Comparing the Utilization and Cost of Health Services between Veterans Experiencing Brief and Ongoing Episodes of Housing Instability

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Abstract Housing instability is associated with costly patterns of health and behavioral health service use. However, little prior research has examined patterns of service use associated with higher costs among those experiencing ongoing housing instability. To address this gap, we compared inpatient and outpatient medical and behavioral health service utilization and costs between veterans experiencing brief and ongoing episodes of housing instability. We used data from a brief screening instrument for homelessness and housing instability that has been implemented throughout the US Department of Veterans Affairs (VA) health care system to identify a national sample of veterans experiencing housing instability. Veterans were classified as experiencing either brief or ongoing housing instability, based on two consecutive responses to the instrument, and we used a series of two-part regression models to conduct adjusted comparisons of costs between veterans experiencing brief and ongoing episodes of housing instability. Among 5794 veterans screening positive for housing instability, 4934 (85%) were experiencing brief and 860 (15%) ongoing instability. The average total annual incremental cost associated with ongoing versus brief episodes of housing instability was estimated at \$7573, with the bulk of this difference found in inpatient services. Cost differences resulted more from a higher probability of service use among those

experiencing ongoing episodes of housing instability than from higher costs among service users. Our findings suggest that VA programmatic efforts aimed at preventing extended episodes of housing instability could potentially result in substantial cost offsets for the VA health care system.

Keywords Housing · Homelessness · Veterans · Health service use

Introduction

Previous studies have linked various forms of housing instability, including homelessness, difficulty in paying for housing, living in a “doubled up” situation, and frequent moves with patterns of increased health and behavioral health service use that result in added costs for health care systems [1–13]. For example, while individuals experiencing housing instability are less likely to access outpatient care, [1–3] they tend to use more expensive forms of acute care such as inpatient and emergency department services at higher rates [2, 3, 5, 10] and with greater frequency and volume than their stably housed counterparts [4–9, 11–13].

Although higher than their stably housed counterparts, evidence suggests that there is substantial variation in health care costs among those experiencing housing instability, with highly expensive use attributable to a relatively small subset of individuals [5, 13, 14]. Prior research also shows that housing instability is a dynamic phenomenon [15], and more protracted

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experiences of housing instability may be a driver of more expensive patterns of care. However, only two prior studies [16, 17] have examined this topic. These studies provide some evidence that extended episodes of housing instability are associated with higher health care costs, but they are limited by the absence of direct comparisons between those experiencing brief and ongoing episodes of housing instability, a reliance on data from a small number of jurisdictions, and an overall lack of information about the breakdown of costs by treatment modality. Additionally, there has been no attempt in prior research to assess the relationship between housing instability over time and health care costs specifically among veterans, which is noteworthy given that veterans are more likely to have better access to comprehensive health services through the US Department of Veterans Affairs (VA) health care system than their non-veteran counterparts [18, 19].

The present study addresses these limitations and adds to the existing literature by using data from a national sample of veterans experiencing housing instability and comparing inpatient and outpatient medical and behavioral health costs between veterans identified as experiencing brief and ongoing episodes of housing instability.

Methods

Sample

We identified the study sample using data from the VA's Homelessness Screening Clinical Reminder (HSCR), which is a brief screening instrument for homelessness and housing instability used throughout the VA health care system [20]. The two questions that comprise the HSCR are the following:

1. In the past two months, have you been living in stable housing that you own, rent, or stay in as part of a household? (Negative response indicates current housing instability.)
2. Are you worried or concerned that in the next two months you may NOT have stable housing that you own, rent, or stay in as part of a household? (Positive response indicates risk of housing instability.)

The HSCR is administered annually to all veterans accessing outpatient care at a VA facility, with the

exception of veterans who are already receiving homeless assistance or living in a long-term or palliative care facility. Veterans who screen positive for current or imminent risk of housing instability or who decline screening are rescreened semiannually; those who screen negative are rescreened annually. Responses to the HSCR are stored as part of veterans' electronic medical records and were obtained from the VA's Corporate Data Warehouse.

The study sample included 6195 veterans who initially responded to the HSCR between October 1, 2012 and September 30, 2013 and indicated current housing instability and then completed an HSCR rescreen between 6 and 12 months later. We excluded 87 veterans whose initial response to the HSCR occurred in either Puerto Rico or the Philippines. Because the HSCR is not intended to be administered to those already receiving VA homeless services, we excluded an additional 314 veterans who, according to data from the VA's National Homeless Registry, had a record of entering a VA specialized homeless program at some point between the date of their initial screen and rescreen. We used responses to the rescreen to categorize veterans in the study sample as experiencing either a brief episode of housing instability (those who rescreened negative for both current or imminent risk of housing instability) or an ongoing episode of housing instability (those with a positive rescreen for current housing instability).

Measures

We obtained the study's outcome measure—the cost of VA health and behavioral health services incurred by veterans in the 1-year period following completion of their HSCR rescreen—from the VA's Managerial Cost Accounting System National Data Extracts (NDE). This measure included all fixed direct, fixed indirect, and variable direct costs [21], and we constructed separate cost measures for inpatient and outpatient services. We used treatment specialty codes available in the inpatient records to create separate measures capturing costs for the following types of inpatient hospitalization: medical, mental health, and substance abuse. We used clinic stop codes in the outpatient data to classify outpatient costs into the following categories: medical, mental health, substance abuse, and a residual other category, which included telephone, home-based care, homeless, and social work services. We also created a parallel set of cost measures for the 1-year period prior to veterans'

completion of their HSCR rescreen. All costs were converted to 2014 dollars using the US Bureau of Economic Analysis Personal Consumption Expenditures index [22].

We obtained a set of socio-demographic measures including gender, age at time of initial response to the HSCR, race/ethnicity, and service in Afghanistan or Iraq as part of Operations Enduring Freedom (OEF) or Iraqi Freedom (OIF) from veterans' electronic medical records. We used *International Classification of Diseases, 9th Edition (ICD-9)* to create an indicator of whether veterans had received a diagnosis indicating the presence of a serious mental illness (ICD-9 codes 295–298) at some point in the year prior to their completion of the HSCR rescreen; whether veterans were experiencing unsheltered homelessness (i.e., living in the street, a vehicle, an abandoned building, or anywhere outside), based on their responses to a follow-up question included in the HSCR regarding current living situation; and whether veterans initially responded to the HSCR in a VA facility located in a rural location, based on designations made by the Veterans Health Administration Support Service Center. The region of the country in which veterans initially responded to the HSCR was categorized according to the US Census Bureau's region division [23].

Analysis

We conducted unadjusted comparisons of costs incurred between veterans experiencing brief and ongoing episodes of housing instability using Wilcoxon-Mann-Whitney *U* tests. We then conducted adjusted comparisons of all cost categories using a series of two-part models [24]. We used logistic regression in the first part of the two-part model to estimate the probability of any service use, and then used a gamma regression model with a log-link function in the second part to estimate the cost of service use, conditional on having any service use. We used predicted values across both parts of the model to estimate regression-adjusted incremental costs associated with ongoing housing instability. We bootstrapped a 95% confidence interval around this estimated incremental cost based on 1000 replicates and using the percentile method [25]. All models included covariates for the set of socio-demographic covariates described above, having a diagnosis of serious mental illness, location of facility in which initial HSCR was completed, unsheltered status, and a square root

transformed measure of service cost in the 1-year prior to completion of the HSCR rescreen, to adjust for baseline cost of service utilization. Because of the importance of age as a determinant of service utilization, we conducted sub-group analysis stratifying the sample into three discrete age groups: 18–44, 45–64, and 65 and older.

Results

Our cohort consisted of 5794 veterans who screened positive for housing instability and were not receiving VA homeless services during FY2013. Of these, 4934 (85%) were classified as experiencing brief and 860 (15%) as experiencing ongoing housing instability. Table 1 compares the characteristics of veterans in the two study groups.

The unadjusted cost comparisons are shown in Table 2. Veterans experiencing ongoing episodes of housing instability had significantly higher inpatient, and to a lesser extent, outpatient, service utilization costs than those experiencing brief episodes. This pattern was largely consistent across age groups, with differences in overall costs between groups driven by inpatient cost differences, although the opposite was the case for veterans aged 65 and older.

Table 3 shows that veterans experiencing ongoing housing instability were more likely to have an inpatient treatment episode in the 1-year period following completion of the HSCR rescreen, a finding that held true across all types of hospitalization. The difference was particularly pronounced for hospitalizations related to substance abuse; those experiencing an ongoing episode of housing instability had about four times the odds of experiencing an inpatient episode relative to those experiencing a brief episode of housing instability. There were fewer differences when looking at inpatient costs among those who experienced an inpatient hospitalization, although. Veterans with an ongoing episode of housing instability had total inpatient costs that were about 30% higher than their counterparts with a brief episode.

Veterans experiencing an ongoing episode of housing instability had higher odds than veterans experiencing a brief episode of housing instability of using any outpatient care in an emergency department/urgent care setting, mental health and substance abuse specialty clinics, or in other settings. Conditional on any use of

Table 1 Descriptive characteristics of veterans experiencing brief and ongoing episodes of housing instability as a percentage of the sample

Variable	Veterans experiencing ongoing episodes of housing instability (n = 860)	Veterans experiencing brief episodes of housing instability (n = 4934)	p
Gender			
Female	6.5	11.3	<0.0001
Male	93.5	88.7	
Age category			
18–34	7.9	10.7	<0.0001
35–44	8.4	9.9	
45–54	21.6	19.8	
55–64	45	36.4	
65+	17.1	23.2	
Race			
White	51.7	56.6	0.009
Non-white	48.3	43.4	
OEF/OIF service			
No OEF/OIF service	91.5	87.3	0.001
OEF/OIF service	8.5	12.7	
Serious mental illness diagnosis			
No serious mental illness	70.2	70.4	0.939
Serious mental illness	29.8	29.6	
Unsheltered status			
Sheltered	80.2	100	<0.0001
Unsheltered	19.8	0	
Location			
Not rural	89.9	85.8	0.002
Rural	10.1	14.2	
Region			
North-east	10	12.3	<0.0001
West	43.6	29.6	
Midwest	13.5	17.8	
South	32.9	40.4	

outpatient care, veterans experiencing ongoing housing instability used more emergency department/urgent care, mental health, and other types of outpatient treatment and their aggregate outpatient service costs were higher than those experiencing brief housing instability.

The pattern of findings for the age-stratified models differed somewhat from those for the full sample. Among veterans in the 18–44 and 45–64 age brackets, those experiencing an ongoing episode of housing instability were more likely to have an inpatient hospitalization than those experiencing a brief episode, although there was no significant difference in inpatient costs conditional on having an inpatient episode. For those aged 65 plus, there was no difference between groups in either the probability of any inpatient hospitalization, or the cost conditional on use of inpatient services. There was a limited degree of consistency across age groups when considering outpatient services. Most notably, veterans in the 18–44 and 65 and older age groups who experienced ongoing housing instability had higher odds of using outpatient substance abuse services.

Table 4 summarizes the results of the regression-adjusted estimates of the incremental costs associated with ongoing housing instability. In the full sample, veterans experiencing an ongoing episode of housing instability had inpatient medical, mental health, and substance abuse treatment costs that were an estimated \$2228, \$1835, and \$737 higher, respectively, in the 1 year following completion of the HSCR rescreen than those experiencing a brief episode of housing instability. The total incremental inpatient costs associated with ongoing housing instability were nearly \$5000. By contrast, ongoing housing instability associated only with an additional \$1918 in outpatient costs. In total, health and behavioral health costs for veterans experiencing ongoing episodes of housing instability were an estimated \$7573 higher than those experiencing brief episodes. Results for veterans in the 18–44- and 45–64-year-old age bracket largely mirror those from the full sample; ongoing housing instability was not significantly associated with total inpatient, total outpatient or overall costs among veterans ages 65 and older.

Discussion

The primary finding from this study is that veterans identified as experiencing ongoing episodes of housing instability incur substantially higher VA health and

Table 2 Comparison of unadjusted costs of inpatient and outpatient services used by veterans experiencing brief and ongoing episodes of housing instability in year following HSCR rescreen

	Veterans experience ongoing episodes of housing instability		Veterans experiencing brief episodes of housing instability		<i>p</i>
	M	SD	M	SD	
Full sample					
Inpatient costs					
Medical	\$8019	\$40,125	\$4333	\$22,565	<0.001
Mental health	\$4534	\$21,584	\$1712	\$11,779	<0.001
Substance abuse	\$1155	\$6969	\$292	\$3262	<0.001
Total	\$13,708	\$47,960	\$6337	\$26,552	<0.001
Outpatient costs					
Emergency department/urgent care	\$1039	\$2383	\$623	\$1530	<0.001
Medical	\$5716	\$9205	\$5664	\$7670	0.07
Mental health	\$1936	\$4438	\$1808	\$4140	0.63
Substance abuse	\$527	\$2490	\$266	\$1638	<0.001
Other	\$2050	\$3726	\$1177	\$2598	<0.001
Total	\$11,267	\$13,408	\$9538	\$10,705	0.01
Total inpatient and outpatient costs	\$24,975	\$52,731	\$15,875	\$30,716	<0.001
Ages 18–44 ^a					
Inpatient costs					
Total	\$9578	\$26,091	\$4459	\$22,110	<0.001
Outpatient costs					
Emergency department/urgent care	\$761	\$1655	\$619	\$1358	0.18
Medical	\$4085	\$6092	\$3892	\$4646	0.21
Mental health	\$3915	\$7824	\$2579	\$5342	0.02
Substance abuse	\$323	\$1168	\$305	\$1523	<0.001
Other	\$1905	\$3103	\$1057	\$2280	<0.001
Total	\$10,989	\$13,472	\$8451	\$9543	0.20
Total inpatient and outpatient costs	\$20,567	\$33,839	\$12,910	\$25,940	0.03
Ages 45–64 ^a					
Inpatient costs					
Total	\$16,052	\$55,882	\$6994	\$29,048	<0.001
Outpatient costs					
Emergency department/urgent care	\$1063	\$2467	\$652	\$1704	0.002
Medical	\$5676	\$9974	\$5895	\$7358	0.01
Mental health	\$1566	\$3228	\$1841	\$3999	0.10
Substance abuse	\$635	\$2912	\$324	\$1900	0.01
Other	\$2004	\$3579	\$1131	\$2354	<0.001
Total	\$10,944	\$13,533	\$9843	\$10,456	0.48
Total inpatient and outpatient costs	\$26,996	\$60,544	\$16,837	\$33,008	0.01
Ages 65+ ^a					
Inpatient costs					
Total	\$8508	\$24,200	\$6411	\$23,605	0.18
Outpatient costs					
Emergency department/urgent care	\$1207	\$2620	\$555	\$1189	0.003
Medical	\$7428	\$8242	\$6675	\$9968	0.15
Mental health	\$1492	\$3504	\$1045	\$2953	0.03
Substance abuse	\$297	\$1349	\$92	\$852	<0.001
Other	\$2366	\$4709	\$1396	\$3316	<0.001
Total	\$12,790	\$12,827	\$9763	\$12,128	0.001
Total inpatient and outpatient costs	\$21,298	\$29,325	\$16,174	\$28,649	0.002

p values based on Wilcoxon-Mann-Whitney *U* tests^a Only total inpatient costs were analyzed due to sparse data for some types of inpatient utilization

Table 3 Results of regression models predicting costs of health and behavioral health services of veterans experiencing ongoing episodes of housing instability (versus veterans experiencing brief episodes of housing instability)

Outcome	Full sample						Ages 18–44 ^{a,b}						Ages 45–64 ^{a,b}						Ages 65+ ^{a,b,c}					
	Part 1: any cost			Part 2: cost cost >0			Part 1: any cost			Part 2: cost cost >0			Part 1: any cost			Part 2: cost cost >0			Part 1: any cost			Part 2: cost cost >0		
	AOR	95% CI	IRR	95% CI	AOR	95% CI	AOR	95% CI	IRR	95% CI	AOR	95% CI	AOR	95% CI	IRR	95% CI	AOR	95% CI	AOR	95% CI	IRR	95% CI	IRR	95% CI
Inpatient costs																								
Medical	1.30	1.03–1.64	1.25	0.96–1.63																				
Mental health	2.48	1.87–3.30	1.16	0.91–1.48																				
Substance abuse	3.98	2.52–6.28	1.05	0.79–1.41																				
Total	1.65	1.35–2.02	1.29	1.05–1.57	2.27	1.41–3.66	1.36	0.87–2.12	1.67	1.31–2.13	1.26	0.98–1.62	1.08	0.64–1.85	1.03	0.6–1.75								
Outpatient costs																								
Emergency dept./urgent care	1.22	1.02–1.46	1.22	1.09–1.36	1.26	0.83–1.9	1.07	0.83–1.38	1.24	0.99–1.54	1.25	1.09–1.42	1.1	0.7–1.74	1.28	0.98–1.68								
Medical ^d			1.06	0.96–1.17			1	0.81–1.22			1.08	0.95–1.24			0.99	0.78–1.27								
Mental health	1.29	1.04–1.6	1.15	1.01–1.3	1.3	0.73–2.31	1.42	1.12–1.8	1.28	0.99–1.66	1.03	0.87–1.21	1.15	0.67–1.99	1.22	0.89–1.68								
Substance abuse	1.63	1.24–2.13	1.18	0.86–1.61	2.21	1.28–3.82	0.67	0.38–1.21	1.28	0.91–1.79	1.31	0.89–1.92	4.42	1.97–9.96	2.03	0.87–4.71								
Other	1.83	1.42–2.36	1.66	1.42–1.95	1.66	0.97–2.83	1.27	0.9–1.79	1.76	1.29–2.41	1.71	1.41–2.08	2.65	1.28–5.46	1.87	1.26–2.76								
Total ^d			1.19	1.1–1.3			1.18	0.99–1.4			1.21	1.09–1.34			1.13	0.92–1.39								
Total costs ^d			1.37	1.21–1.57			1.51	1.11–2.06			1.38	1.17–1.63			1.17	0.85–1.61								

Contrasts shown are ongoing versus brief housing instability group (reference category). All models are adjusted for cost of service use in year prior to HSCR restreen, age group, gender, race, OEF/OIF service, serious mental illness diagnosis, unsheltered status, and screening in a rural location and region, unless specified otherwise

AOR adjusted odds ratio, IRR incidence rate ratio, CI confidence interval

^a Models are not adjusted for age group

^b Only total inpatient costs were analyzed due to sparse data for some types of inpatient utilization

^c Models not adjusted for OEF/OIF service

^d Only gamma regression model estimated for cost due to small number of observations with no costs. A constant of \$1 added to all observations in order to include those with zero costs in gamma regression models

Table 4 Regression-adjusted estimates of cost differences between veterans experiencing ongoing and brief episodes of housing instability

	Full sample		Ages 18–44 ^a		Ages 45–64 ^a		Ages 65+ ^a	
	Cost difference	95% CI	Cost difference	95% CI	Cost difference	95% CI	Cost difference	95% CI
Inpatient costs								
Medical	\$2228	\$317, \$4358						
Mental health	\$1835	\$884, \$2841						
Substance abuse	\$737	\$345, \$1240						
Total	\$4788	\$2343, \$7549	\$5233	\$601, \$10,232	\$4997	\$1857, \$8263	\$572	–\$3218, \$5177
Outpatient costs								
Emergency department/urgent care	\$203	\$84, \$325	\$109	–\$117, \$349	\$232	\$73, \$405	\$203	–\$61, \$478
Medical	\$342	–\$441, \$1171	–\$10	–\$899, \$784	\$499	–\$567, \$1586	–\$57	–\$1773, \$1841
Mental health	\$336	\$14, \$650	\$1172	\$248, \$2217	\$109	–\$258, \$519	\$276	–\$170, \$841
Substance abuse	\$124	–\$15, \$283	–\$22	–\$227, \$216	\$153	–\$36, \$390	\$270	–\$3, \$563
Other	\$889	\$639, \$1180	\$384	\$53, \$789	\$899	\$595, \$1249	\$1408	\$374, \$2642
Total	\$1918	\$942, \$3000	\$1532	–\$253, \$3181	\$2097	\$733, \$3536	\$1362	–\$581, \$3602
Total inpatient and outpatient costs	\$7573	\$3961, \$11,920	\$8902	\$1701, \$20,031	\$7447	\$2885, \$12,551	\$3840	–\$2581, \$11,236

Cost difference columns show contrasts for ongoing versus brief housing instability. Cost differences were calculated based on predicted costs from regression models for the brief and ongoing housing instability group, which were standardized to the underlying characteristics of the study population as a whole

^a Only total inpatient costs were analyzed due to sparse data for some types of inpatient utilization

behavioral health care costs than those identified as experiencing brief episodes of housing instability. On average, the total annual incremental cost associated with ongoing versus brief episodes of housing instability was estimated at \$7573, with the bulk of this difference found in inpatient hospitalizations. This finding is generally consistent with the limited number of studies that have examined this topic, [16, 17] although methodological differences make it difficult to draw direct comparisons across studies of the magnitude and type of higher costs associated with ongoing housing instability.

We found that ongoing housing instability was more consistently associated with an increased probability of any service use than with higher costs conditional on service use. Thus, cost differences may be driven more by an increased propensity to use services, particularly inpatient services, among veterans identified as

experiencing ongoing housing instability than by a higher volume of use among service users. This suggests that primary care models tailored for veterans experiencing homelessness and housing instability that have been implemented in the VA health care system and linked to reduced utilization of inpatient services [26] may be important for this population.

The pattern and magnitude in cost differences between veterans identified as experiencing brief and ongoing housing instability was largely consistent among veterans in the 18–44 and 45–64-year-old age brackets, but total health and behavioral health costs did not differ between the two study groups among veterans aged 65 or older. This could be due to access to Medicare coverage among older veterans, which may increase the likelihood that they seek care outside of the VA, leading to an underestimate in services use for this age group

and potentially masking some of the differences between groups.

The additional costs found to be associated with ongoing housing instability has important implications for VA efforts to prevent and ending homelessness among veterans. Our findings suggest that there could potentially be substantial cost offsets associated with intervening to prevent a brief episode of housing instability from becoming more protracted in nature. This potential for cost offsets has the most direct bearing on the VA's Supportive Services for Veteran Families (SSVF) program, which provides time-limited, flexible assistance and has the explicit goals of preventing homelessness among those at risk and helping recently homeless veterans to regain permanent housing as quickly as possible. At an estimated average cost per household of \$3028 [27], SSVF compares favorably with the \$7573 in VA health care costs that this study suggests may be avoided by preventing an ongoing episode of housing instability. Prior research demonstrates that housing interventions for those experiencing chronic homelessness providing more intensive housing and service support than are available through SSVF generate substantial health care cost offsets [28]. Such evidence underscores the need for future research to conduct rigorous evaluation of the relative costs and benefits of the SSVF program. A study of this type would be of great value in terms of guiding future VA investments in SSVF and similar programs that take a prevention-oriented approach to homelessness and housing instability.

Our findings also point to the potential need for other services for veterans this population. Prior research shows that persons experiencing homelessness experience delays in discharges from inpatient hospitalizations, [4, 6] due primarily to the lack of a suitable environment for discharge. Such evidence is consistent with our findings regarding inpatient costs and suggest that respite care facilities, the availability of which has been linked to shorter inpatient stays among persons experiencing homelessness, [29, 30] may be an important form of care for the population considered in this study. However, respite care should be viewed as a complement to, and not substitute for, assistance that helps veterans access more permanent stable housing.

This study has several limitations. First, the observational design of our study means that the association we identified between ongoing housing instability and higher costs cannot be assumed to demonstrate causality

and competing explanations cannot be ruled out. Cost differences between the two study groups may be driven by confounding variables (e.g., clinical characteristics) for which we were not able to fully account. Second, our measure of housing instability, which was based on data collected at two time points between 6 and 12 months apart, does not fully capture changes in housing status over time and thus may not be fully accurate for differentiating between those experiencing brief versus ongoing housing instability. Third, our study did not include non-VA health and behavioral health costs and thus underestimates the true costs. The paucity of research on the use of VA and non-VA health services specifically among homeless veterans makes it difficult for us to assess the impact of this limitation. However, prior studies suggest that certain characteristics that are more common in the homeless population (lower levels of education and income; lack of alternative health insurance) are associated with a decreased probability of dual VA and non-VA service use [31, 32], suggesting that use of non-VA services may be less common among this population. Moreover, VA costs are the most important to understand in terms of assessing the potential cost offsets associated with increased investment in VA-funded housing assistance programs.

Conclusions

Veterans identified as experiencing an ongoing episode of housing instability incurred substantially higher health and behavioral health costs than those with a brief episode of housing instability. Expanded efforts to identify veterans experiencing housing instability and help them quickly regain stable housing could result in substantial reductions in health care costs for the VA health care system and would help promote better health, economic, and social outcomes for veterans.

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