Army personnel compare to comparable civilians in similar locations and housing types. We redid the analysis in Tables 4.1 and 4.2 using data on the six

[22] To be truly representative, considerations of cost burden among active duty families should also consider the value of free family health care and the potential retirement benefits of a career in the military because most civilians today must set aside a considerable amount of their gross income for retirement under defined contribution plans that predominate in the private sector (Myers and Topoleski, 2021).

exemplar locations with results shown in Tables A.3 (homeowners) and A.4 (renters) in the Appendix A.[23]

We find that the results for the exemplar locations are broadly similar with the national results shown in Tables 4.1 and 4.2. That is, military households spend more on housing compared with income-matched civilians in the same location and housing type. Thus, the national results are generally representative for Army personnel. The most substantive difference between the results from these areas and the results using national data is that civilians across the income distribution appear to spend moderately more on housing both in dollar terms and as a share of income in the six exemplar locations than at the national level. This is true of both homeowners and renters. Perhaps relatedly, the magnitude of additional spending by military households compared with civilian households, both in dollar terms and as a share of income, is smaller for both types of housing tenure in the exemplar locations than the national level. For example, at the lowest octile, additional spending by military households is $4,348 annually at the national level, compared with $2,393 for the exemplar locations. Despite this difference between the national versus the Army-specific locations, most of the results are still highly statistically significant, even with sample sizes that are generally between around 5 to 8 percent of the national sample sizes.

Comparison of Housing Expenditures of Military Personnel with Demographically Comparable Civilians

The current BAH methodology of setting the housing allowance for service members based on the housing obtained by civilians with comparable income may obscure important differences related to the fact that military pay is benchmarked to exceed the average pay for civilians with similar demographic characteristics in terms of age, sex, and education. These demographics are used in analysis that compares military and civilian pay because they affect the human capital as well as the civilian opportunities that military personnel may have in the external market. Since the 9th QRMC, the 70th percentile of the earnings of demographically similar civilians has been used by DoD and by subsequent QRMCs to measure the adequacy of military relative to civilian pay. To measure military pay, the QRMCs focus on regular military compensation (RMC), which is defined as the sum of basic pay, the basic allowance for subsistence, BAH, and the federal tax advantage of receiving these allowances tax free. That said, in the 2000s and through 2017, RMC exceeded the 70th percentile. For example, the most recent estimate for the 13th QRMC found that in 2017, for those within their first 20 years of service, RMC was at the 85th percentile of the civilian wage distribution for enlisted personnel and at the 77th percentile for officers (DoD, Office of the Under Secretary of Defense for Personnel and Readiness, 2020).

We find a similar result using the ACS data, for which income of service members includes all income, not just the elements of RMC, but does not include the tax advantage. Specifically, Table A.5 in Appendix A uses a regression model to compare both personal and household income of service

[23] As discussed in Chapter 3, we use data across a five-year period for modeling housing expenditures across the six exemplar Army locations to achieve a sample size large enough to provide useful levels of statistical inference. Given the similarity of our findings at the national level for 2017 and 2021, this aggregation of data for the exemplar analysis is not likely to obscure important takeaways about these locations.

members and civilians of the same "type" (e.g., junior enlisted, mid-career enlisted, and so forth, as discussed in Chapter 3). The results indicate that there are often large, usually positive differences in the personal income of active duty military relative to demographically civilians. For example, junior enlisted without dependents earn nearly 30 percent more than their civilian counterparts in terms of age and education level, whereas mid-career officers with dependents earn around 7 percent more. However, the total household income of these same mid-career officers with dependents is 6 percent less than comparable civilian families, highlighting the importance of spousal earnings and how frequent moves and other aspects of military service can affect them (Hosek et al., 2004). In fact, nearly all military "types" in our analysis show positive differences in personal income when compared with demographically similar civilians but negative or statistically insignificant differences in terms of total household income.

Table 4.1 National Differences in Annual Housing Expenditures Among Active Duty Military and Civilians with Comparable Incomes in 2021 (Homeowners)

	Income Groupings (octiles)							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Panel A: Outcome is annual housing expenditures ($)								
Active duty difference	5,502*** (1018)	4,980*** (620)	4,468*** (938)	3,213*** (720)	3,656*** (516)	3,762*** (535)	3,256*** (620)	3,207*** (738)
Average civilian spending	12,491*** (1)	13,567*** (1)	14,758*** (3)	15,895*** (4)	16,941*** (3)	18,505*** (3)	21,037*** (3)	24,520*** (3)
Panel B: Outcome is annual housing expenditures as a share of annual total household income ($)								
Active duty difference	0.176*** (0.04068)	0.138*** (0.02035)	0.116*** (0.01938)	0.088*** (0.01228)	0.091*** (0.00913)	0.064*** (0.00749)	0.046*** (0.00652)	0.031*** (0.00641)
Average civilian income share	0.318*** (0.00003)	0.239*** (0.00004)	0.213*** (0.00007)	0.197*** (0.00006)	0.184*** (0.00005)	0.173*** (0.00004)	0.162*** (0.00003)	0.146*** (0.00003)
Income range ($1,000s)	$15–$29	$29–$39	$39–$48	$48–$55	$55–$65	$65–$80	$80–$102	$102–$150
Observations (total)	141,153	100,396	82,129	61,381	69,891	82,672	78,028	77,006
Observations (active duty military households)	72	133	210	214	271	363	317	331

SOURCE: Author calculations using 2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with fixed effects for dependency status (a binary measure), PUMA, and DoD housing profile. The two "average civilian" rows are the constant term from this regression. Income octiles are reported to the nearest thousand. To reduce the influence of outlier low and high incomes, the minimum income in the 1st octile used the value of the 25th percentile of incomes in the data within that range and the maximum income in the 8th octile used the 75th percentile of incomes in the data within that range. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4.2 National Differences in Annual Housing Expenditures Among Active Duty Military and Civilians with Comparable Incomes in 2021 (Renters)

	Income Groupings (octiles)							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Panel A: Outcome is annual housing expenditures ($)								
Active duty difference	2,703*** (327)	2,397*** (427)	2,629*** (404)	2,230*** (461)	1,324** (414)	3,146*** (490)	3,435*** (668)	4,348*** (941)
Average civilian spending	13,838*** (2)	15,126*** (5)	16,120*** (6)	17,123*** (9)	18,357*** (8)	19,943*** (9)	22,343*** (11)	25,751*** (16)
Panel B: Outcome is annual housing expenditures as a share of annual total household income ($)								
Active duty difference	0.106*** (0.02177)	0.075*** (0.01188)	0.085*** (0.01144)	0.067*** (0.00951)	0.045*** (0.00753)	0.052*** (0.00669)	0.041*** (0.00693)	0.044*** (0.00738)
Average civilian income share	0.468*** (0.00012)	0.335*** (0.00013)	0.285*** (0.00017)	0.257*** (0.00019)	0.239*** (0.00015)	0.220*** (0.00012)	0.199*** (0.00012)	0.176*** (0.00013)
Income range ($1,000s)	$15–$29	$29–$39	$39–$48	$48–$55	$55–$65	$65–$80	$80–$102	$102–$150
Observations (total)	70,691	43,006	29,485	18,878	18,885	19,437	15,479	12,554
Observations (active duty military households)	348	479	457	379	371	385	300	235

SOURCE: Author calculations using 2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with fixed effects for dependency status (a binary measure), PUMA, and DoD housing profile. The two "average civilian" rows are the constant term from this regression. Income octiles are reported to the nearest thousand. To reduce the influence of outlier low and high incomes, the minimum income in the 1st octile used the value of the 25th percentile of incomes in the data within that range, and the maximum income in the 8th octile used the 75th percentile of incomes in the data within that range. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

For this reason, comparisons of housing expenditures by military personnel to civilians with similar income are likely to provide different results than comparisons to civilians with similar demographics, which are typically used to help set the appropriately level of military pay. Further complicating the process of using civilians with similar income as a benchmark for setting BAH is the fact that BAH itself is part of RMC. Thus, as the costs of housing increase (as they have been doing steadily over the past two decades and then rapidly over the two years of the COVID-19 pandemic), BAH is raised, which increases the RMC of service members, which changes the definition of the civilians that service members must be compared to in future rounds of setting BAH levels.

As an example, in 2000 BAH represented 22.4 percent of the RMC of a service member whose pay grade is E-4. By 2023, that share had increased to 32.2 percent (Office of the Under Secretary of Defense for Personnel and Readiness, Directorate of Compensation, 2000 and 2023). This change was driven by a nominal increase in the average BAH from just over $6,100 to more than $20,000 (the inflation adjusted value of the BAH amount from 2000 in 2023 had it stayed constant in real terms would have been just under $11,000).

It is, therefore, instructive to consider an approach that avoids this feedback loop by comparing the housing expenditures of active duty service members to demographically similar civilians. This framework can bring a different perspective on the kind of housing that might be considered acceptable for members in a location. For example, military personnel may have differing demographics beyond age, education, and gender that affect their housing choices, such as their family structure. Furthermore, the results in Table 3.6, showing that BAH is more likely to cover housing expenses for demographically similar civilians than it is for military personnel, also point to the importance of understanding this dimension of differences in housing expenditures. We therefore investigated how housing expenditures differed among demographically similar military personnel and civilians using the ACS data.

Model and Results

We use a series of simple regression models to estimate how differences in housing expenditures between demographically similar service members and civilians change when we control for increasingly more characteristics. For example, there may be important differences between military members and civilians in family size or other characteristics, such as race and ethnicity, that might bear on neighborhood choice, housing type and size, or other aspects of housing spending. For this reason, we take an approach that begins with a simple model in which we control for geographic area. This simple model provides estimates of within-area differences in housing expenditures between military members and civilians with broadly similar demographics (e.g., junior enlisted "type" and so on), controlling for neighborhood differences that may correspond with higher or lower housing spending. We then estimate models that add controls for race/ethnicity, marital status, and number of children for families with dependents. Finally, to consider spending differences holding constant the type of housing (e.g., a two-bedroom apartment versus a three-bedroom single-family house), we estimate models that control for the DoD housing profiles. (We remind readers that this same strategy of controlling for housing profile was used for the models we presented results for in Tables 4.1 and 4.2.) In the final model specification, then, we are comparing housing spending of military

members and civilians within a small geographic area, within a specific DoD housing profile, and controlling for race/ethnicity, marital status, and number of children.[24]

Tables 4.3 and 4.4 summarize the results; the full regression results are shown in Tables A.6–A.13 in Appendix A. Overall, they indicate that active duty service members have consistently higher expenditures on housing than civilians even when we condition on demographic characteristics such as number of children and compare only service members and civilians within small geographic areas. That is, we estimate consistently positive and statistically significant differences in housing expenditures even in models with numerous controls.

Table 4.3. Summary of Results of Estimated Percent Differences in Housing Expenditures Between Active Duty Military and Demographically Comparable Civilians (Homeowners)

	Junior Enlisted		Mid-Career Enlisted		Junior Officer		Mid-Career Officer	
	Dependents	No Dependents	Dependents	No Dependents	Dependents	No Dependents	Dependents	No Dependents
Difference among active duty households relative to civilians of same "type"								
Controlling for geographic area	14.4%	19.5%	17.4%	20.8%	12.1%	7.3%	6.4%	15.4%
Adding demographic controls	13.9%	18.4%	15.9%	20.5%	12.0%	7.7%	5.7%	15.9%
Adding DoD housing profile controls	11.1%	17.8%	13.4%	17.5%	10.4%	5.4%	4.3%	14.5%
Mean annual housing expenditures among civilians	$13,309	$12,655	$17,204	$14,673	$20,476	$20,277	$29,413	$22,348

SOURCE: Author calculations using 2017–2021 1-year ACS microdata from IPUMS (Ruggles et al., 2023).
NOTE: A positive percentage in the table means that housing expenditures for military members are greater than for demographically comparable civilians. These results correspond to the outcomes in Tables A.6–A.13 in Appendix A. All results are statistically significant at the 99 percent confidence level using standard errors clustered at the PUMA level.

[24] The final (third) model in the results (presented in full in Tables A.6 through A.13 in Appendix A) is $y_{ijk} = \alpha + \boldsymbol{X_i}'\mathbf{B} + \theta_j + \phi_k + \varepsilon_{ijk}$, where the annual housing expenditure, y, of household i living in DoD housing profile j in PUMA k is regressed on a vector of household characteristics, $\mathbf{X}$, and fixed effects for PUMA and DoD housing profile. ε_{ijk} is the error term. In the prior two models, these characteristics are subtracted as indicated in the tables.

Table 4.4. Summary of Results of Estimated Percent Differences in Housing Expenditures Between Active Duty Military and Demographically Comparable Civilians (Renters)

	Junior Enlisted		Mid-Career Enlisted		Junior Officer		Mid-Career Officer	
	Dependents	No Dependents	Dependents	No Dependents	Dependents	No Dependents	Dependents	No Dependents
Difference among active duty households relative to civilians of same "type"								
Controlling for geographic area	17.3%	29.6%	26.2%	22.0%	17.8%	15.5%	21.4%	12.9%
Adding demographic controls	15.3%	28.9%	24.5%	21.5%	17.5%	14.9%	18.3%	12.7%
Adding DoD housing profile controls	14.4%	20.7%	20.2%	19.4%	13.8%	11.0%	12.9%	10.5%
Mean annual housing expenditures among civilians	$13,618	$14,030	$16,079	$22,458	$19,330	$21,112	$24,816	$21,295

SOURCE: Author calculations using 2017–2021 1-year ACS microdata from IPUMS (Ruggles et al., 2023).
NOTE: A positive percentage in the table means that housing expenditures for military members are greater than for demographically comparable civilians. These results correspond to the outcomes in Tables A.6–A.13 in Appendix A. All results are statistically significant at the 99 percent confidence level using standard errors clustered at the PUMA level.

What might account for the higher housing expenditures of military personnel? One possibility is that military members pay more relative to comparable civilians to obtain better-quality housing, such as housing of better construction or with amenities such as a nicer yard, a pool, or a remodeled kitchen. This conjecture is consistent with the fact that we still observe large spending differences even when we condition on DoD housing profile, limiting comparisons to groups of households within each of these broad housing type categories (so, for example, residents of two-bedroom apartments are only compared with other residents of two-bedroom apartments). In some cases, this control reduces the magnitude of the resulting difference by as much as 25 to 30 percent, but in many cases the magnitude of the estimated positive spending difference barely changes. While we cannot directly observe housing quality, some testing of a simple measure of average differences in housing quantity—the number of bedrooms—reveals no meaningful difference between service member and civilian households.[25] However, there may be other aspects of housing quality that we cannot measure with available data.

[25] Using the same model as we used in the housing expenditure regressions, we found no statistically significant difference in the number of bedrooms across six of eight octiles for homeowners and four of eight octiles for renters. For the remaining cases (primarily between the sixth and eighth income octiles) positive differences in the number of bedrooms are qualitatively small, between 0.09 and 0.25 (shares of a bedroom).

Comparison of Housing Choices Across Locations

In Chapter 3, we noted that the BAH Primer states that DoD uses housing standards that are based on the typical housing choices of civilians with similar incomes. While we did not compare housing choices of military personnel and civilians with similar income in Chapter 3, we compared choices among those with similar demographics, as shown in Tables 3.1 and 3.2.

Revisiting those tables, two conclusions are relevant to assessing BAH from the standpoint of the QRMC objectives. First, the BAH methodology uses standard housing types to evaluate rental rates in each MHA under the presumption that members should be unaffected by housing price variation across locations for a given housing type. If members' housing choice set were truly unaffected by changes in location, then we would expect members to make similar choices of housing regardless of location. Yet, the tabulations in Tables 3.1 and 3.2 for junior enlisted types and mid-career enlisted types, respectively, suggest that Army personnel make different housing decisions across the six exemplar installations.

As we noted in our comparisons of results for Fort Liberty versus Fort Cavazos, fewer junior enlisted types choose a two-bedroom apartment near Fort Liberty compared with near Fort Cavazos. The choices of junior enlisted type households with dependents for Fort Myer are particularly different than for the other installations. Personnel in Fort Myer are more likely to choose smaller housing types, such as a one-bedroom apartment.

Second, we would expect the BAH methodology to lead to military personnel to make roughly similar housing choices as civilians if the housing standards are based on the typical housing choices of similar civilians. Earlier in this chapter, we found that military households spend more on housing than civilians with comparable income and comparable demographics. The tables in Chapter 3 indicate that military members with dependents in the exemplar installations make different housing choices and, in particular, that these military households tend to choose larger housing types than civilians with similar demographic characteristics. For example, civilian households who are comparable to the mid-career enlisted type with dependents in the Fort Liberty and Fort Cavazos MHAs tend to be less likely to live in three-bedroom single-family houses and more likely to live in four-bedroom houses. Additionally, among those living in non-DoD housing profiles, most civilians live in either mobile homes or two-bedroom single-family houses, while most military members living in non-DoD profiles live in either apartments larger than three bedrooms or single-family houses larger than four bedrooms (see Appendix A). The exception is the Fort Myer MHA, which includes the high-cost areas of greater Washington, D.C., and Arlington, Virginia. In this MHA, junior enlisted type households with dependents disproportionately reside in one-bedroom apartments, whereas comparable civilians are more likely to live in two-bedroom apartments.

The results suggest that similar military personnel in terms of grade and dependency status choose different types of housing from one another depending on location and, in most cases, also choose housing types that are different from demographically similar civilians even within a location. For the most part, these differences appear to be favorable to service members in terms of the "quantity" of housing in terms of such measures more bedrooms or detached versus attached housing.

Do Members Experience the Same Area Amenities Across Locations?

The BAH methodology seeks to ensure that a change of station does not adversely affect the type of housing members can procure, and it does incorporate differences in area amenities to the extent that amenities are priced into the housing prices or the amenity is implicitly incorporated into the BAH methodology.[26] To the extent that an amenity is not fully incorporated into housing prices or the BAH methodology, we would expect amenities to differ across locations for military personnel. On the other hand, amenities may not be equalized because smaller, more rural areas may have a different stock of amenities than more urban areas. Thus, a different standard for assessing whether amenities are equalized is to assess whether amenities for military personnel in a location are no different than similar civilians. Our analysis compares amenities across locations for military personnel as well as compares amenities for military personnel with that of civilians in the same location.

Table 4.5 lists the amenities as well as the data we use in the analysis. We use the ACS for analysis of commute time within the six housing markets. To measure school quality in an MHA, we collected information about school districts' performance on standardized tests, a common measure of school quality, from the Stanford Education Data Archive (SEDA), an open source repository of school-level data that covers most American school districts. We use data from the 2017–2018 school year, the most recent data available in the web portal (Reardon et al., 2021). For zip code–level crime rate data for property and violent crimes, we use data from CrimeGrade, a private data repository (CrimeGrade, 2023).

An important caveat to our analysis of amenities is that the nature of the data used throughout this analysis precludes us from being able to restrict the analysis to comparable civilians or any specific subset of civilians. Both the CrimeGrade and SEDA data are zip code–level rather than individual-level data, making it impossible to remove civilians with dissimilar family structure, education, and earnings potential. Appendix B gives more detail about these data and the processes we used to clean and assemble them in the analytic data file we use below.

Table 4.5. List of Amenities in Analysis

Outcome	Measure	Source
Travel time to work	Average travel time to work in minutes	ACS from the National Historical Geographic Information System (NHGIS)
School quality	Average school district standardized test scores	Stanford Education Data Archive (SEDA)
Violent crime rates	Log of violent crime per 100,000 residents	CrimeGrade
Property crime rates	Log of property crime per 100,000 residents	CrimeGrade

[26] As discussed in Chapter 2, the BAH methodology is based on selecting locations in the MHA near installations, thereby reducing potential commuting times, and the survey methodology screens out high-crime areas when selecting survey areas, thereby reducing crime rates. The methodology does not consider public school quality.

Methodology for Making Comparisons

A challenge we faced in making comparisons of amenities in location between military members and civilians is that the data for both civilians and members are for the same set of zip codes that comprise the MHA. A simple average of the zip codes within the MHA would yield the same value for both civilians and Army soldiers. To capture a meaningful difference, we use each zip code's civilian and service member populations and then calculate a unique weighted average for the MHA for the civilian and for the military populations.[27]

Tables 4.6 and 4.7 illustrate how this process generates unique estimates of the MHA-level amenities for civilians and military populations, based on their different residential distributions across an MHA's zip codes. We populate the table with data from Fort Moore's MHA and two of its zip codes, 31909 and 31905. Despite using the same underlying amenity data, Table 4.7 shows that the different population weights lead to unique average amenities for the two subpopulations.

Table 4.6. Illustration of Population Weighted Estimation Process

Geography	Civilian Population	Civilian Weight	Military Population	Military Weight
ZIP: 31909	40,062	**0.702**	1,198	**0.215**
ZIP: 31905	16,973	**0.298**	4,377	**0.785**
MHA: GA075	**57,035**	**1.000**	**5,575**	**1.000**

SOURCE: Authors' calculations using NHGIS and DMDC data.

Table 4.7. Illustration of Differences in Amenities Through Population Weighting

Geography	Violent Crime Rate	Civilian Average	Military Average
ZIP: 31909	1.775	-	-
ZIP: 31905	5.054	-	-
MHA: GA075	**3.415**	**2.751**	**4.349**

SOURCE: Authors' calculations using NHGIS, DMDC, and CrimeGrade data.

Results

We present the results of the analyses by amenity, starting with travel time to work and following the order in which the amenities are listed in Table 4.5. For each amenity, we first show the geographic distribution of the amenity by zip code in each installation's MHA and its surrounding areas. We then plot the average level of each amenity within the installation's MHA using the civilian and Army population weights.

[27] Estimates of civilian population at the zip code level come from the ACS five-year samples and are downloaded through the National Historical Geographic Information System (NHGIS). We again use the DMDC data on service members' mailing address to estimate the Army population in each zip code.

Travel Time to Work

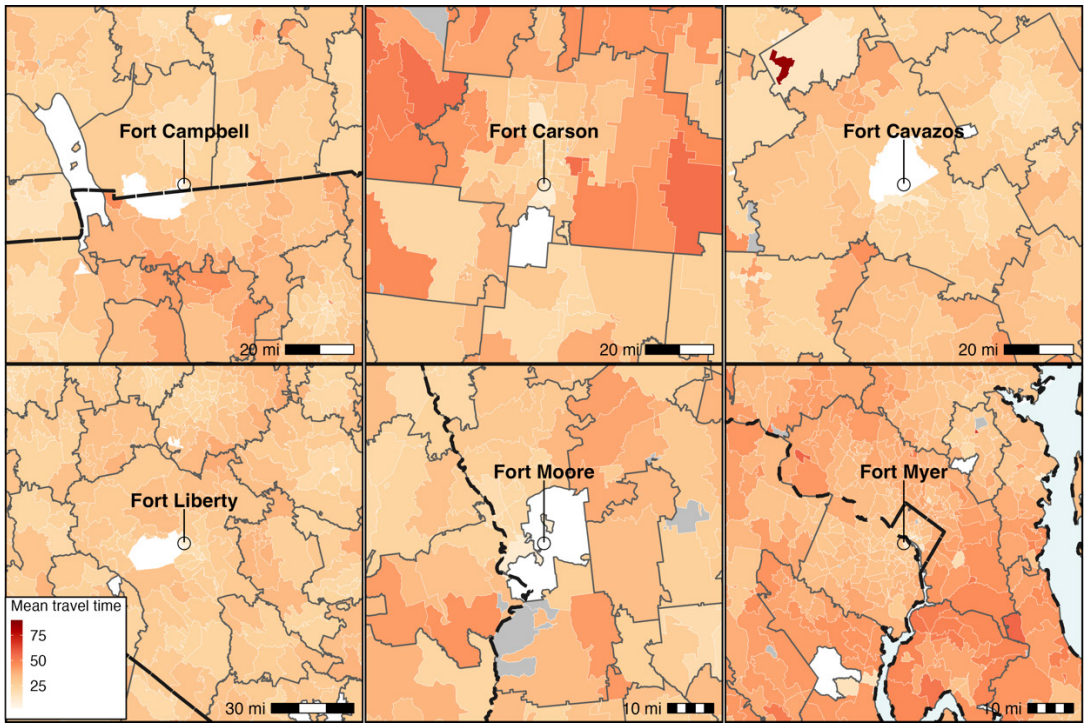
While the literature studying the cost of travel time is complex and estimates of individuals' willingness to pay to reduce their work commute vary, research finds that people generally prefer shorter commutes to longer ones (Small, 2012). The selection of zip codes used in the BAH methodology when constructing the MHA geography implicitly reduces commute size by restricting its selection to areas relatively near the base. Data on travel time to work for civilians and active duty military personnel in each of the six exemplar locations come from the ACS. Figure 4.9 contains six panels, each showing the geographic distribution of the average travel time to work at the zip code level for the six exemplar Army installation. Zip codes are colored by their average commute time. Lighter colors indicate shorter commutes (e.g., under 25 minutes), while the darker shades of red highlight zip codes where Americans must spend more time to reach their place of work.

Figure 4.1 shows substantial variation in the commute times between and within MHAs. Fort Carson and Fort Myer, in Panels 2 and 6, respectively, have a greater share of their area covered in zip codes with relatively high average travel time. We explicitly quantify these differences in Figure 4.2, which plots the average commute time for each of the MHAs using both civilian (represented by hollow circles) and Army (filled circles) population weights.

The dashed red line in Figure 4.2 represents the national average commute time using the civilian population weights. Unsurprisingly, the residents in each of the six MHAs, which are largely found in rural areas, tend to have shorter commutes than the average American commute time. Only civilians in Fort Myer's MHA, in the Washington, D.C., metropolitan area and which is more urban than its counterparts, face commutes longer than the national average.

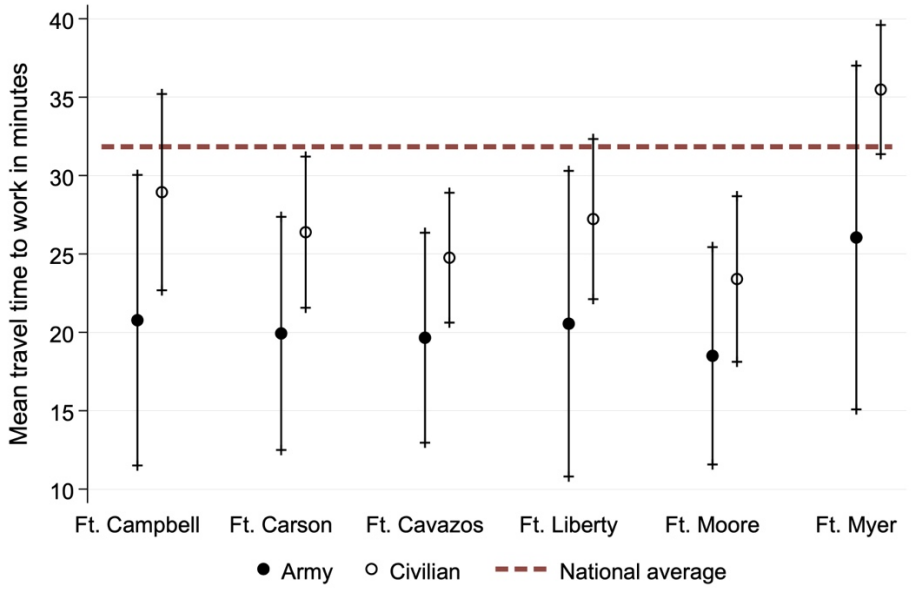
Importantly, we find that commutes are shorter for Army personnel than their civilian counterparts across all six installations, and these differences are nontrivial. For instance, at Fort Campbell, a soldier's commute is, on average, around seven minutes (i.e., 32 percent) shorter than a civilian's commute. That difference is even larger for Fort Myer, where civilians spend almost ten more minutes on their daily commute on average than military personnel.

Figure 4.1. Distribution of Average Travel Times, by Army Installation



SOURCE: Authors' calculations using ACS (NHGIS; work commute time) and DTMO (zip code to MHA crosswalk) using population weights from ACS (NHGIS). Data were joined based on their zip code identifier.
NOTE: In the legend, "mean travel time" is each zip code's average travel time to work, expressed in minutes. Zip codes in gray are missing data. State lines are the dashed black lines. Solid gray lines denote MHA boundaries. The regions in white do not belong to a ZCTA.

Figure 4.2. Differences in Average Travel Time to Work, Between and Within MHAs



SOURCE: Authors' calculations using ACS (NHGIS; work commute time) and DTMO (zip code to MHA crosswalk) using population weights from ACS (NHGIS). Data were joined based on their zip code identifier.
NOTE: The scatter plot points represent the population-weighted average of each MHA's mean travel time to work using either the zip code's Army (solid) or civilian (hollow) population. The national average of travel time across all zip codes using civilian population weights is 32 minutes. The "whiskers" of the plot represent a one population-weighted standard deviation from the mean and represent the variability or "noise" in the mean estimate.

Note that we do not explicitly test whether these differences are statistically significant, but we do incorporate the uncertainty of the estimate in the plot: The "whiskers" that extend above and below the estimate of the mean represent a one standard deviation increase and decrease, respectively.

Commute time reflects both (1) a region's infrastructure (e.g., the availability of housing near places of work, road quality, the availability of public transit, etc.) and (2) an individual's choice of housing location. The first component is a true amenity in the sense that it reflects qualities of the locality. The second, however, is not so much a feature of the locality, but a product of each individual's preference to lower their commute time. Our finding that commute times were lower for military personnel than for civilians may reflect access to better transportation infrastructure, the availability of housing on or near the military installation, or merely stronger preferences among service members to live near their place of employment. Consequently, we cannot conclude that service members enjoy better commuting amenities than civilians within the MHA, only that the combination of service members' preference for housing near their place of employment and their local amenities are stronger than that of civilians.

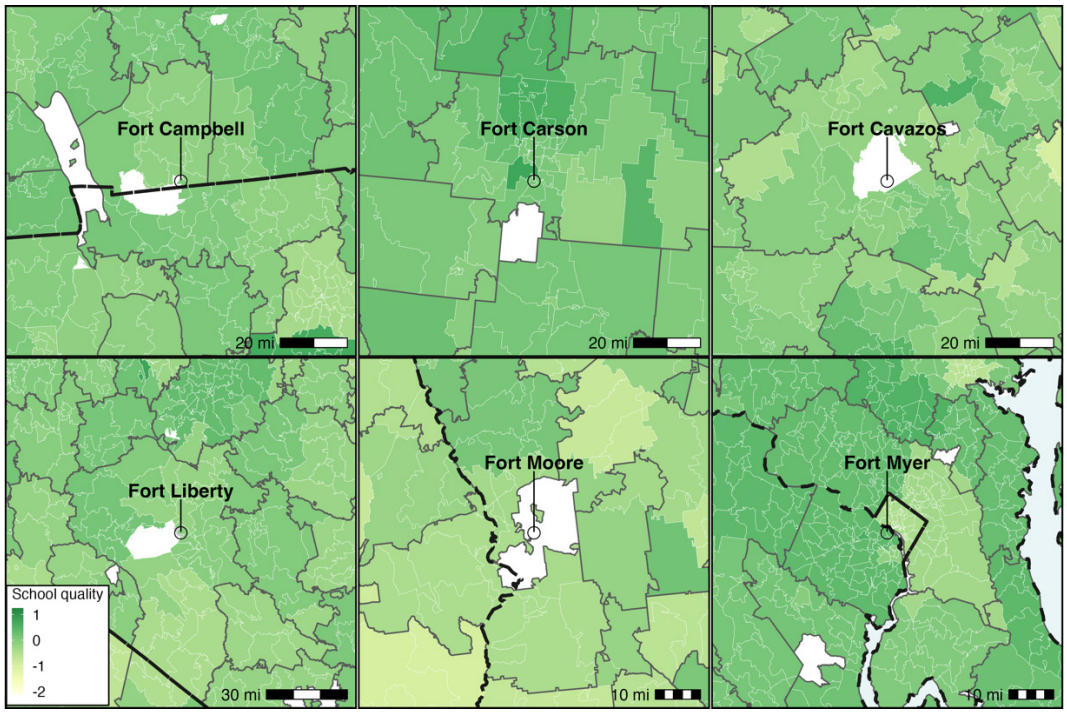
School Quality

School quality is important amenity to homebuyers. A 2011 literature review found that a one-standard deviation increase in school quality raises home prices by 3–4 percent (Nguyen-Hoang and

Yinger, 2011; Collins and Kaplan, 2017). As noted earlier, school quality does not figure into the BAH rate-setting methodology, yet personnel are likely to face higher housing costs to access the MHA's best school districts or, depending on the MHA, simply lack access to high-performing school districts.

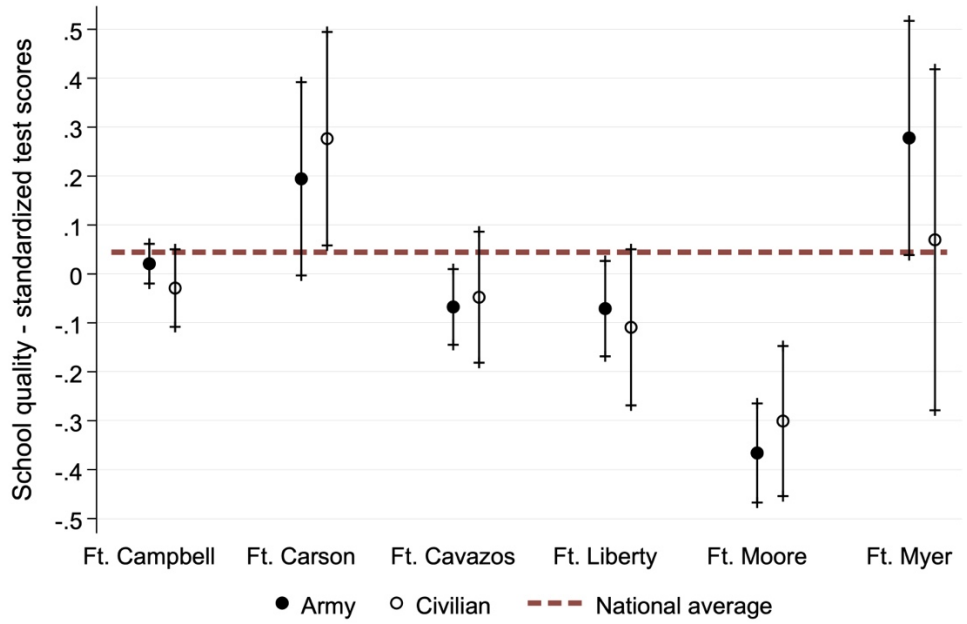
The geographic distribution of each installation's school quality is plotted in Figure 4.3, where the color of the zip code corresponds to its school's performance. We see lighter colors across Fort Moore's map panel, indicating that students in these schools tend to underperform on standardized test relative to the national average. The plots for Fort Carson and Fort Myer, however, are darker green, reflecting their higher-performing schools relative to both the national average and the other exemplar installations. We see this again in the plots of each exemplar MHA's average school quality using both the civilian and Army population weights, found in Figure 4.4. As in Figure 4.2, the national average is plotted with a red dashed line and uses weights from the civilian population of each zip code in its calculation; it is 0.044 standard deviations above zero.

Figure 4.3. Distribution of School Quality, by Army Installation



SOURCE: Authors' calculations using SEDA (school quality) and DTMO (zip code to MHA crosswalk).
NOTE: In the legend, "school quality" is the school district's average standardized test scores relative to the national average, expressed in standard deviations. Zip codes in gray are missing data. State lines are the dashed black lines. Solid gray lines denote MHA boundaries. The regions in white do not belong to a ZCTA.

Figure 4.4. Differences in School Quality, Between and Within MHAs



SOURCE: Authors' calculations using SEDA (school quality) and DTMO (zip code to MHA crosswalk).
NOTE: The standardized test scores represent differences between the school district's average test scores and the national average. The scores are normed such that the national average is zero and each unit change is one standard deviation. The national average we calculate, shown as the red dashed line, is just above zero (i.e., 0.044) because we calculate the average using civilian population-weighted statistics and only using zip codes that were successfully joined to the MHA-zip code key provided by DTMO. The "whiskers" of the plot represent a one population-weighted standard deviation from the mean and represent the variability or "noise" in the mean estimate.

Across the MHAs, Figure 4.4 shows substantial variation in school quality depending on a soldier's duty location. As suggested by the maps in Figure 4.3, we find that Fort Myer and Fort Carson have higher-quality schools than those in the other four MHAs on average. Members in the Fort Moore MHA, however, send their children to schools that perform at a level 0.366 standard deviations below the national average. This finding suggests that members may experience substantial differences in school quality when they change duty locations.

As for differences between civilians and Army personnel within each MHA, their experiences with respect to school quality appear to be relatively similar. Military members fare better than their civilian counterparts at Fort Campbell, Fort Liberty, and Fort Myer but worse in Fort Carson, Fort Cavazos, and Fort Moore, although the differences in most cases appear to be trivial.

SEDA, our source of school quality data, contains information on most public schools across the United States, however, to our knowledge, it does not include test scores from schools run by the Department of Defense Education Activity (DoDEA). DoDEA provides a comprehensive pre-kindergarten through 12th grade education for approximately 70,000 children of active duty and DoD civilians families including those stationed overseas. A 2022 GAO report found that students at DoDEA schools outperformed their peers in state public schools. In 2019, fourth-graders in DoDEA's school system scored higher than 98 percent and 100 percent of states in math and reading

assessments, respectively (GAO, 2022). Furthermore, DoDEA schools have fared much better than state public schools since the COVID-19 pandemic: From 2013 to 2021, their share of eighth-graders proficient at reading and math increased, while the national averages declined (Mervosh, 2023). Though DoDEA does not have schools at every U.S. military installation across the globe, it does have schools located at three of our six exemplar stations: Fort Campbell, Fort Liberty, and Fort Moore. In these cases, we expect that Figure 4.4 underestimates the true school quality that service members experience.

Crime Rates

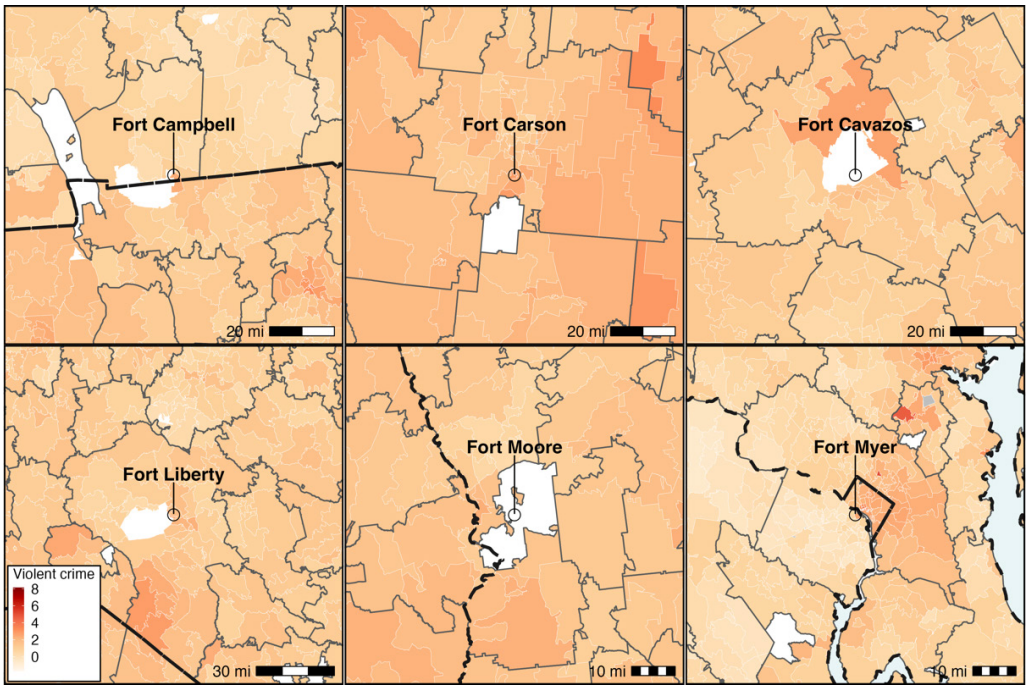
The BAH survey methodology excludes rental units in high-crime areas from its data collection efforts, although the exact criteria for "high-crime" is not specifically outlined in available public resources on the methodology, and DoD's source for crime statistics is also not specified (DTMO, 2023). Given that we are unable to replicate DoD's high-crime areas, one weakness of our analysis is that we include all zip codes in the calculation of the MHA-level crime rates, for both violent and property crime. In other words, we are not able to replicate the exact composition of the true BAH sample and so our estimates of MHAs' average crime rate may be larger as they include the high-crime areas that the BAH methodology omits.

Violent Crime Rates

Figure 4.5 shows the geographic distribution of the log of violent crime per 100,000 residents at the zip code level for each of the six Army bases, where "violent crime," according to CrimeGrade's webpage, includes murder, robbery, rape, and assault. Fort Campbell has several low-crime areas on the Kentucky side of its MHA, but more violence further south, signaling within-MHA variation of violent crime that we see at other installations. Rates of violent crime appear to be highest around Fort Carson and lowest around either Fort Moore or Myer. To compare these rates at the aggregate, we apply the zip code–level population weights and estimate each fort's average rate of violent crime for both Army personnel and civilians. We plot the estimate of the estimated means and their standard deviations in Figure 4.6.

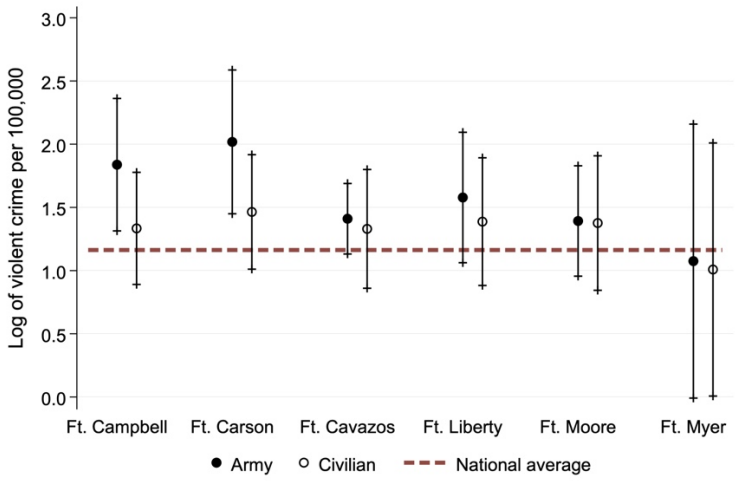
For five of the six installations, the violent crime rate is above the national average for both civilians and military personnel, while at Fort Myer the population-weighted estimates of violent crime are roughly on par with the national average. We observe some small differences in the rate of violent crime between civilians and soldiers, where the latter uniformly experience higher crime rates than the general population in all six MHAs. The differences are largest around Fort Campbell and Fort Carson, where service members experience between three and four more incidents of violent crime per 100,000 residents compared with civilians, a nearly 50 percent increase.

Figure 4.5. Distribution of Violent Crime Rates, by Army Installation



SOURCE: Authors' calculations using CrimeGrade.org (violent crime rates) and DTMO (zip code to MHA crosswalk) using population weights from ACS (NHIS). Data were joined based on their zip code identifier.
NOTE: In the legend, "violent crime" is the log of each zip code's violent crimes per 100,000 residents. Zip codes in gray are missing data. State lines are the dashed black lines. Solid gray lines denote MHA boundaries. The regions in white do not belong to a ZCTA.

Figure 4.6. Differences in Violent Crime Rates, Between and Within MHAs



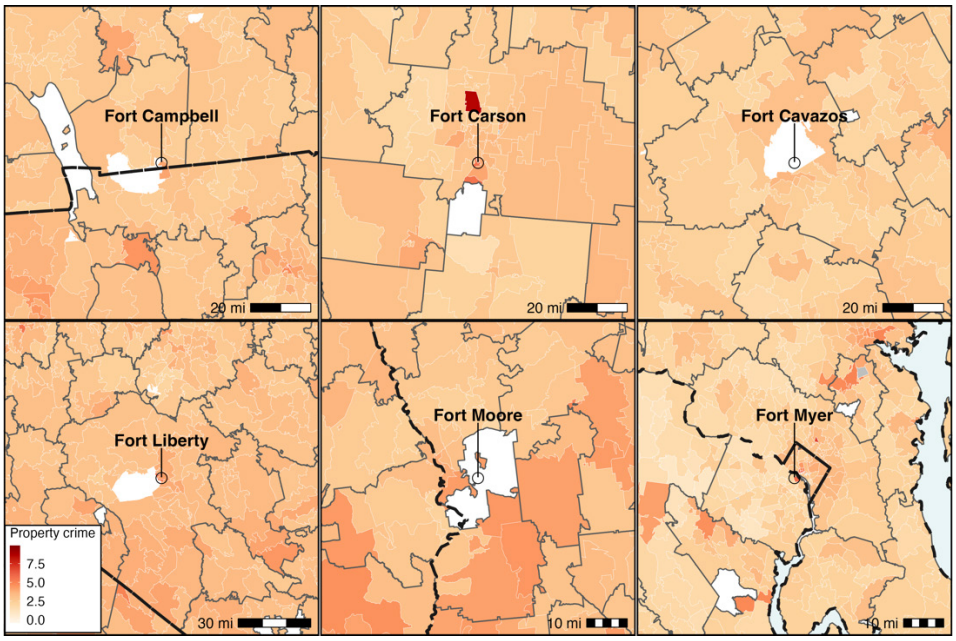
SOURCE: Authors' calculations using CrimeGrade.org (violent crime rates) and DTMO (zip code to MHA crosswalk) using population weights from ACS (NHIS). Data were joined based on their zip code identifier.
NOTE: The scatter plot points represent the population-weighted average of each MHA's logged violent crime rate using either the zip code's Army or civilian population. The national average of the log of violent crime across all zip codes, using the civilian population weights, is 1.163.

Property Crime Rates

Homebuyers and renters are often wary of areas with high property crime, which, per CrimeGrade's definition, includes arson, theft, and burglary (Linden and Rockoff, 2008). We plot the geographic distribution of logged property crime rates in Figure 4.7, where we observe substantial variation both within and across the MHAs. In our exploration of the crime data, we found zip codes with exceptionally high property or violent crime rates, such as the zip code north of Fort Carson, shown in the second panel. Its deep red coloring indicates that it has an exceptionally high rate of property crime, far higher than its neighbors, which raises concerns about the validity of this observation (and other outliers). The zip code in question, 80840, has about 6,000 residents, according to the 2021 ACS data, and a little over 100 Army personnel. It is unclear why the zip code experiences about 5,1000 incidents of property crime per 100,000 residents, the third-highest rate in the country, but given its relatively small population, its inclusion in the population-weighted statistics presented in Figure 4.8 calculations should not bias the mean too greatly, if it indeed is the product of an error in the raw CrimeGrade data.

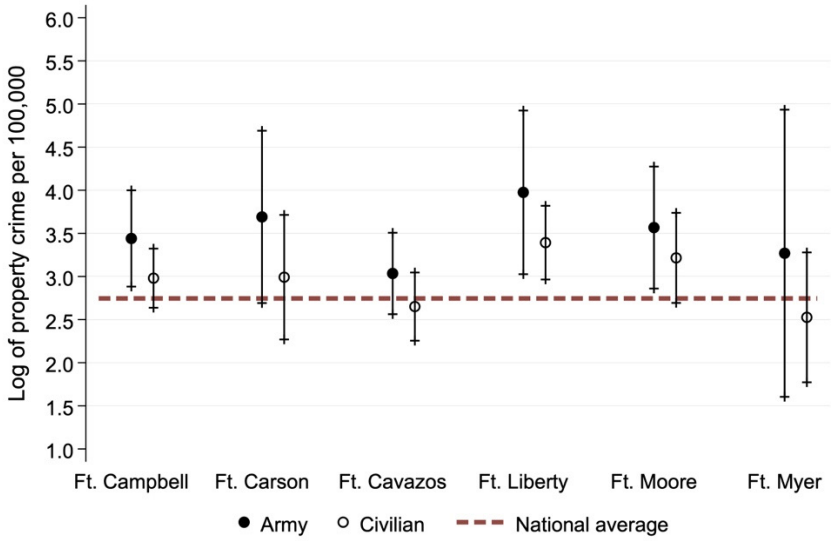
Figure 4.8 plots the means and standard deviations of the logged property crime rates for the six MHAs. We find that, again, property crime rates are higher around the exemplar bases than the other areas across the nation, and the rates for Army personnel are again higher than those in areas where civilians typically live.

Figure 4.7. Distribution of Property Crime Rates, by Army Installation



SOURCE: Authors' calculations using CrimeGrade.org (property crime rates) and DTMO (zip code to MHA crosswalk) using population weights from ACS (NHIS). Data were joined based on their zip code identifier.
NOTE: In the legend, "property crime" is the log of each zip code's property crimes per 100,000 residents. Zip codes in gray are missing data. State lines are the dashed black lines. Solid gray lines denote MHA boundaries. The regions in white do not belong to a ZCTA.

Figure 4.8. Differences in Property Crime Rates, Between and Within MHAs



SOURCE: Authors' calculations using CrimeGrade.org (property crime rates) and DTMO (zip code to MHA crosswalk) using population weights from ACS (NHIS). Data were joined based on their zip code identifier.
NOTE: The scatter plot points represent the population-weighted average of each MHA's logged property crime rate using either the zip code's Army or civilian population. The national average of the log of property crime across all zip codes using civilian population weights is 2.746.

It appears that these six MHAs are not only more prone to crime than the rest of the United States, but that service members experience higher rates of crime than civilians do. We offer three possible explanations for this result. First, military members may be unable to find adequate housing in lower-crime areas and so live in higher-crime areas. This seems an unlikely explanation, given that service members typically spend more on housing than their civilian counterparts and the BAH methodology excludes high-crime areas in its survey, though members can choose to live in areas outside the survey. Another second explanation is that the higher crime experienced by military members is attributable to crime being committed by military personnel. Although few studies have investigated the linkage between military installations and crime rates or explored its root causes, a 2015 report focused on Army personnel stationed at Fort Carson, one of our exemplar locations, found that service members that had never been deployed were more likely commit violent crimes (i.e., assaults, murders, rapes, and robberies) than their recently deployed counterparts, bucking conventional wisdom around the relationship between deployment, posttraumatic stress disorder, and violence (Anderson and Rees, 2015). Stahre et al. (2009) show that binge-drinking is linked to a higher incidence of alcohol-related harms, lower job performance, and, most relevant to this report, criminal justice problems among service members. This limited evidence supports the notion that military service members may be in some part responsible for these differences. The final possible explanation is that service members may have a higher propensity to report crime. Put simply, military personnel may be more vigilant or more willing to report crime to the police than civilians.

Summary

This chapter analyzes the housing expenditures of active duty military members and compares them with income-matched civilians and to civilians with comparable demographic characteristics. The results show that military households spend more on housing compared to civilians who are similar in terms of income, housing type, and geographic area. The differences in housing expenditures are largest for the lowest income levels and become generally smaller as we consider higher incomes. We also find that military households spend more on housing than civilians who are comparable in terms of demographic characteristics, also controlling for geographic area and housing type.

The chapter also considers the extent to which location amenities, such as commuting distance, school quality, and crime rates, differ across locations. We do this by weighting amenity data across zip codes in an MHA by population concentrations in these zip codes of military personnel versus civilians. The BAH methodology recognizes crime rates and commuting distance to the extent that high crime areas are screened out when conducting the surveys and housing near military installations are included in the MHA. The results show that Army personnel have shorter commutes than civilians across all six installations and that the average travel times for military personnel differ across the six locations. The results also show that there are differences for military personnel across installations in school quality, violent crime, and property crime, suggesting that amenities are not equalized across locations. For five of the six installations, the violent crime rate is above the national average for military personnel, though our analysis does not screen out high-crime areas, as the BAH methodology does. While we observe differences across the same locations for military personnel in amenities, we often find similar variation in amenities across the same locations for civilians as well. This suggests that some of the differences across installations may reflect differences in the availability of amenities in these locations.

Chapter 5

Assessment of BAH Methodology from the Standpoint of Tracking Changes in Housing Prices and Rental Rates

In this chapter, we consider the extent to which the BAH methodology is adequately capturing changes in housing prices, particularly given the dramatic increases in both rents and home sale prices in the years since the start of the COVID-19 pandemic.[28] For example, between early 2020 and early 2022, overall national measures of spending on shelter rose by as much as 34 percent (Aladangady, Anenberg, and Garcia, 2022). Year-over-year rent growth peaked at over 15 percent in early 2022, with the highest rates of growth among lower-cost rental units (CoreLogic, 2022). These changes raise the question of how well the BAH methodology performs when housing prices increase very quickly.

To provide evidence on this question, we use publicly available data on changes in rental prices and housing costs from Zillow—specifically, we use the Zillow Observed Rent Index (ZORI) on rental prices and the Zillow Home Value Index (ZHVI) on housing costs. These two data sources are available at the zip code level for a significant portion of the country over a relatively long period of time. The ZORI index, in particular, uses a "repeat sales" methodology that has been widely used in the housing economics literature to control for the quality of housing, which is often otherwise unobservable (Clark, 2022; Ries and Somerville, 2010; Dorsey et al., 2010; Harding et al., 2007).[29]

These two indexes are compared to an index of BAH rates created using the BAH for a service member whose pay grade is E-4 and who does not have dependents.[30] It is important to reiterate that BAH prices are set using area rental price data, so the ZORI measure is the most relevant index to consider in terms of accuracy of the BAH methodology. But, given that we observe many homeowner service members in the data, we also consider the ZHVI index.

[28] With respect to military personnel and potential effects of the COVID-19 pandemic on housing cost burden, Congress amended the Servicemembers Civil Relief Act over this period to protect service members from being responsible for paying rent in two locations because of COVID-19-related delays in executing a PCS order (Huff et al., 2023)

[29] The ZHVI uses a quasi-repeat sales approach that involves synthesizing values for the same homes using comparable data from matched housing pairs. For more on this approach, see Olsen (2023).

[30] We found that the particular BAH rate was unimportant from the perspective of creating an index because raw correlations between various BAH rates in our data period were in the range of roughly 0.977 to 0.998, indicating nearly perfect linear correlation between them.

The zip code–level ZORI and ZHVI data are averaged to the MHA level using zip code–level military population weights.[31] Note that we set the indexes to be equal in 2019, so by construction the percentage change in all the indexes, including our index of changes in BAH, is set to zero for 2019. We use 2019 as the base year for the analysis because, over the period 2015 to 2018, Congress reduced BAH by adjusting downward the share of housing expenses that BAH was intended to cover from 100 percent to 95 percent (U.S. Code Title 37, Section 403). This was implemented through a gradual process of lowering the BAH amount independently of the adjustments made to reflect price changes in the housing market. Thus, we set our indexes to be equal in the first year after this process was complete.

Results of Index Comparisons

Figure 5.1 compares the percentage change in BAH rates relative to 2019 with the change in the two measures of the change in housing costs for our six exemplar Army locations. In the period prior to our base year, 2019, we see that, in most of the six locations, the change in BAH rates were relatively higher than the rental index and converged downward to the base year. This is consistent with the reduction in BAH rates over this period relative to housing costs, although the positive gap between the index of BAH rates and these price indexes in the first year of our analysis, 2015, varies quite a bit across locations.

Beyond 2019, we see that across most locations the BAH index and the ZORI tracked fairly closely until 2020. This period was characterized by relatively steady, trend-like growth in prices and is consistent with the BAH methodology doing an adequate job of tracking housing costs in this kind of environment. In the Fort Carson, Fort Cavazos, and Fort Myer (D.C. metro) areas, they were virtually identical. However, in the Fort Liberty and especially Fort Moore areas, we see more notable divergence starting in 2019, with the BAH index failing to track the increases measured in the ZORI data.

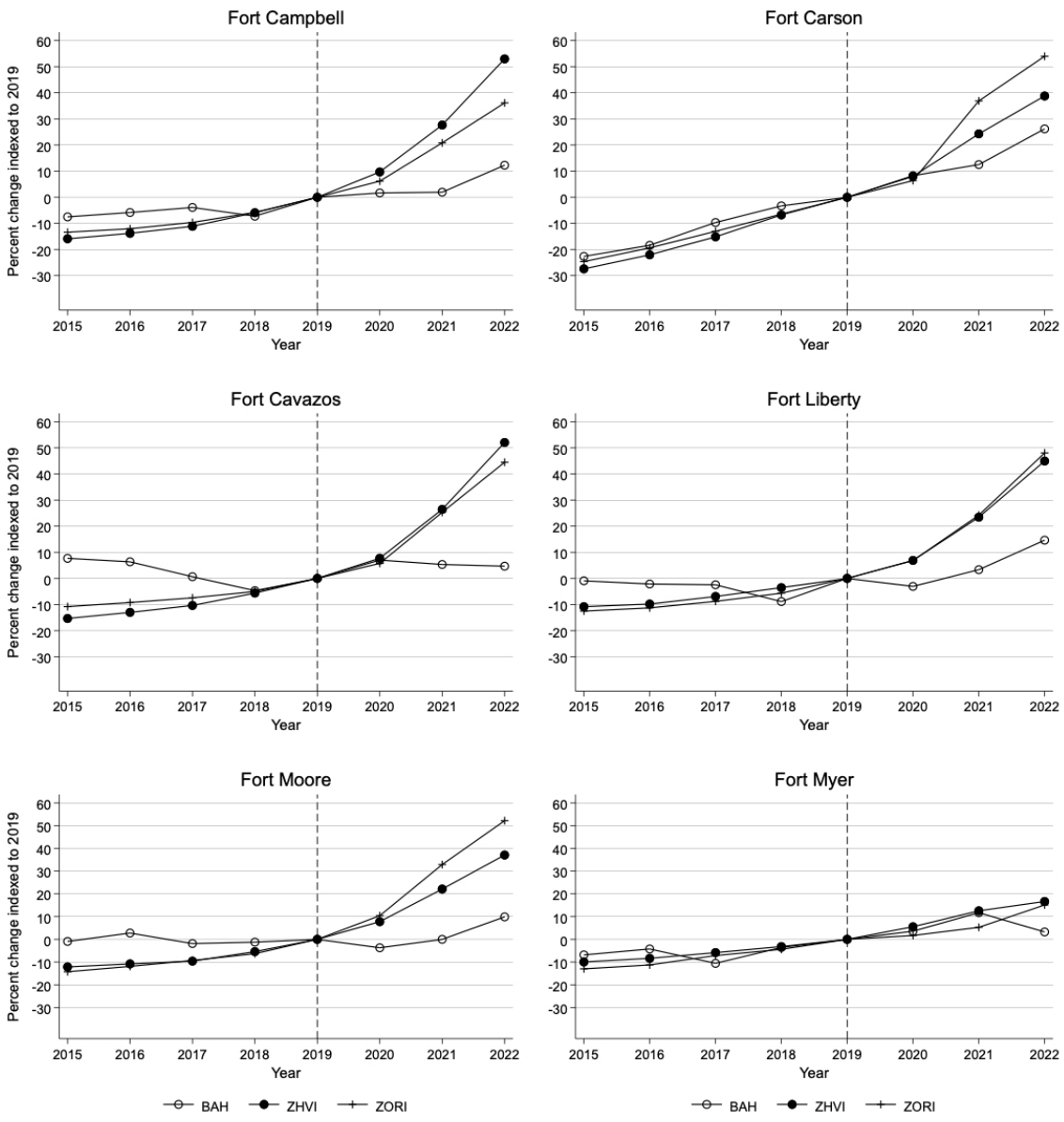
From 2020 to 2022—the period of the COVID-19 pandemic, when the housing market experienced virtually unprecedented run-ups in both rental prices and home sale prices—we see very large divergences between the BAH index and both Zillow price indexes across every location but the Fort Myer (D.C. metro) area that all go in one direction, namely increases in these housing indexes outpacing increases in the BAH index. By 2022, this gap is roughly 40 index points (a 40 percent difference) for the Fort Cavazos and Fort Moore MHAs.[32]

In the Fort Myer MHA in the Greater Washington, D.C., area the BAH index diverges only modestly from both Zillow indexes for this MHA. It may be the case that the BAH methodology works better in much thicker housing markets like this densely populated metro area, where there may be less of a need to rely on imputing local changes using national rental price changes.

[31] We also use overall population weights as an alternative approach. These results are shown in Figure A.3 in Appendix A. In general, this approach made the gaps we discuss below between BAH and the Zillow indexes larger.

[32] These rapid increases did not escape notice by DoD as the department authorized a temporary increase to BAH mid-year in 2021 to address evidence that housing prices were increasing rapidly around the U.S. (DoD, 2021).

Figure 5.1. Housing Price Index, Rent Index, and BAH over Time at Select Army Installations



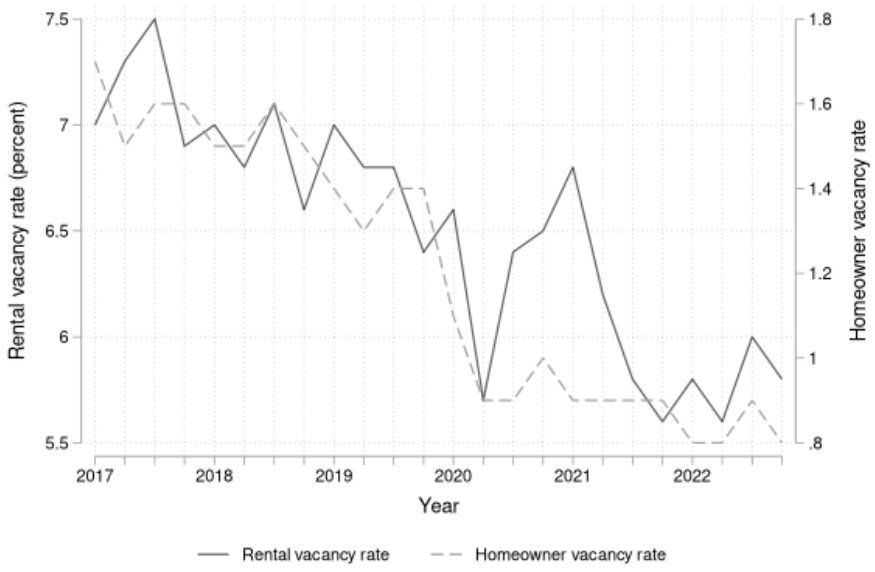
SOURCE: Authors' calculations using Zillow's ZORI and ZHVI data along with DTMO's published BAH rates.
NOTE: All indexes are originally in zip code and year-level data format. We collapse the data to the MHA and year-level using military populations weights to calculate averages. All values are set equal to zero in 2019, and values in other years represent percent changes from the 2019 value.

Potential Explanations for a Divergence Between Changes in BAH and in Housing Prices in Recent Years

As mentioned in Chapter 2, rental unit listings are the exclusive primary source of housing costs used in the BAH methodology. While many specifics of the BAH methodology are not well

documented in sources we could access for this study, our reading of the available resources suggests that the BAH methodology uses cross-sectional listings of available rental units in an area and does not attempt to assess changes in rental costs using repeat rentals of the same units. One of the primary motivations of the repeat sales/repeat rental approach to estimating changes in housing costs is to hold constant otherwise unobservable housing quality. There are reasons to believe that changes in the quality of the available housing stock could have shifted dramatically over the years where we see significant divergence between changes in BAH and these price indexes. First, in the second year of the pandemic, beginning in early 2021, the rental vacancy rate declined substantially, from a high of 6.8 percent in January of 2021 to a low of 5.6 percent in October of that same year, a decline of more than 20 percent (Figure 5.2). This lack of vacancies means that there were fewer listings to use in assessing price changes. It is likely that the lower turnover of units was concentrated in housing that offered the highest value. That is, better-quality housing probably turned over less. Consequently, those units that were turning over more were probably lower quality. The result was a likely downward shift in the quality of the housing stock on the market over this period. The Zillow methodology holds housing quality constant by only including repeat sales/repeat rentals in its data. But by using what appears to be a cross-sectional approach to gathering rental data, the BAH methodology likely has a downward bias in the magnitude of estimated changes in housing costs because the available quality of housing probably changed dramatically during the pandemic but the BAH methodology did not hold housing quality constant as the Zillow methodology did.

Figure 5.2. National Vacancy Rates for Rental Housing and Homeowners



SOURCES: Federal Reserve Bank of St. Louis, undated-b; Federal Reserve Bank of St. Louis, undated-c.

Second, the ZORI does not restrict calculations of rental units to those that fit the fairly narrow set of DoD housing profiles used to compute BAH. This restriction on the calculation of BAH may also serve to limit the overall accuracy of BAH rates in terms of reflecting broad changes in housing

prices in a location in at least two ways. First, the focus on sometimes rare housing types in an area (e.g., townhomes) may lead to estimates being based on a set of housing prices that are not representative of the overall housing stock in that area. Second, the smaller sample that could result from the use of an unusual mix of housing types can be expected to lead to a great reliance on imputation using national changes in rental housing prices, which may be unrepresentative of any given small area.

Finally, the BAH methodology requires a monotonic relationship between the profiles—for example, a BAH rate associated with a two-bedroom apartment cannot exceed the BAH rate associated with a two-bedroom townhouse. This approach for setting BAH may arbitrarily limit the overall growth of BAH rates by, for example, limiting the ability of price increases in relatively lower cost housing types from being fully incorporated into the allowance provided to members.

Summary

We compared changes in BAH relative to 2019 and compared those changes with changes in rental rates and home prices using publicly available Zillow data. The BAH index and these price indexes tracked very closely until 2020. But, from 2020 to 2022—the period of the COVID-19 pandemic, when the housing market experienced unprecedented increases in both rental prices and home sale prices—the changes in BAH relative to 2019 did not keep up with the two Zillow price indexes across locations. By 2022, this gap was as large as 40 index points (a 40 percent difference) for the Fort Cavazos and Fort Moore MHAs.

Understanding why BAH rate changes did not keep up requires more in-depth information about the BAH rate-setting methodology, but one possible explanation is that the quality of available housing declined beginning in 2021 as vacancy rates plummeted. The Zillow methodology holds housing quality constant by including only repeat sales and repeat rentals, but the BAH methodology appears to be based on a cross-sectional survey of rental rates that does not include only repeat rentals. Consequently, the approach does not hold constant housing quality as the Zillow methodology does, and the BAH methodology likely captured the lower quality available housing stock where rental rates increased less rapidly. Other explanations are the limited range of DoD housing profiles on which BAH is based, especially in some locations where some profiles are rare, so data are based on limited samples, as well as the use of imputation of BAH rates for some pay grades, which might limit the amount by which BAH can increase for those pay grades.

Chapter 6

Summary of Findings and Conclusions

Using DMDC personnel data together with ACS data for 2017–2021 on active duty military personnel and civilians, we assessed the adequacy of BAH and the BAH rate-setting methodology for Army personnel, focusing on the housing choices made by service members. We considered whether those choices are consistent with the underlying methodology for determining and whether service members are making similar choices to comparable civilians. We investigated the amenities experienced by members across locations and how those amenities differ from civilians. Finally, we considered how well changes in BAH rates kept up with housing price changes in a rapidly changing market that characterized the COVID-19 pandemic and post-pandemic period.

Are Member Housing Choices Consistent with the Underlying the BAH Methodology?

The BAH rate-setting methodology surveys rental housing costs for the six anchor housing profiles in a set of zip codes surrounding military installations. While there is no requirement or presumption that members choose the housing profiles assigned to their grade and dependents status or live in the MHA associated with their duty location, the validity of this methodology in using assigned housing profiles and setting MHAs rests on the presumption that a sizable share of members select the assigned housing profile and live in the MHA associated with their installation. We therefore investigated the extent to which members live in the MHA defined for their duty location and live in the housing profile assigned to their pay grade and dependent status. We find that most soldiers lived in their assigned MHA in the six exemplar Army installations we considered but that most do not live in the housing profile that DoD assigns to them specifically. Furthermore, although the BAH methodology seeks to hold members harmless with respect to variations in housing prices across locations, we find that similar Army personnel make different housing choices across the six exemplar installations that we considered, and these choices differed from similar civilians in the same locations. We also found that across the country in most of the MHAs that we were able to match to census data, military members spend, on average, less than their BAH rate. The exception is junior officers, but even for them, the share of MHAs where average expenditures were less than BAH was over 40 percent. This suggests that many members choose housing profiles or living arrangements (e.g., roommates) that are less expensive than their BAH rate.

Are Members Procuring Housing Similar to Comparable Civilians?

While the analysis indicates that many members spend less than their BAH, on average, in the MHA we were able to analyze, we find that, across all locations in the United States as well across the six exemplar Army installations, in terms of expenditures, active duty members procure at least as much housing as civilians who are comparable in terms of income within the same locations and housing types. The differences in housing expenditures are largest for the lowest income levels and become generally smaller as we consider higher incomes.

The current BAH methodology of setting the housing allowance for service members based on the housing obtained by civilians with comparable income may obscure important differences related to the fact that military pay is benchmarked to exceed the average pay for civilians with similar demographic characteristics in terms of age, sex, and education. Thus, comparisons of housing expenditures by military personnel with civilians with similar income is likely to provide different results than comparisons with civilians with similar demographics that are typically used when comparing military pay. An additional consideration is whether to consider household income instead of personal income; military families would be disadvantaged in this comparison, given that it is harder for military spouses to find employment and their earnings are lower than comparable spouses. That said, we find similar results, namely military households spend more on housing that civilians who are comparable in terms of demographic characteristics, also controlling for geographic area and housing type.

Are Members Experiencing Similar Amenities Across Locations?

We do not investigate whether the BAH rate-setting methodology results in members being unaffected by differences in housing prices (the second objective of the Seventh QRMC). Instead, we consider whether amenities are equalized across locations for military personnel. To the extent that amenities differ across locations, we also assess whether civilians in the same locations as military personnel experience different housing amenities.

We find that, in the six locations we considered in our analysis, average commuting times are shorter for military personnel than for civilians, and shorter than the national average. On the other hand, public school quality is generally comparable between civilians and military members within most of the six locations, but school quality differs substantially across locations. Finally, we find that crime rates in these six locations are above the national average for military personnel but about generally comparable with civilians in these locations. The implication is that members may choose housing to improve amenities, but those amenities are not equalized across locations, though the amenities achieved by military personnel are broadly comparable to those achieved by civilians in the same location.

Did BAH Rate Changes Keep Up with Housing Cost Changes in Recent Years?

We compared changes in BAH relative to 2019 and compared those changes to changes in rental rates and home prices using publicly available Zillow data. The changes in BAH and these price indexes generally tracked fairly well from 2019 until 2020. From 2020 to 2022—the period of the COVID-19 pandemic, when the housing market experienced unprecedented increases in both rental prices and home sale prices—the changes in BAH relative to 2019 did not keep up with the two Zillow price indexes across most locations we analyzed, and the divergence between BAH growth and housing cost growth was substantial in some locations.

Understanding why BAH rate changes did not keep up requires more in-depth information about the BAH rate-setting methodology, but one possible explanation is that the quality of available housing likely declined beginning in 2021 as vacancy rates plummeted. The BAH rate-setting approach may not hold constant housing quality as the Zillow methodology does, and the BAH methodology likely captured the lower-quality available housing stock, resulting in less growth than the Zillow price indexes. Other differences may relate to the methodology itself, specifically the use of housing profiles that are often not congruent with the local housing stock and the requirement that the BAH rates associated with these profiles must maintain a monotonic relationship, such that BAH must be higher for the DoD profile associated with a higher pay grade regardless of whether this is true in the actual rental data.

Conclusions

These findings lead to the following conclusions:

- The definitions of MHAs and the zip codes included in MHAs are generally accurate in terms of where members choose to live.
- The housing profiles that DoD assigns based on pay grade and whether a member has dependents do not reflect the housing choices made by members. Members in the six exemplar locations made different choices than their assigned profile and generally spent, on average, about the same or less on their housing than their BAH rate. Their housing choices also differed across locations. Furthermore, within a location, their housing choices differed from those of civilians. Although there is no requirement for members to live in the housing profile assigned to their grade and dependent status, the face validity of the BAH methodology that assigns profiles to grade and dependent status is challenged when relatively few members choose to live in those profiles in key locations. This suggests that the profiles may need to be adjusted and perhaps be region- or location-specific to reflect the housing stock available to members in different areas. Analysis would be needed to determine how to measure the available housing stock and whether and how it might be based on civilian choices.
- The current BAH methodology achieves the first objective of the Seventh QRMC in terms of allowing members to procure at least as much housing as similar civilians with comparable incomes. On average, active duty members spend more on housing and a larger share of their

income on housing than civilians who are comparable in terms of income and in terms of demographic characteristics.

- While the second objective of the Seventh QRMC focuses on equalizing the cost of adequate housing across locations, we considered how amenities differed across locations and found that members have shorter commuting times, on average, than the national average and relative to civilians, but school quality and crime rates vary across the six installations we considered. On the other hand, the location amenities achieved by military personnel through their housing choices are broadly similar with the amenities experienced by civilians in the same location.
- The BAH rate-setting methodology does not appear resilient to rapid and dramatic changes in the housing market, as occurred during the pandemic; BAH rates did not increase as dramatically as either rental rates or housing prices in the six locations we examined. One potential approach to addressing rapidly changing prices could be to more regularly use mid-year BAH adjustments, as was done in 2021, when there is evidence that housing prices are experiencing large changes on an annual basis.

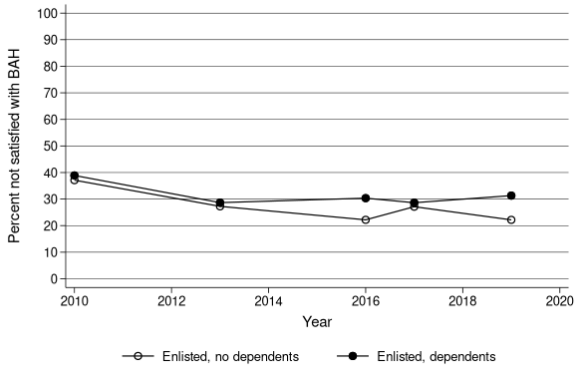
Is BAH Generally Adequate for Army Personnel?

The analysis suggests that, in many ways, BAH is generally adequate for Army personnel, though not necessarily when the housing market is changing rapidly and dramatically, as it has in recent years. The analysis indicates that, on average, active duty members generally spend less on housing than their BAH but spend more on housing than comparable civilians. While they choose to live in different types of housing across locations, and the amenities they experience because of those choices differ across locations, the amenities are generally comparable to the amenities realized by civilians. The exception is commuting time: Average commuting times are shorter for military personnel than for civilians.

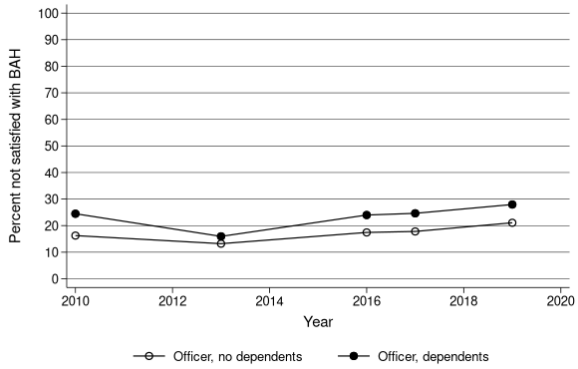
Given these findings and conclusions, it interesting to note that a significant fraction of Army personnel report being very dissatisfied or dissatisfied with BAH in the DoD Status of Forces Survey of Active Members. The surveys for 2010, 2013, 2016, 2017, and 2019 asked respondents how satisfied they were with BAH they had received in the past 12 months. Figure 6.1 shows that about 30 percent of enlisted soldiers with dependents and who received BAH responded they were either very dissatisfied or dissatisfied with BAH in the 2013–2019 surveys, and about 40 percent reported dissatisfaction in the 2010 survey. Dissatisfaction rates were lower among soldiers without dependents in the more recent surveys. They were also lower for Army officers (right panel of Figure 6.1), except in the 2019 survey, where the dissatisfaction rate for officers with dependents was just under 30 percent. Figure 6.2 shows a similar pattern over time for enlisted members and officers in the other services. In the 2019 survey, dissatisfaction rates were higher for non-Army personnel than for Army personnel, especially enlisted personnel.

Figure 6.1. Dissatisfaction with BAH Among Army Personnel, Through 2019

Panel A: Enlisted



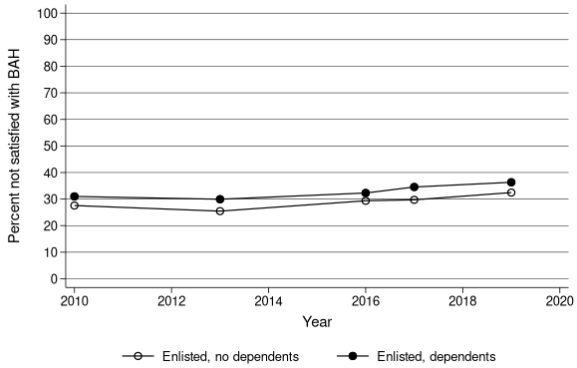
Panel B: Officers



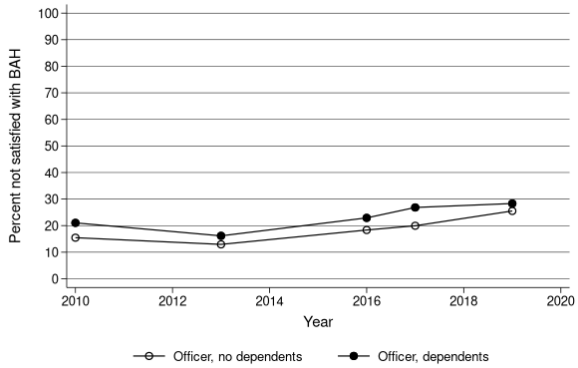
SOURCE: Author calculations using SOFS microdata for 2010, 2013, 2016, 2017, and 2019.

Figure 6.2. Dissatisfaction with BAH Among Non-Army Personnel

Panel A: Enlisted



Panel B: Officers



SOURCE: Author calculations using SOFS microdata for 2010, 2013, 2016, 2017, and 2019.

The implication of the survey responses is that while analysis of housing choices and expenditures among military personnel and of their locational amenities points to an overall positive picture with respect to BAH, a substantial though still minority share of members report dissatisfaction with BAH. It is notable that these surveys were taken before the dramatic run-up in housing prices during the COVID-19 pandemic, as shown in Chapter 5. On the other hand, the surveys were administered during a period of rising housing prices, and the years 2016–2019 cover the period when Congress reduced the share of housing costs covered by BAH to 95 percent, potentially explaining dissatisfaction among some members. Members reporting dissatisfaction with BHA might also live in MHAs where average BAH falls short of average housing expenditures; as shown in the scatter plots in Figures 3.5–3.8 and in Table 3.6, average BAH equaled or exceed housing expenditures for most but not all MHAs.

Recommendations and Areas for Further Study

We stated at the outset that our report was not focused on evaluating courses of actions to improve BAH. That said, the analysis suggests four recommendations, each of which will require further study.

First, DoD should investigate the feasibility and desirability of using housing profiles in setting BAH that are region- or location-specific to better reflect the housing choices of comparable civilians and the housing stock available in different regions of the country. In addition to improving the methodology, such an approach might better set members' expectations about the type of housing they can procure in different parts of the country and potentially improve perceptions about the adequacy of BAH.

Second, the Army and, more generally, DoD should investigate further why a significant fraction of personnel express dissatisfaction with BAH. It is possible that these reports reflect factors we did not consider, such as the quality of their housing. The dissatisfaction with BAH might also reflect concerns about poorer-quality amenities in the locations where Army installations are based, such as more rural areas.

Third, given that comparisons of military pay with that of similar civilians define comparability based on demographic characteristics, DoD should consider using demographic characteristics rather than income to define comparability in the BAH methodology.

Finally, DoD should consider ways to improve the resiliency of the BAH methodology when the housing market is changing quickly and dramatically, as it did during the COVID-19 pandemic and thereafter. More information is needed on the BAH methodology, but using housing profiles that are more congruent with the local housing stock; eliminating the requirement that the BAH rates associated with these profiles must increase monotonically; and using a methodology that controls for changes in housing quality among the available stock, such as the use of repeat rentals, are potentially productive areas for improvement.

Appendix A

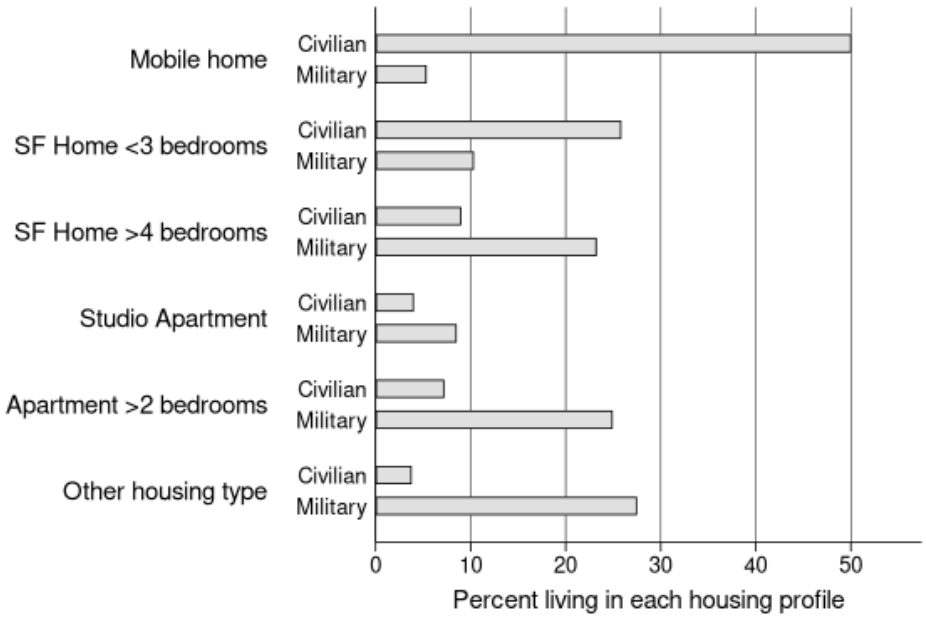
Additional Tables and Figures

This appendix shows tables that supplement the analysis shown in Chapters 3–6.

Tabulations of "Non-DoD" Housing Profiles

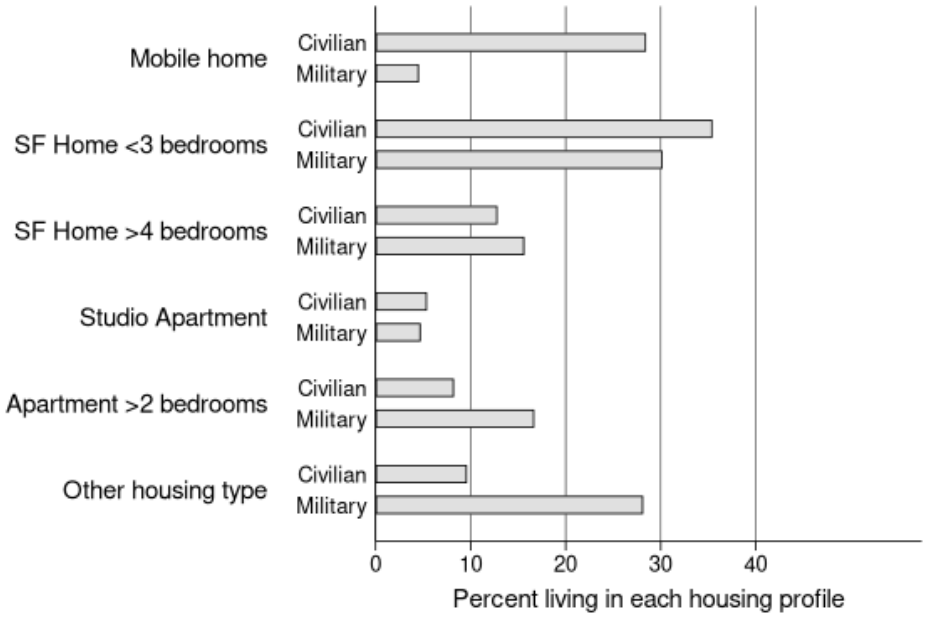
Figures A.1 and A.2 present a further breakdown of the most common, identifiable housing types that are not DoD profiles used in the calculation of BAH rates for the two largest Army installations in our analysis, Fort Liberty and Fort Cavazos. These figures supplement the figures shown in Chapter 3. Note that the residual category, "other housing type," in these tabulations comprises a mix of townhomes or duplexes with more than three bedrooms.

Figure A.1. Distribution of Army Personnel and Civilians Across Non-DoD Housing Profiles at Fort Liberty



SOURCE: Author calculations from ACS data (1-year samples) from IPUMS (Ruggles et al., 2023).
NOTE: SF = single-family. Tabulations use five years of ACS data (2017–2021) to reach reasonable minimum sample sizes across the case study areas we focus on.

Figure A.2. Distribution of Army Personnel and Civilians Across Non-DoD Housing Profiles at Fort Cavazos



SOURCE: Author calculations from ACS data (1-year samples) from IPUMS (Ruggles et al., 2023).
NOTE: SF = single-family. Tabulations use five years of ACS data (2017–2021) to reach reasonable minimum sample sizes across the case study areas we focus on.

Supplementary Tables on Housing Expenditure Differences Between Military and Civilians

Tables A.1 and A.2 correspond to Tables 4.1 and 4.2 in the main text, where we showed how housing expenditures differed between income-comparable civilians and military personnel. The tables in Chapter 4 are based on 2021 data, whereas the results for Tables A.1 and A.2 are for 2017. We consider 2017 to assess whether the results for 2021 reflect recent changes in the housing market due to changes such as the COVID-19 pandemic. Tables A.3 and A.4 show results using data for 2017–2021 but using data that focus on Army personnel, and specifically data for areas around the six Army installations. Table A.5 shows national results estimated differences in income between military members and civilians in the ACS. In Tables A.6–A.13, we show estimated differences in housing expenditures, again at the national level, but define comparability in terms of demographics instead of income. Each table corresponds to a different career stage and either homeowners or renters.

Table A.1. National Differences in Annual Housing Expenditures Among Active Duty Military and Civilians with Comparable Incomes in 2017 (Homeowners)

	Income Groupings (octiles)							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Panel A: Outcome is annual housing expenditures ($)								
Active duty difference	4,997* (2,073)	1,250 (1,106)	4,435*** (887)	2,034* (963)	2,026** (728)	2,409*** (642)	3,602*** (567)	4,138*** (755)
Average civilian spending	13,275*** (1)	14,883*** (1)	15,545*** (1)	16,900*** (2)	18,275*** (2)	19,595*** (2)	22,262*** (3)	26,562*** (3)
Panel B: Outcome is annual housing expenditures as a share of annual total household income ($)								
Active duty difference	0.156* (0.07062)	0.100*** (0.02951)	0.112*** (0.02433)	0.075*** (0.01567)	0.077*** (0.01157)	0.068*** (0.00821)	0.049*** (0.00592)	0.034*** (0.00492)
Average civilian income share	0.330*** (0.00002)	0.258*** (0.00002)	0.222*** (0.00003)	0.210*** (0.00004)	0.196*** (0.00004)	0.183*** (0.00003)	0.173*** (0.00003)	0.159*** (0.00002)
Income range ($1,000s)	$15–$29	$29–$39	$39–$48	$48–$55	$55–$65	$65–$80	$80–$102	$102–$150
Observations (total)	121,000	89,690	67,234	52,200	72,358	76,380	86,824	91,252
Observations (active duty households)	31	70	75	98	186	221	356	307

SOURCE: Author calculations using 2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with fixed effects for dependency status (a binary measure), PUMA, and DoD housing profile. The "average civilian" row is the constant term from this regression. Income octiles are reported to the nearest thousand. To reduce the influence of outlier low and high incomes, the minimum income in the 1st octile used the value of the 25th percentile of incomes in the data within that range and the maximum income in the 8th octile used the 75th percentile of incomes in the data within that range. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.2. National Differences in Annual Housing Expenditures Among Active Duty Military and Civilians with Comparable Incomes in 2017 (Renters)

	Income Groupings (octiles)							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Panel A: Outcome is annual housing expenditures ($)								
Active duty difference	4,161*** (626)	3,244*** (404)	3,392*** (471)	2,519*** (462)	3,216*** (405)	2,972*** (438)	3,829*** (565)	4,790*** (612)
Average civilian spending	14,175*** (2)	15,845*** (3)	16,585*** (5)	17,422*** (5)	18,543*** (5)	20,145*** (7)	22,104*** (10)	25,578*** (11)
Panel B: Outcome is annual housing expenditures as a share of annual total household income ($)								
Active duty difference	0.063 (0.04153)	0.116*** (0.01517)	0.086*** (0.01301)	0.076*** (0.01212)	0.070*** (0.00845)	0.050*** (0.00753)	0.053*** (0.00591)	0.041*** (0.00701)
Average civilian income share	0.472*** (0.00010)	0.347*** (0.00012)	0.290*** (0.00015)	0.263*** (0.00012)	0.242*** (0.00011)	0.223*** (0.00013)	0.200*** (0.00010)	0.177*** (0.00013)
Income range ($1,000s)	$12–$26	$26–$35	$35–$41	$41–$50	$50–$55	$55–$64	$64–$73	$73–$89
Observations (total)	70,128	44,622	27,931	19,277	23,966	20,671	20,525	17,192
Observations (active duty households)	199	399	310	239	361	397	421	393

SOURCE: Author calculations using 2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with fixed effects for dependency status (a binary measure), PUMA, and DoD housing profile. The "average civilian" row is the constant term from this regression. Income octiles are reported to the nearest thousand. To reduce the influence of outlier low and high incomes, the minimum income in the 1st octile used the value of the 25th percentile of incomes in the data within that range and the maximum income in the 8th octile used the 75th percentile of incomes in the data within that range. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.3 Differences in Housing Expenditures Among Active Duty Military and Civilians with Comparable Incomes in Selected Army Installation Locations, 2017–2021 (Homeowners)

	Income Groupings (octiles)							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Panel A: Outcome is annual housing expenditures ($)								
Active duty difference	2,393 (2,247)	5,058*** (1,034)	2,304** (798)	633 (1,504)	2,400*** (631)	3,353*** (919)	4,067*** (599)	5,045*** (1,366)
Average civilian spending	16,378*** (14)	18,434*** (16)	19,074*** (17)	19,837*** (32)	21,084*** (13)	23,056*** (26)	25,688*** (12)	30,629*** (23)
Panel B: Outcome is annual housing expenditures as a share of annual total household income ($)								
Active duty difference	0.214* (0.08886)	0.105*** (0.02792)	0.092*** (0.02079)	0.063** (0.02119)	0.079*** (0.01234)	0.041*** (0.01114)	0.061*** (0.00709)	0.044*** (0.01084)
Average civilian income share	0.388*** (0.00057)	0.302*** (0.00044)	0.264*** (0.00045)	0.236*** (0.00046)	0.224*** (0.00026)	0.209*** (0.00031)	0.194*** (0.00015)	0.174*** (0.00018)
Income range ($1,000s)	$15–$29	$29–$39	$39–$48	$48–$55	$55–$65	$65–$80	$80–$102	$102–$150
Observations (total)	6,091	4,623	4,228	2,888	4,455	5,800	7,215	10,909
Observations (active duty households)	23	44	64	43	85	122	129	161

SOURCE: Author calculations using 2017 to 2021 ACS data (1-year samples) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with fixed effects for dependency status (a binary measure), PUMA, and DoD housing profile. The "average civilian" row is the constant term from this regression. Income octiles are reported to the nearest thousand. To reduce the influence of outlier low and high incomes, the minimum income in the 1st octile used the value of the 25th percentile of incomes in the data within that range and the maximum income in the 8th octile used the 75th percentile of incomes in the data within that range. These models use MHAs associated with six Army locations: Fort Moore, Fort Liberty, Fort Campbell, Fort Carson, Fort Cavazos, and Fort Myer. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.4 Differences in Housing Expenditures Among Active Duty Military and Civilians with Comparable Incomes in Selected Army Installation Locations, 2017–2021 (Renters)

	Income Groupings (octiles)							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Panel A: Outcome is annual housing expenditures ($)								
Active duty difference	2,522*** (525)	2,188*** (351)	2,897*** (666)	1,710* (682)	1,773*** (399)	2,872*** (583)	2,783*** (614)	3,780*** (1,066)
Average civilian spending	16,467*** (14)	18,007*** (24)	19,059*** (58)	20,128*** (41)	21,883*** (26)	23,121*** (37)	25,472*** (34)	28,647*** (51)
Panel B: Outcome is annual housing expenditures as a share of annual total household income ($)								
Active duty difference	0.058 (0.02988)	0.060** (0.01840)	0.059*** (0.01559)	0.045* (0.02108)	0.055*** (0.00975)	0.042*** (0.00966)	0.038*** (0.00857)	0.039*** (0.00891)
Average civilian income share	0.533*** (0.00078)	0.387*** (0.00128)	0.320*** (0.00135)	0.297*** (0.00128)	0.276*** (0.00064)	0.247*** (0.00061)	0.224*** (0.00048)	0.192*** (0.00043)
Income range ($1,000s)	$15–$29	$29–$39	$39–$48	$48–$55	$55–$65	$65–$80	$80–$102	$102–$150
Observations (total)	5,343	3,762	2,888	1,784	2,668	3,105	3,171	3,626
Observations (active duty households)	159	288	247	120	186	211	202	217

SOURCE: Author calculations using 2017 to 2021 ACS data (1-year samples) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with fixed effects for dependency status (a binary measure), PUMA, and DoD housing profile. The "average civilian" row is the constant term from this regression. Income octiles are reported to the nearest thousand. To reduce the influence of outlier low and high incomes, the minimum income in the 1st octile used the value of the 25th percentile of incomes in the data within that range and the maximum income in the 8th octile used the 75th percentile of incomes in the data within that range. These models use MHAs associated with six Army locations: Fort Moore, Fort Liberty, Fort Campbell, Fort Carson, Fort Cavazos, and Fort Myer. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.5. Income Differences Among Active Duty Military and Demographically Similar Civilians (2020 and 2021 Data)

	Junior Enlisted	Mid-Career Enlisted	Junior Officer	Mid-Career Officer	Junior Enlisted	Mid-Career Enlisted	Junior Officer	Mid-Career Officer
	With Dependents				Without Dependents			
Panel A: Outcome is annual total personal income ($)								
Active duty personal income difference	368.8 (1,228.0)	2,564.4* (1,161.8)	4,432.1* (1,919.7)	–6397.1*** (1,261.2)	9,611.5*** (1,848.0)	6,003.3*** (1,522.5)	8,579.8*** (2,119.0)	4,497.5* (2,167.2)
Average Civilian personal income	40,325.8*** (147.4)	56,183.4*** (35.79)	66,729.2*** (79.71)	117,912.9*** (26.36)	34,653.0*** (62.54)	47,331.5*** (24.56)	62,171.1*** (38.58)	90,729.3*** (25.81)
Panel B: Outcome is annual total household income ($)								
Active duty household income difference	–4,334.5* (1838.8)	–5,208.1** (1,629.5)	1,067.0 (3,561.0)	–23,368.5*** (1,910.7)	4,714.6 (2875.1)	–903.9 (2,195.8)	2,771.7 (2,885.5)	–2,045.3 (2,853.9)
Average Civilian household income	60,992.2*** (220.7)	84,858.4*** (50.20)	107,251.1*** (147.9)	172,397.7*** (39.93)	54,987.4*** (97.29)	65,445.7*** (35.43)	91,830.7*** (52.53)	114,073.4*** (33.99)
Observations	9,879	57,004	14,234	153,391	18,616	40,407	40,886	73,678

SOURCE: Author calculations using 2020 and 2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual income (personal or household as indicated) on an indicator for active duty military personnel along with fixed effects for dependency status (a binary measure), PUMA, and DoD housing profile. The "average civilian" row is the constant term from this regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.6. National Differences in Housing Expenditures Among Junior Enlisted Type Active Duty Military and Civilians, 2017–2021 (Homeowners)

	Junior Enlisted Type with Dependents			Junior Enlisted Type without Dependents		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Active duty difference	1,915.4***	1,854.3***	1,478.7***	2,470.0***	2,332.0***	2,252.7***
	(290.7)	(286.5)	(283.3)	(327.4)	(325.0)	(289.7)
Black		–1013.3***	–723.0**		–1,581.7***	–1,337.5***
		(246.9)	(241.5)		(190.0)	(179.9)
Asian-American/Pacific Islander		730.9	906.8		680.7	637.9
		(589.3)	(577.5)		(432.8)	(407.8)
Other non-White race		–595.1*	–465.6		–312.6	–322.4
		(272.3)	(260.7)		(187.0)	(173.5)
Hispanic ethnicity		–291.8	–234.2		–553.9**	–614.5***
		(202.7)	(195.9)		(180.4)	(167.8)
Married		433.8*	389.5		–	–
		(206.5)	(198.6)			
One child		393.9	66.36		–	–
		(211.0)	(194.4)			
Two children		619.8**	35.64		–	–
		(226.5)	(213.9)			
Three children		1,387.3***	529.5		–	–
		(377.5)	(371.9)			
Four or more children		3,237.0***	2051.9*		–	–
		(971.5)	(927.1)			
Mean annual housing expenditure among civilian households ($)	13,309	13,309	13,309	12,655	12,655	12,655
Geography fixed effects	X	X	X	X	X	X
Additional demographic controls		X	X		X	X
Housing type fixed effects			X			X
Observations	6,049	6,049	6,049	13,102	13,102	13,102

SOURCE: Author calculations using 2017–2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with (as indicated) fixed effects for PUMA and DoD housing profile, along with controls for race/ethnicity and number of children. The "Mean annual housing expenditure among civilian households ($)" row is the sample mean from the civilians in each regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.7. National Differences in Housing Expenditures Among Junior Enlisted Type Active Duty Military and Civilians, 2017–2021 (Renters)

	Junior Enlisted Type with Dependents			Junior Enlisted type Without Dependents		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Active duty difference	2,300.9**	2,040.5**	1,917.6**	3,739.7***	3,654.3***	2,619.0*
	(775.2)	(790.1)	(709.0)	(1,074.9)	(1,087.2)	(1,044.6)
Black		1,299.4	1,360.3		–2,125.3*	–2,056.6*
		(1070.5)	(1066.6)		(939.4)	(946.6)
Asian-American/Pacific Islander		1,868.1	734.0		611.5	423.7
		(3,695.4)	(3,199.0)		(1,682.5)	(1,667.2)
Other non-White race		–890.9	–801.9		1053.7	1,099.2
		(783.3)	(747.7)		(801.2)	(738.6)
Hispanic ethnicity		–256.9	–343.4		–2,680.8***	–2,789.3***
		(685.6)	(655.9)		(697.7)	(658.7)
Married		795.1	486.7		–	–
		(462.4)	(437.0)			
One child		–348.5	–349.1		–	–
		(435.0)	(424.7)			
Two children		–360.3	–641.2		–	–
		(527.0)	(519.8)			
Three children		113.5	–250.0		–	–
		(712.6)	(667.9)			
Four or more children		–1834.1	–2,829.9*		–	–
		(1,428.4)	(1,267.0)			
Mean annual housing expenditure among civilian households ($)	13,618	13,618	13,618	14,030	14,030	14,030
Geography fixed effects	X	X	X	X	X	X
Additional demographic controls		X	X		X	X
Housing type fixed effects			X			X
Observations	3,467	3,467	3,467	4,490	4,490	4,490

SOURCE: Author calculations using 2017–2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with (as indicated) fixed effects for PUMA and DoD housing profile, along with controls for race/ethnicity and number of children. The "Mean annual housing expenditure among civilian households ($)" row is the sample mean from the civilians in each regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.8. National Differences in Housing Expenditures Among Mid-Career Enlisted Type Active Duty Military and Civilians, 2017–2021 (Homeowners)

	Mid-Career Enlisted Type with Dependents			Mid-Career Enlisted Type without Dependents		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Active duty difference	2,999.7***	2,731.4***	2,300.9***	3,044.9***	3,012.5***	2,574.0***
	(398.9)	(398.3)	(394.2)	(724.8)	(720.8)	(697.2)
Black		–729.4*	–892.2**		–1,171.6**	–1,278.7**
		(327.0)	(310.1)		(431.6)	(415.1)
Asian-American/Pacific Islander		80.82	16.65		–494.4	–767.0
		(566.6)	(548.4)		(725.5)	(693.4)
Other non-White race		–1,023.7***	–954.1***		–1,106.3**	–1,099.7**
		(251.2)	(243.3)		(365.7)	(351.3)
Hispanic ethnicity		–1,655.4***	–1,489.8***		–411.4	–479.9
		(244.3)	(236.5)		(391.5)	(374.9)
Married		2,121.3***	1,856.7***		–	–
		(157.1)	(156.0)			
One child		730.5***	514.8**		–	–
		(175.6)	(174.0)			
Two children		1,371.6***	902.5***		–	–
		(175.8)	(173.9)			
Three children		1,563.0***	909.2***		–	–
		(219.5)	(216.2)			
Four or more children		1,422.8***	750.9**		–	–
		(285.7)	(280.8)			
Mean annual housing expenditure among civilian households ($)	17,204	17,204	17,204	14,673	14,673	14,673
Geography fixed effects	X	X	X	X	X	X
Additional demographic controls		X	X		X	X
Housing type fixed effects			X			X
Observations	35,403	35,403	35,403	16,026	16,026	16,026

SOURCE: Author calculations using 2017–2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with (as indicated) fixed effects for PUMA and DoD housing profile, along with controls for race/ethnicity and number of children. The "Mean annual housing expenditure among civilian households ($)" row is the sample mean from the civilians in each regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.9. National Differences in Housing Expenditures Among Mid-Career Enlisted Type Active Duty Military and Civilians (Renters)

	Mid-Career Enlisted Type with Dependents			Mid-Career Enlisted Type without Dependents		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Active duty difference	4,503.2***	4,218.7***	3,477.8***	3,228.8***	3,159.5***	2,840.5***
	(320.9)	(315.2)	(286.6)	(363.4)	(367.3)	(351.5)
Black		–759.4***	–360.0*		–1,443.8***	–1,142.9***
		(165.7)	(152.6)		(1,48.3)	(141.5)
Asian-American/Pacific Islander		–1,776.0***	–1,082.8***		251.1	–18.53
		(294.8)	(284.1)		(310.3)	(297.6)
Other non-White race		–654.8***	–519.5***		–586.1***	–647.9***
		(154.7)	(139.1)		(164.1)	(155.0)
Hispanic ethnicity		–1,141.8***	–900.6***		–378.8*	–402.1*
		(155.1)	(141.3)		(172.8)	(161.7)
Married		605.0***	433.3***		–	–
		(110.2)	(102.6)			
One child		277.2	–228.2		–	–
		(147.9)	(139.1)			
Two children		882.4***	–122.8		–	–
		(146.1)	(138.0)			
Three children		1,464.5***	–2.920		–	–
		(190.7)	(180.7)			
Four or more children		2,280.7***	572.6**		–	–
		(230.9)	(218.1)			
Mean annual housing expenditure among civilian households ($)	16,079	16,079	16,079	22,458	22,458	22,458
Geography fixed effects	X	X	X	X	X	X
Additional demographic controls		X	X		X	X
Housing type fixed effects			X			X
Observations	21,043	21,043	21,043	22,976	22,976	22,976

SOURCE: Author calculations using 2017–2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with (as indicated) fixed effects for PUMA and DoD housing profile, along with controls for race/ethnicity and number of children. The "Mean annual housing expenditure among civilian households ($)" row is the sample mean from the civilians in each regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.10. National Differences in Housing Expenditures Among Junior Officer Type Active Duty Military and Civilians, 2017–2021 (Homeowners)

	Junior Enlisted Type with Dependents			Junior Enlisted Type without Dependents		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Active duty difference	2,483.7*	2,451.8*	2,124.6	1,489.8	1,557.5	1,095.6
	(1116.2)	(1143.1)	(1157.7)	(940.9)	(923.8)	(1003.6)
Black		–406.1	–326.3		–2,248.8**	–2,186.2**
		(912.2)	(915.0)		(703.2)	(692.8)
Asian-American/Pacific Islander		–1,268.8	–1201.5		–715.3	–621.3
		(1314.8)	(1,267.6)		(746.8)	(737.9)
Other non-White race		–1,386.1	–1,105.0		–1,208.1	–1241.1
		(740.2)	(727.6)		(680.8)	(677.3)
Hispanic ethnicity		–34.91	–24.05		557.8	741.8
		(710.2)	(691.9)		(689.8)	(669.9)
Married		2,078.2***	1,809.3**		–	–
		(583.5)	(573.8)			
One child		–4.321	–262.3		–	–
		(276.2)	(269.9)			
Two children		–249.6	–584.7		–	–
		(407.3)	(392.0)			
Three children		165.3	–497.5		–	–
		(875.9)	(882.4)			
Four or more children		575.9	–523.8		–	–
		(1,383.4)	(1,391.6)			
Mean annual housing expenditure among civilian households ($)	20,476	20,476	20,476	20,277	20,277	20,277
Geography fixed effects	X	X	X	X	X	X
Additional demographic controls		X	X		X	X
Housing type fixed effects			X			X
Observations	7,179	7,179	7,179	8,941	8,941	8,941

SOURCE: Author calculations using 2017–2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with (as indicated) fixed effects for PUMA and DoD housing profile, along with controls for race/ethnicity and number of children. The "Mean annual housing expenditure among civilian households ($)" row is the sample mean from the civilians in each regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.11. National Differences in Housing Expenditures Among Junior Officer Type Active Duty Military and Civilians, 2017–2021 (Renters)

	Junior Enlisted Type with Dependents			Junior Enlisted Type without Dependents		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Active duty difference	3,637.0***	3,587.2***	2,820.0***	3,145.4***	3,030.1***	2,224.8***
	(471.2)	(467.6)	(449.4)	(376.8)	(372.3)	(337.0)
Black		–1,007.4**	–570.4		–2358.3***	–2073.9***
		(384.4)	(365.2)		(196.4)	(186.8)
Asian-American/Pacific Islander		–899.3*	–360.7		–779.9***	–824.7***
		(409.0)	(398.5)		(227.3)	(214.8)
Other non-White race		–1,359.3***	–1,111.9**		–153.7	–173.6
		(399.2)	(382.9)		(270.6)	(256.3)
Hispanic ethnicity		–979.1**	–804.3*		–1,182.4***	–1,140.2***
		(373.2)	(361.5)		(232.9)	(219.2)
Married		101.7	41.02		–	–
		(471.2)	(472.5)			
One child		519.4	–318.6		–	–
		(283.6)	(268.4)			
Two children		883.3*	–158.6		–	–
		(404.1)	(414.9)			
Three children		623.1	–306.1		–	–
		(1,053.8)	(974.5)			
Four or more children		30.97	–1080.2		–	–
		(729.2)	(851.5)			
Mean annual housing expenditure among civilian households ($)	19,330	19,330	19,330	21,112	21,112	21,112
Geography fixed effects	X	X	X	X	X	X
Additional demographic controls		X	X		X	X
Housing type fixed effects			X			X
Observations	6,267	6,267	6,267	31,039	31,039	31,039

SOURCE: Author calculations using 2017–2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with (as indicated) fixed effects for PUMA and DoD housing profile, along with controls for race/ethnicity and number of children. The "Mean annual housing expenditure among civilian households ($)" row is the sample mean from the civilians in each regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.12. National Differences in Housing Expenditures Among Mid-Career Officer Type Active Duty Military and Civilians, 2017–2021 (Homeowners)

	Mid-Career Enlisted Type with Dependents			Mid-Career Enlisted Type without Dependents		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Active duty difference	1,887.2***	1,676.3***	1,276.3***	3,451.4***	3,561.6***	3,237.7***
	(290.8)	(286.9)	(274.8)	(833.6)	(831.7)	(800.3)
Black		–1,755.7***	–1,641.3***		–1,588.3***	–1,701.6***
		(276.0)	(269.2)		(407.5)	(390.3)
Asian-American/Pacific Islander		–308.0	–150.5		–425.6	–755.0
		(245.4)	(236.7)		(479.3)	(472.0)
Other non-White race		–1,560.1***	–1,467.4***		–343.3	–553.0
		(247.7)	(244.0)		(427.9)	(413.8)
Hispanic ethnicity		–1,804.9***	–1,502.9***		–1,461.7***	–1,403.4***
		(233.4)	(229.7)		(388.5)	(374.7)
Married		3,914.7***	3,395.4***		–	–
		(208.4)	(201.7)			
One child		2,105.3***	1,359.7***		–	–
		(154.1)	(145.5)			
Two children		3,909.4***	2,442.7***		–	–
		(166.5)	(150.4)			
Three children		5,010.2***	2,953.9***		–	–
		(213.2)	(193.0)			
Four or more children		4,860.7***	2,383.4***		–	–
		(259.6)	(248.0)			
Mean annual housing expenditure among civilian households ($)	29,413	29,413	29,413	22,348	22,348	22,348
Geography fixed effects	X	X	X	X	X	X
Additional demographic controls		X	X		X	X
Housing type fixed effects			X			X
Observations	116,467	116,467	116,467	31,934	31,934	31,934

SOURCE: Author calculations using 2017–2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with (as indicated) fixed effects for PUMA and DoD housing profile, along with controls for race/ethnicity and number of children. The "Mean annual housing expenditure among civilian households ($)" row is the sample mean from the civilians in each regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.13. National Differences in Housing Expenditures Among Mid-Career Officer Type Active Duty Military and Civilians, 2017–2021 (Renters)

	Mid-Career Enlisted Type with Dependents			Mid-Career Enlisted Type without Dependents		
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Active duty difference	6,309.1***	5,391.4***	3,790.3***	2888.5***	2,843.1***	2,353.3***
	(310.4)	(303.6)	(288.2)	(382.3)	(377.1)	(351.1)
Black		–2,413.5***	–1,661.2***		–2,245.3***	–1,998.8***
		(239.8)	(226.2)		(194.7)	(190.0)
Asian-American/Pacific Islander		–2,796.1***	–1,308.2***		–993.9***	–839.1***
		(191.3)	(188.6)		(178.9)	(173.2)
Other non-White race		–1,423.8***	–1,006.6***		–1,265.5***	–1,194.0***
		(221.3)	(212.5)		(213.9)	(205.3)
Hispanic ethnicity		–1,596.8***	–1,166.8***		–1,130.9***	–1,071.9***
		(215.7)	(199.7)		(198.3)	(185.1)
Married		1,901.3***	1,561.7***		–	–
		(207.6)	(190.7)			
One child		1,594.4***	594.4***		–	–
		(164.8)	(153.4)			
Two children		2,811.3***	678.1***		–	–
		(190.1)	(174.3)			
Three children		3,446.7***	666.5**		–	–
		(269.3)	(256.8)			
Four or more children		3,578.8***	363.3		–	–
		(387.7)	(374.1)			
Mean annual housing expenditure among civilian households ($)	24,816	24,816	24,816	21,295	21,295	21,295
Geography fixed effects	X	X	X	X	X	X
Additional demographic controls		X	X		X	X
Housing type fixed effects			X			X
Observations	36,702	36,702	36,702	40,626	40,626	40,626

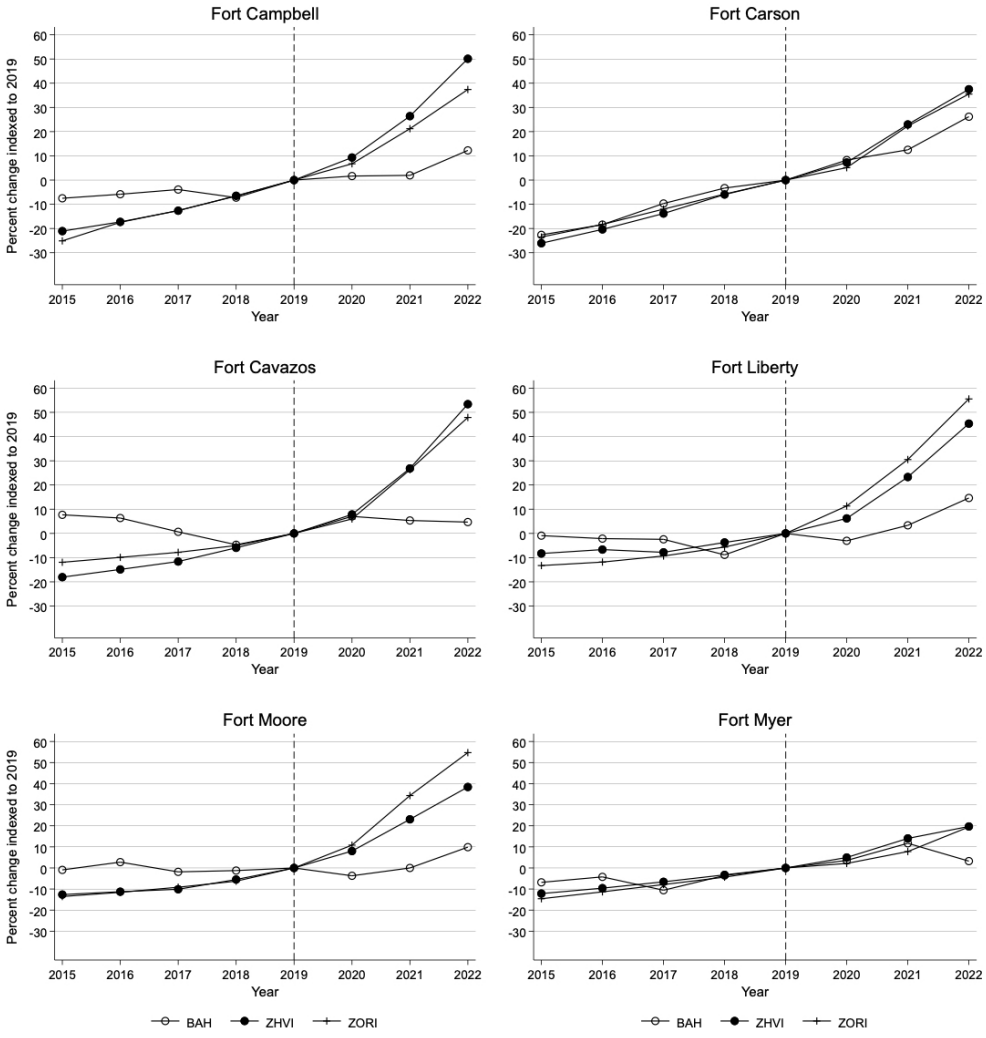
SOURCE: Author calculations using 2017–2021 ACS data (1-year sample) from IPUMS (Ruggles et al., 2023).

NOTE: Results are from a regression of annual housing expenditure on an indicator for active duty military personnel along with (as indicated) fixed effects for PUMA and DoD housing profile, along with controls for race/ethnicity and number of children. The "Mean annual housing expenditure among civilian households ($)" row is the sample mean from the civilians in each regression. Standard errors clustered at the PUMA level are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Comparisons of Changes in BAH and Zillow Price Indexes Using Civilian Weights

Figure A.3 replicates the analysis from Figure 5.1 but uses the civilian population as weights in the calculation of the MHA mean housing index values. The raw data files that we downloaded from Zillow (ZORI and ZHVI indexes) and DTMO (BAH rates) are at the zip code and year level. We collapse the data to the MHA and year level using population weighted estimates of the mean for each of the three variables. In the main body of the report, we use Army population weights so that the MHA-level averages draw more heavily from areas where Army personnel tend to live. Figure A.3 presents the results when using civilian, rather than Army, population weights at the zip code level, which we downloaded from the NHGIS portal. Overall, the findings using civilian weights are comparable to the results shown in Chapter 5 using the military weights.

Figure A.3. Housing Price Index, Rent Index, and BAH Over Time at Select Army Installations Using Civilian Population Weights



SOURCE: Authors' calculations using Zillow's ZORI and ZHVI data along with DTMO's published BAH rates.
NOTE: All indexes are originally in zip code– and year-level data format. We collapse the data to the MHA and year level using military populations weights to calculate averages. All values are set equal to zero in 2019, and values in other years represent percent changes from the 2019 value.

Appendix B

Data Supplement

This appendix presents additional information about the data used in the report and the steps we took to join data with different geographies.

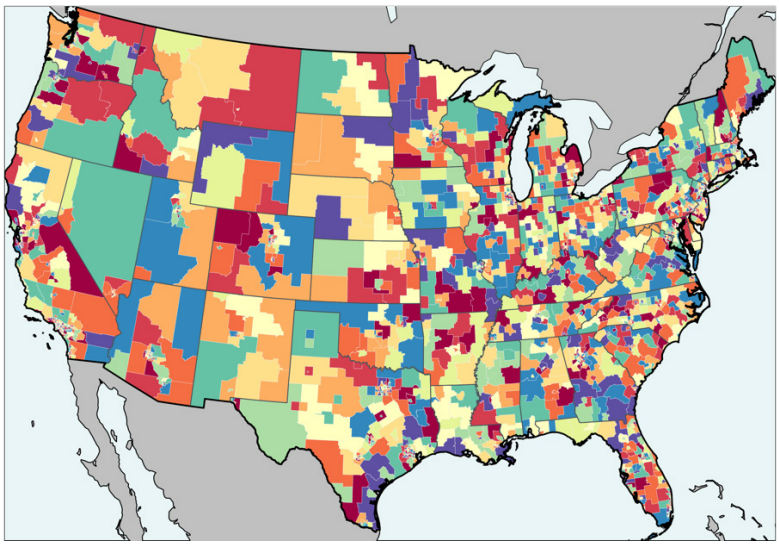
Merging American Community Survey and Defense Manpower Data Center Data

We use three data sources from the ACS in the report:

1. individual-level survey data downloaded from Integrated Public Use Microdata Series (IPUMS) web portal and with information about the survey respondents PUMA
2. zip code–level data; a zip code is a much smaller geography than a PUMA, but ACS zip code–level data lack any individual-level information
3. ACS data at the census tract level, including their geographies and total population.

MHAs are simply collections of zip codes, and so the process of matching the ACS zip code–level data to BAH rates and other DMDC data is relatively simple. However, the PUMA and MHA geographies are independent of one another, the former being a product of the U.S. Census Bureau and the latter a DoD creation. We downloaded a shapefile of PUMAs in the computer programming language R using the *tidycensus* package and plotted the PUMAs in CONUS (see Figure B.1). The PUMA geography changes after every decennial census to changes in population; the version we use is valid through spring 2023 (U.S. Census, 2020).

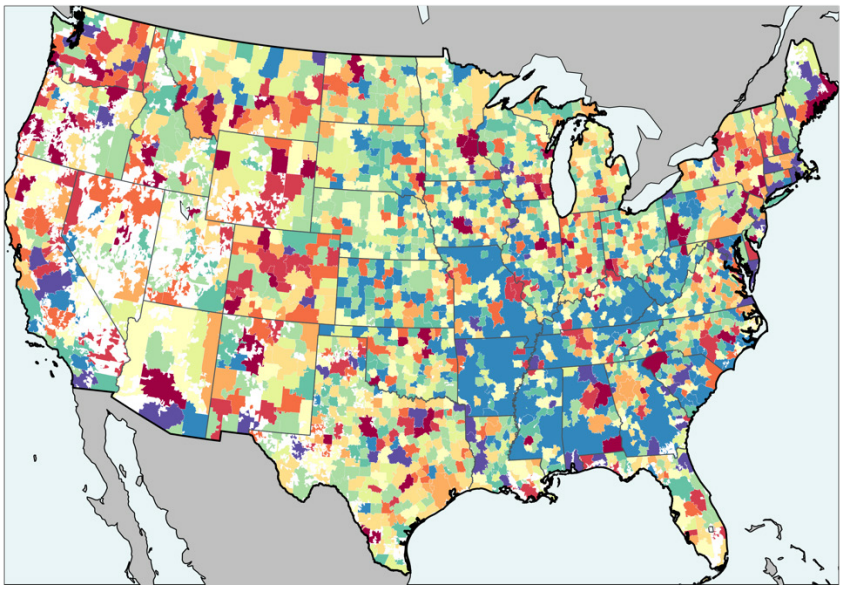
Figure B.1. Map of 2010 Decennial Census PUMAs in the Continental United States



SOURCE: PUMA shapefile downloaded from the U.S. Census Bureau using R's *tidycensus* package.

We constructed the map of MHAs using a zip code shapefile, which we downloaded from the U.S. Census Bureau's website (U.S. Census, undated-b). DTMO's zip code to MHA crosswalk allowed us to generate a map of MHAs in CONUS, which we plot in Figure B.2.

Figure B.2. Map of MHAs in the Continental United States in 2021



SOURCE: Authors' calculations using shapefile of U.S. zip codes downloaded from the U.S. Census Bureau and DTMO's zip code to MHA crosswalk.
NOTE: White areas are those without zip code assignment. Large contiguous areas, like the blue MHA spanning the southeastern part of the map are county cost groups, defined in Chapter 2. The regions in white do not belong to a ZCTA.

Constructing the PUMA to MHA Crosswalk

We create a crosswalk between the two geographies that matches each PUMA to a single MHA. Whether a PUMA matches to an MHA depends on the fraction of the PUMA's total population that an MHA covers. The matching process begins with the MHAs' and PUMAs' subgeographies: zip codes and census tracts. That is, MHAs are collections of zip codes, while PUMAs are collections of census tracts. Tracts are one of the smallest of the U.S. Census Bureau's geographies. There are around 84,000 tracts that cover the United States. Tract shapefiles come directly from the U.S. census and, like the PUMA maps, were downloaded using the *tidycensus* R package for the years 2017–2021. We incorporate information on each tract-year's total population by its tract ID, using data downloaded from NHGIS. The zip codes (MHA subgeography) are then spatially joined to the tracts (PUMA subgeography) based on their proximity—that is, each tract is joined to the nearest zip code, a spatial calculation made by from the polygons' centroids.

After the zip code–level information was incorporated into the tract shapefiles, we joined each tract's corresponding PUMA assignment using a crosswalk obtained from the U.S. Census Bureau's website (U.S. Census Bureau, undated-c). The resulting data file is at the tract-level, and each tract is tied to the PUMAs', zip codes', and MHAs' geographies. To construct the final crosswalk, we calculated each PUMA's total population using its tract's ACS population estimates and, for each PUMA, we identified the MHAs covering it and calculated their share of the total PUMA population (i.e., the population of the PUMA's tracts that are assigned to zip codes in a specific MHA). If 80

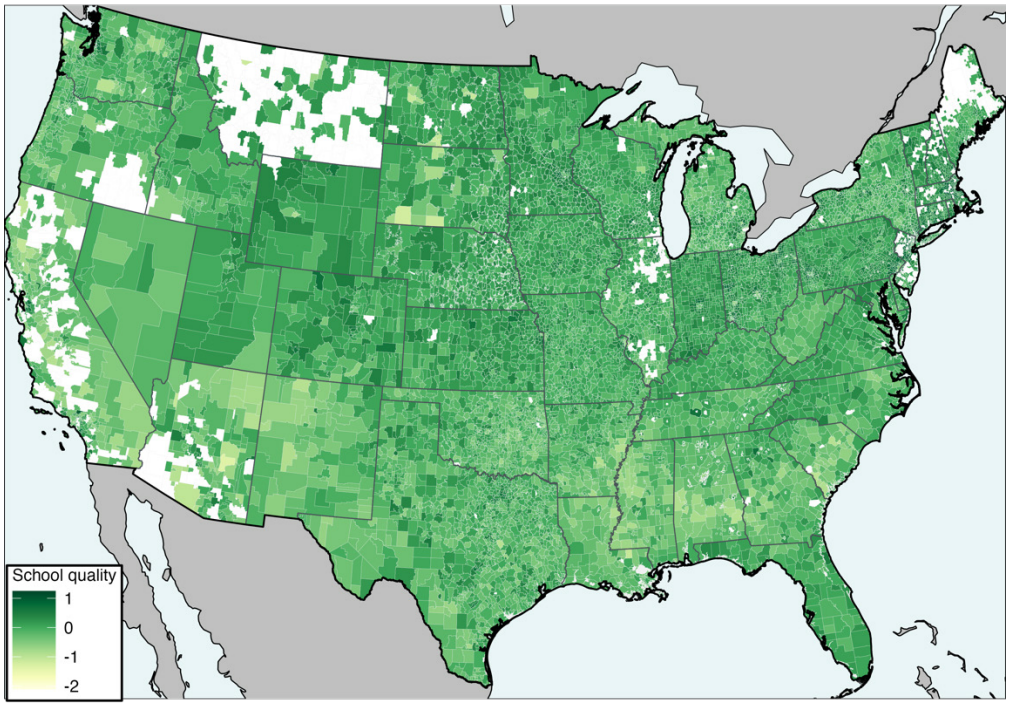
percent or more of the PUMA's population resides in tracts joined to a single MHA, then the two are matched in our crosswalk. A single MHA can cover multiple PUMAs. However, if no single MHA covers 80 percent of the PUMA's total population, then it is left without a matching MHA. In total, the process successfully joins 73.76 percent (8,847/11,995) of the PUMAs in 2017 through 2021 to an MHA.

School Quality Data and Geography

The analysis of housing amenities in Chapter 4 uses a zip code–level data file. The data on school quality we obtained from SEDA, however, are not available at the zip code level. Instead, their geography is the school district. SEDA does not include shapefiles of U.S. school districts, and so we obtained spatial data on U.S. school districts in the 2017–2018 school year to match SEDA 4.1's most recent data from the National Center for Education Statistics (NCES). Figure B.3 plots the geographic distribution of school quality at the school district level.

To construct the zip code–level data on school quality, we joined the school districts' geographies to the zip code shapefile. The join is based on the school district that covers the largest share of each zip code. If a zip code does not overlap with any school district, it is not joined to the SEDA data and lacks any information on the zip code's school quality. This process yields estimates of school quality for all but 213 zip codes of the 33,144 total (i.e., 0.64 percent). But the process of the geographic merge between school districts and zip codes may not perfectly align with the school quality faced by the majority of people within the zip code, because we are unsure of where individuals reside within that geography. While a limitation of the data, it is unlikely to skew the results of our amenities analysis in Chapter 4, because the data are aggregated up to the MHA level using population weights, and any "errors" should not occur in any sort of systematic way. In other words, the estimated school quality of the zip code is as likely to underestimate the true quality of schooling as it is to overestimate it.

Figure B.3. Distribution of School Quality Using the School District Geographies

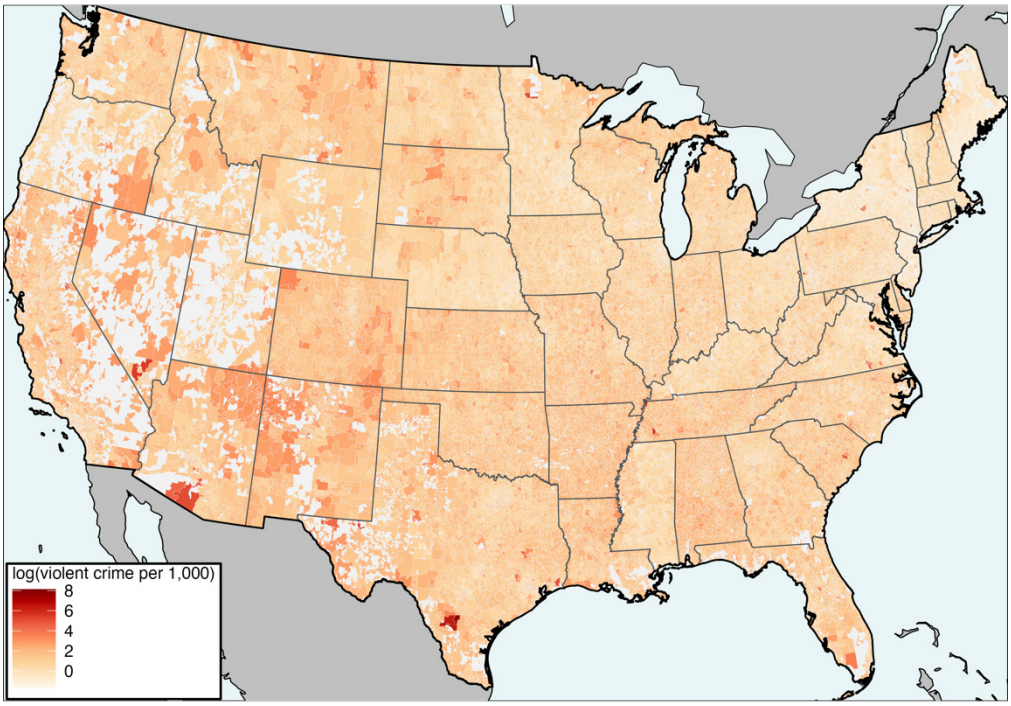


SOURCE: Authors' calculations using SEDA and NCES data.
NOTE: Areas in white are missing information on standardized test scores in the 2017–2018 academic year in SEDA 4.1.

CrimeGrade Data

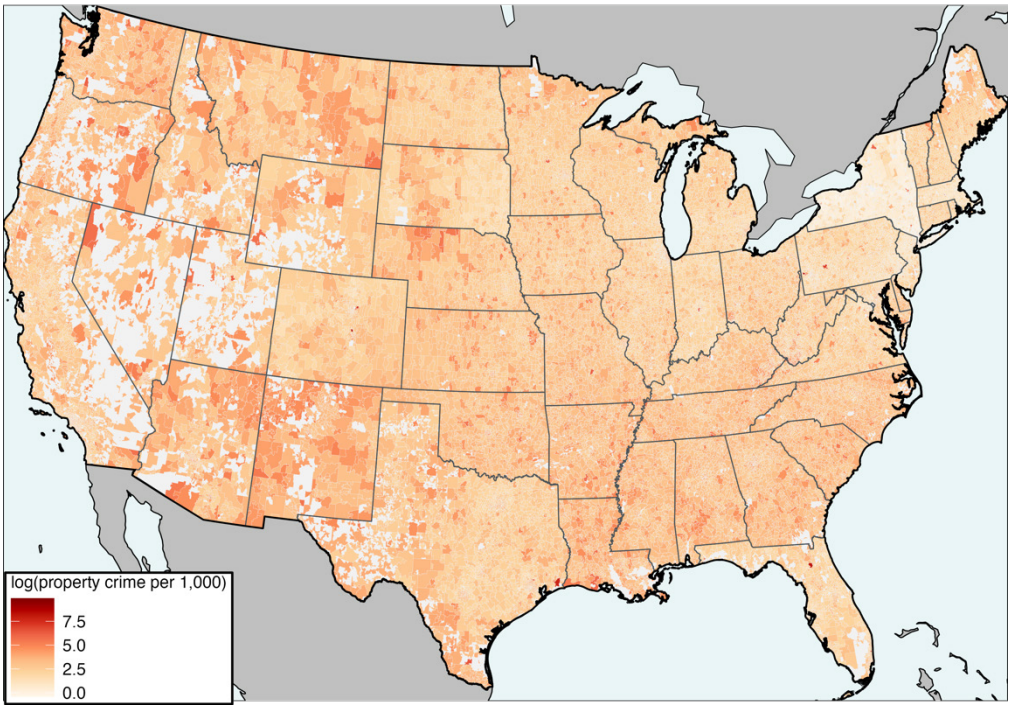
We purchased data on crime rates from a CrimeGrade.org, an organization that gathers and constructs zip code–level crime data across the United States. Because the data come natively at the zip code level, they do not require the creation of a crosswalk to merge into our main analysis data file. The data include information about the rates of both property and violent crime, omitting CrimeGrade's third and final category, "Other Crimes," which includes vandalisms, drug possession, and identity theft. Previous work on crime and its effects on home value suggests that home prices are most sensitive to violent and property crimes (Ihlanfeldt and Mayock, 2010), so we focus on those in our analysis. Figures B.4 and B.5 plot the log of violent and property crime rates per 100,000 residents, respectively.

Figure B.4. Distribution of the Log of Violent Crime Rates



SOURCE: Authors' calculations using CrimeGrade.org (violent crime) data and shapefile of U.S. ZTCAs downloaded from the U.S. Census Bureau.
NOTE: Areas in white are not ZCTAs.

Figure B.5. Distribution of the Log of Property Crime Rates



SOURCE: Authors' calculations using CrimeGrade.org (violent crime) data and shapefile of U.S. ZCTAs downloaded from the U.S. Census Bureau.
NOTE: Areas in white are not ZCTAs.

Limitations of CrimeGrade Data

There are two limitations of the CrimeGrade data: (1) The unit for the data is a rate (i.e., crime incidents per 100,000 residents), so the value of the data is sensitive to zip codes with low population, and (2) CrimeGrade uses a proprietary process to generate its final crime rates data files—that is, CrimeGrade interpolates many zip codes' values and smooths crime rates over geography. Given that they are proprietary, little is known about these processes, so it is unclear how accurately the CrimeGrade data reflect current crime rates. Below, we explain these limitations in greater detail and our reasoning behind trusting this source in our analysis.

The CrimeGrade data give the zip code's crime by type per 100,000 residents. Because some zip codes have exceptionally low populations, a handful of crimes can lead to exceptionally high rates of crime in these regions. We see examples of this among the exemplar MHAs and their underlying zip code data used in the amenities analysis found in Chapter 4. For example, in Fort Moore's MHA, there is a zip code (87116) with a violent crime rate of 225.35 per 100,000 residents, far above the national average of 1.16. This value is driven, in part, by high crime, but also by the zip code's low population: 4,579 residents. Fortunately, we address the outliers driven by low population by calculating population-weighted statistics in the amenities analysis. A zip code, such as 87116, makes up only a small fraction of total MHA residents and thus receives a relatively small weight when we calculate the average violent crime rates at the MHA level.

Because we are not privy to a detailed description of CrimeGrade's process for interpolating missing crime rates data and, ultimately, the creation of its final data file, it is difficult to determine whether the data capture the true crime rates by type across the zip codes. But CrimeGrade draws primarily from the FBI's Uniform Crime Reporting Program and local police departments, two perennially trusted sources of crime data, so we have little reason to believe the data files we receive are largely or systematically inaccurate in ways that pose risks the reliability of the analysis and its conclusions.

Abbreviations

ACS	American Community Survey
BAH	Basic Allowance for Housing
CONUS	continental United States
DMDC	Defense Manpower Data Center
DoD	U.S. Department of Defense
DoDEA	Department of Defense Education Activity
DTMO	Defense Travel Management Office
FY	fiscal year
GAO	U.S. Government Accountability Office
IPUMS	Integrated Public Use Microdata Series
MHA	military housing area
MHO	military housing office
NHGIS	National Historical Geographic Information System
PUMA	public use microdata area
QRMC	Quadrennial Review of Military Compensation
RMC	regular military compensation
SEDA	Stanford Education Data Archive
ZCTA	zip code tabulation area
ZHVI	Zillow Home Value Index
ZORI	Zillow Observed Rent Index

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Rising housing prices and inflation since 2020 have brought attention to the adequacy of the Basic Allowance for Housing (BAH) for military personnel. The authors of this report assess the adequacy of BAH and the BAH rate-setting methodology from the standpoint of Army personnel, in the context of recent changes in the housing market.

The authors first assess the BAH methodology by considering the housing choices made by Army personnel and whether soldiers are making choices consistent with the way the allowance is set. They then assess the adequacy of BAH and the housing procured by members by using the 2017–2021 American Community Survey data to assess the extent to which the housing expenditures of active duty soldiers are comparable with those of income-matched civilians and civilians with comparable demographic characteristics. They also assess the extent to which there are observable differences between soldiers and civilians in neighborhood amenities across six exemplar installations. Finally, they assess the extent to which the BAH methodology adequately captured changes in housing prices, particularly given the dramatic increases in both rents and home sale prices in the years since the start of the coronavirus disease 2019 (COVID-19) pandemic.

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