Evaluation of the Home Health Value-Based Purchasing (HHVBP) Model

Fifth Annual Report

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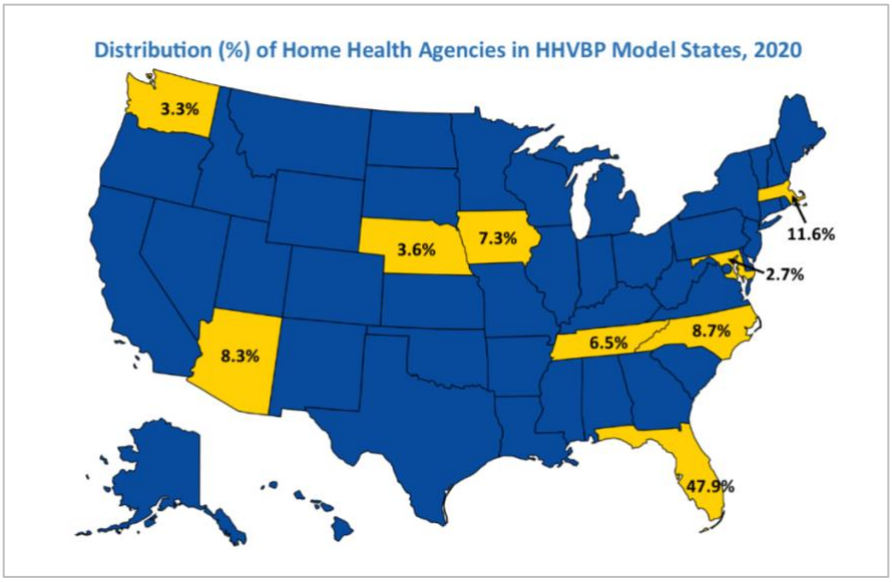
Exhibits

Acronym List

Acronym	Term
ACH	Acute Care Hospitalization
ACO	Accountable Care Organization
APM	Alternative Payment Model
BPCI	Bundled Payment for Care Improvement
CI	Confidence Interval
CJR	Comprehensive Care for Joint Replacement
CMMI	Center for Medicare & Medicaid Innovation
CMS	Centers for Medicare and Medicaid Services
CY	Calendar Year
D-in-D	Difference-in-Differences
DME	Durable Medical Equipment
ED	Emergency Department
ESRD	End-Stage Renal Disease
FFS	Fee-for-Service
HCC	Hierarchical Condition Category
HH	Home Health
HHA	Home Health Agency
HHC	Home Health Compare
HHCAHPS	Home Health Consumer Assessment of Healthcare Providers and Systems
HHVBP	Home Health Value-Based Purchasing
HMO	Health Maintenance Organization
ICD	International Classification of Diseases
LUPA	Low Utilization Payment Adjustment
MBSF	Master Beneficiary Summary File
MS-DRG	Medicare Severity Diagnosis Related
MSSP	Medicare Shared Savings Program
OASIS	Outcome and Assessment Information Set
OCM	Oncology Care Model
PAC	Post-acute Care
PDGM	Patient-Driven Groupings Model
PEP	Partial Episode Payment
PHE	Public Health Emergency
POS	Provider of Services
RCD	Review Choice Demonstration
SNF	Skilled Nursing Facility
TNC	Total Normalized Composite
TPS	Total Performance Score

Executive Summary

Background



In January 2016, the Center for Medicare & Medicaid Innovation (CMMI) of the Centers for Medicare & Medicaid Services (CMS) initiated the Home Health Value-Based Purchasing (HHVBP) Model in nine randomly selected states: Arizona, Florida, Iowa, Massachusetts, Maryland, Nebraska, North Carolina, Tennessee, and Washington. CMS designed the HHVBP Model to test the impact of providing financial incentives to home health agencies (HHAs) for improvements in quality of care by adjusting Medicare payments upward or downward based on their Total Performance Score (TPS), a composite score of an agency's quality achievement/ improvement. The budget neutral adjustment process redistributes Medicare payments among agencies within a state to reward agencies with relatively higher achieved quality or improved quality and reduce payments to agencies with lower levels of performance.

The primary goals of this evaluation are to understand how the shift in financial incentives under the HHVBP Model may influence agency behavior and, in turn, aspects of home health care. To achieve the goals of this evaluation, we examine a wide range of outcomes, including the performance measures used to calculate an agency's TPS in 2020 as well as measures of Medicare spending. We also explore additional topics of interest, including whether the model impacts access to home health care and if there are differential impacts on patient subgroups that have implications for health equity (including patients with Medicaid coverage and in racial and ethnic minority groups). We use multivariate linear regression within a difference-in-differences (D-in-D) framework to evaluate the effects of HHVBP, comparing the changes observed in the nine HHVBP states with those in the 41 comparison states based on data for the baseline period prior to HHVBP implementation (2013-2015) and cumulatively post-HHVBP implementation (2016-2020).

This Annual Report focuses on the experience of home health patients and agencies through 2020, the third year that eligible agencies in HHVBP states received an adjustment to their Medicare payment amounts under the Home Health Prospective Payment System (HH PPS). An agency's performance in 2018 was the basis for their payment adjustment of up to ±6 percent in 2020. The original HHVBP Model's payment adjustment increased each year, beginning with up to ± 3 percent in 2018 and up to ±7 percent in 2021.

Key Findings

The figure below provides an overview of our key findings (Exhibit ES-1). We provide a summary of our evaluation findings below.

Exhibit ES-1. Overview of Key Findings in the Fifth Annual Report

Total Performance Scores	↑ 7% greater average scores than the comparison group in 2020 Continued positive impact of HHVBP on overall agency performance all 5 years	
Spending during and after Home Health Care	↓ Total Medicare spending Inpatient and skilled nursing facility visits	↑ Total Medicare spending on emergency department visits and observation stays
Utilization during and after Home Health Care	↓ Unplanned acute care hospitalizations Skilled nursing facility visits ⇄ No effect on total ED use	↑ Outpatient emergency department visits
Quality/Patient Experience	↑ Patients discharged to community Improvement in functional status (e.g., oral medications)	↓ Professional care provided by agencies Agency communication with patients Discussion of care with patients
Agency Operations	⇄ No effect on overall agency entries or closures, use of home health services, or access to home health care	

***The HHVBP impacts on quality, utilization, and Medicare spending in the third payment year are similar to previous years*.** We found an overall reduction in Medicare spending for Part A and Part B services, modest declines in some but not all aspects of utilization, and modest improvements in most quality measures for the fifth year of the HHVBP Model, and the third year of the HHVBP payment adjustments. These results are largely similar to what we found for the first four years of the model, despite two substantial exogenous events in 2020 that had implications for our evaluation: the introduction of the Patient-Driven Groupings Model (PDGM) for Medicare payment of all fee-for-service (FFS) home health claims and the onset of the COVID-19 Public Health Emergency (PHE). We observed similar trends in COVID-19 diagnoses and COVID-19 hospitalizations among home health episodes in both HHVBP and non-HHVBP states during 2020, suggesting there was not a differential impact of the COVID-19 PHE between the two groups.

When comparing the impact of the HHVBP Model between the initial years (2016-2017) with the later years when HHAs received a payment adjustment (2018-2020), we found evidence among some, but not all, measures of successively larger impacts of HHVBP in later years of the model. In particular, we found evidence of growing intended impacts for Medicare spending and for unplanned hospitalizations and skilled nursing facility (SNF) use among all episodes. We also found evidence of growing intended impacts between the initial and later years of the model for one of the OASIS-based measures (Discharged to Community) and unintended but modest impacts for two of the five patient experience measures derived from the Home Health Care Consumer Assessment of Healthcare Providers and Systems (HHCAHPS) survey. Collectively, these findings seem driven to a large extent by the increase in the HHVBP impact on these measures in 2020 relative to all prior years of the model. Given exogenous events in 2020 that included implementation of the PDGM—a major revision of the HH PPS— the onset of the COVID-19 PHE, and uncertainty about potential confounding related to these events, we urge caution with interpretation of the larger HHVBP impacts on these outcomes in 2020 than in earlier years

of the model. Our finding of sustained impacts of HHVBP that began in the first year of model implementation (2016) may reflect effects of the model's performance incentives, whereby agencies anticipated that their performance in 2016 as well as in subsequent years would affect their future Medicare payments.

***Agency Total Performance Scores are higher in each of the first five years of the model*.** The TPS values serve as broad indicators of HHA performance and are the basis for adjusting Medicare FFS payments to agencies in the nine model states. For each of the first five years of the model (2016-2020), the TPS for agencies in HHVBP states were higher overall relative to the TPS we calculated for agencies in the 41 non-model states. The TPS for 2020 is not comparable to the TPS calculated in earlier years of the model due to changes in the TPS scoring methodology, but we found a continued positive impact of HHVBP on overall agency performance for 2020, when the third HHVBP payment adjustment was applied. Similar to previous years, we also continued to find no patterns in agency performance based on patient social risk factors that might indicate risks for some beneficiaries under the model.

HHVBP Model Snapshot, 2020

- **1,907** home health agencies in operation
- **2,077,228** home health episodes provided
- **734,951** Medicare FFS beneficiaries covered

Cumulative decline of $949.2 million in overall Medicare spending for FFS beneficiaries receiving home health services during 2016-2020, largely driven by reduced spending for inpatient and skilled nursing facility services. Through the first five years of the model, we detected a 1.6 percent decline in average Medicare expenditures per day among FFS beneficiaries in HHVBP relative to the comparison group during and within 30 days following home health episodes (Exhibit ES-2). The cumulative (2016-2020) reduction in total Medicare spending during and within 30 days following home health episodes for FFS beneficiaries receiving home health care in the model was $949.2 million (average annual reduction of $189.8 million). The overall decline in spending is largely explained by the slower rate of growth in HHVBP states relative to the non-HHVBP states in spending during home health episodes (rather than in the subsequent 30 days). We found evidence of HHVBP leading to larger reductions in Medicare spending for FFS beneficiaries receiving home health services in the three years of the model in which payment adjustments were applied (2018-2020) than in earlier years of the model (2016-2017), a difference that appears to be strongly influenced by the larger savings estimate for 2020.

The declines in overall Medicare spending due to HHVBP continue to be largely driven by reductions in spending for inpatient and SNF services among home health beneficiaries (Exhibit ES-2). Our D-in-D analyses point to a 2.8 percent decline in average Medicare spending per day for inpatient services and a 4.0 percent decline in average spending for SNF services, which translates to cumulative (2016-2020) savings of $546.8 million and $201.2 million, respectively. These savings due to HHVBP were partly offset by an estimated 6.4 percent increase in Medicare spending for outpatient emergency department (ED) visits and observation stays through 2020, which translates to a cumulative (2016-2020) increase in spending of $87.5 million for these services. We continue to find no HHVBP effect on Medicare spending for home health services, which—along with inpatient services—represents the two largest components of Medicare spending for FFS beneficiaries receiving home health care.

Exhibit ES-2. Impact of HHVBP on Medicare Spending among FFS Home Health Beneficiaries, Overall and Components

Medicare Spending (in millions $)	Cumulative (2016-2020) D-in-D Impact (95% CI)	2016	2017	2018	2019	2020
Total Medicare Parts A and B Spending during and following FFS Episode of Care*						
*Per day impact***	-$2.17 (-$3.67, -$0.68)	-$1.12 (-$1.92, -$0.32)	-$2.00 (-$3.25, -$0.74)	-$1.99 (-$3.63, -$0.35)	-$2.68 (-$4.73, -$0.64)	-$3.26 (-$5.69, -$0.82)
Aggregate Impact	-$949.2 (-$1,605.3, -$297.4)	-$100.3 (-$172.0, -$28.7)	-$176.6 (-$287.0, -$65.3)	-$179.7 (-$327.8, -$31.6)	-$237.3 (-$418.8, -$56.7)	-$262.9 (-$458.9, -$66.1)
% Impact	-1.6%	-0.8%	-1.4%	-1.4%	-1.9%	-2.5%
Inpatient Spending						
Aggregate Impact	-$546.8 (-$975.4, -$113.7)	-$74.4 (-$125.4, -$22.4)	-$96.2 (-$170.4, -$23.0)	-$102.1 (-$198.7, -$5.4)	-$159.4 (-$278.9, -$39.8)	-$114.5 (-$242.7, $12.9)
% Impact	-2.8%	-1.8%	-2.4%	-2.5%	-3.9%	-3.2%
Outpatient ED and Observation Stays Spending						
Aggregate Impact	$87.5 ($43.7, $126.8)	$11.6 ($6.3, $16.1)	$16.8 ($9.7, $23.0)	$19.0 ($9.0, $28.9)	$19.5 ($8.0, $31.0)	$19.4 ($7.3, $32.3)
% Impact	6.4%	4.1%	6.1%	6.7%	7.0%	8.0%
Skilled Nursing Facility Spending						
Aggregate Impact	-$201.2 (-$341.2, -$56.9)	-$27.8 (-$43.9, -$10.8)	-$41.5 (-$65.3, -$17.7)	-$47.9 (-$79.5, -$15.4)	-$56.7 (-$93.9, -$18.6)	-$28.2 (-$72.6, $16.1)
% Impact	-4.0%	-2.7%	-4.1%	-4.7%	-5.6%	-2.9%
Home Health Spending						
Aggregate Impact	-$140.0 (-$384.9, $105.0)	$12.5 (-$10.8, $34.9)	-$19.4 (-$59.2, $20.3)	$6.3 (-$48.8, $61.4)	$5.3 (-$63.8, $75.3)	-$150.0 (-$226.6, -$73.4)
% Impact	-0.7%	0.3%	-0.5%	0.2%	0.1%	-4.8%
Number of Agencies	11,974	10,849	10,437	10,102	9,752	9,407
Number of FFS Beneficiaries	9,936,461	3,261,908	3,210,320	3,258,787	3,183,150	2,841,220

*CI= Confidence Interval. D-in-D = difference in differences. Cumulative estimate is a weighted average of the yearly D-in-D estimates with 2016-2019 HHVBP impacts estimated from one regression model and 2020 impact estimated from another regression model that reflects a post-PDGM approach to defining the spending measure. The percent impact reflects the estimated change in spending among HHVBP states relative to comparison group. * Reflects Medicare spending during the home health episode and up to 30 days after home health care. ** Per day impact is not in millions.*

Reductions in unplanned hospitalizations and use of skilled nursing facilities. Through the first five years of HHVBP, we continued to find a modest impact of the model on the claims-based utilization measures that apply to FFS beneficiaries receiving home health services. This includes declines of 0.27 percentage points in unplanned hospitalization rates among all home health episodes, which corresponds to a 1.6 percent decrease from average measure values pre-HHVBP implementation. We also found HHVBP to result in a 0.34 percentage point decline in the use of SNFs among home health beneficiaries, which corresponds to a 6.9 percent decrease in average measure values relative to pre-HHVBP implementation. Additionally, despite the larger TPS weights assigned to the unplanned hospitalization measure (from 6.25 percent in 2018 to 26.25 percent in 2019 and 2020), we did not find the change in TPS weight to result in greater

improvements in performance on this measure in either 2019 or 2020 beyond the gains that had already occurred under HHVBP.

Increase in outpatient emergency department use accompanied by a decrease in emergency department use leading to an inpatient admission. In contrast to the observed declines in inpatient hospitalizations and SNF visits due to HHVBP, we found a 0.29 percentage point increase in outpatient ED use, which corresponds to a 2.5 percent increase relative to average measure values prior to HHVBP. However, we also found that HHVBP led to a 0.16 percentage point decrease in ED use resulting in an inpatient hospital stay, or a 1.1 percent decrease relative to average HHVBP baseline values. When examining ED use regardless of whether it resulted in an inpatient hospital stay, we found no cumulative impact of HHVBP on overall ED use. Together, these results suggest that the increase in outpatient ED use attributed to HHVBP is related to the reduced likelihood of ED use followed by an inpatient hospital stay. To better understand factors contributing to higher outpatient ED use in HHVBP states, we examined four groups of the most common causes for ED visits (abdominal pain, chest pain, superficial injury and urinary tract infections [UTI]). We did not find these conditions to be the primary drivers of the HHVBP impact of higher outpatient ED use, suggesting that this impact is instead largely explained by changes in care for patients with other less common diagnoses.

Modest increase in shift of skilled nursing and therapy visits to early weeks of home health episode in HHVBP agencies. During our previous interviews with HHAs in HHVBP states, some agencies mentioned scheduling more skilled nursing visits early in an episode of care (commonly termed *frontloading* visits by home health practitioners) as a quality improvement strategy. Expanding on our previous analyses, we found a small but statistically significant effect of HHVBP on frontloading among both post-acute care and community-referred home health episodes, with agencies in HHVBP states shifting more skilled nursing and therapy visits into the first week. Additionally, our subgroup analysis suggests that frontloading was associated with greater reductions in the risk of unplanned hospitalizations for post-acute home health patients who had greater clinical risk. While we find evidence that HHVBP contributed to increased therapist frontloaded visits for such high-risk patients, the impact on use of frontloaded skilled nurse visits was more pronounced for lower risk patients, likely due to the relatively lower baseline use of frontloaded skilled nurse visits in such episodes.

Modest gains in quality of care include greater improvements in functional outcomes. There continues to be a strong pattern of relatively small but positive effects of HHVBP on the Outcome and Assessment Information Set (OASIS)-based outcome measures used to calculate TPS through the fifth year of the model. They include a measure of discharge to the community and five measures of improvement in functional status, including the two composite measures introduced in 2019. These effects reflect improvements over time in functional status during home health episodes in HHVBP states that exceed those observed in non-HHVBP states. These relative gains also occurred in a context where average measure rates for many of the quality measures exceeded 51 percent prior to implementation of HHVBP. Interviews with agencies in previous years suggest there have been changes in agency perspectives on administering OASIS assessments which may also have influenced our results.

A pattern of differential impacts based on Medicaid coverage as well as patient race and ethnicity. If HHVBP does not uniformly affect all patients in the same way, the model could have important implications for health equity. While there is potential for the quality incentives under HHVBP to

encourage greater gains among populations who initially had worse outcomes and thereby improve health equity, a potential unintended consequence of the model is that it may lead to greater health inequities if the benefits of quality improvement are limited for historically underserved populations. We continued to find a pattern of differential impacts of the model based on Medicaid coverage and, in new analyses for this report, also based on patient race and ethnicity. For example, we observed a 2.9 percent decline in unplanned acute care hospitalizations and more than a 3 percent gain in composite change scores for both self-care and in mobility due to HHVBP among non-Medicaid patients, but did not observe these impacts among Medicaid patients. These differential impacts on changes in functioning were associated with modest growth in disparities in these outcomes for Medicaid patients under the model. In contrast, we did not find a consistent pattern in the impacts for black non-Hispanic and Hispanic patients who showed larger improvements in outcomes and smaller improvements in outcomes, respectively, relative to white non-Hispanic patients. As the use of VBP in the home health care setting continues to evolve and is expanded to all states, it will be important to understand its implications for health equity.

Modest, unintended impact on some aspects of patient experience. Performance scores for the five patient experience measures derived from the Home Health Care Consumer Assessment of Healthcare Providers and Systems (HHCAHPS) survey remained stable and relatively high over time in both HHVBP states and non-HHVBP states. Our D-in-D analyses showed no impact on the two global HHCAHPS-based performance measures through the first five years of the model (that is, patients' ratings of overall care from the agency and likelihood of recommending the agency). For the three composite measures that rate professionalism, communication, and discussion of care by the agencies, we found that HHVBP was associated with a -0.2 to -0.4 percentage point relative decline. While unintended, this does not translate to an especially meaningful impact of HHVBP on these aspects of patient experience with care, given the high overall levels of performance on these measures (i.e., ranging from 82 percent to 89 percent).

No evidence of changes in the overall use of home health services among FFS Medicare beneficiaries or of an adverse impact on access to home health care. As part of our evaluation, we explored whether the model has induced changes in the use of home health services and the patient population receiving these services as a potential strategy among HHAs for improving performance under the model in ways that were not intended (e.g., by admitting patients with a more favorable case-mix). We continue to find declines in home health utilization in both HHVBP and non-HHVBP states and did not find evidence of an HHVBP effect on the percentage of FFS beneficiaries receiving home health care nor on the number of home health days per FFS beneficiary through 2020.

While we continued to observe a pattern of increasing clinical severity over time among home health patients for multiple case-mix measures, these trends were generally similar in HHVBP and non-HHVBP states. For one of five broad measures of case-mix examined, we saw modestly lower growth in severity among patients receiving care from HHVBP agencies relative to agencies in non-HHVBP states in the post-implementation period. It will be important to continue to examine whether HHVBP encourages agency practices of admitting patients based on their case-mix, especially when the model is expanded nationally in 2023.

In examining trends in both utilization and availability of higher quality HHAs shows larger overall improvements in HHVBP states compared to non-HHVBP states following implementation of HHVBP. However, there were disparities that persisted for some subgroups, including beneficiaries enrolled in Medicaid who generally had worse potential and realized access to higher quality home health services.

To examine impacts on the use of potential substitutes for home health care, we explored whether the HHVBP Model contributed to changes in the percentage of hospital discharges that transition to alternative types of post-acute care, including home health. We continue to observe a small increase in the share of discharges from acute inpatient settings admitted to home health care in HHVBP states. We also found that HHVBP has not substantially altered the selection of discharge destination for beneficiaries with a prior inpatient stay for three common diagnoses. Together, these findings are consistent with our other analyses that show no signs of emerging access problems due to HHVBP.

State-level impacts continue to vary across measures. Given the diversity in some agency and home health beneficiary characteristics across HHVBP states, our findings continue to reflect varying state-level impacts of HHVBP relative to regional comparison groups and were not sensitive to any single HHVBP state. Six of the nine HHVBP states—Arizona, Maryland, Nebraska, North Carolina, Tennessee, and Washington—continued to be the drivers of the overall higher agency TPS values. For the claims-based utilization measures, there was consistently strong evidence of intended impacts on unplanned hospitalizations and SNF use in Florida and Tennessee, and also intended impacts on total ED use in Tennessee. There was evidence of overall Medicare savings due to HHVBP in six states—Arizona, Florida, Iowa, Massachusetts, Nebraska, and Tennessee. Arizona was the most consistent driver for the positive impacts on the OASIS measures, which represent 6 of the 13 measures used to calculate agency TPS values, while Florida and Massachusetts drove the unintended impacts for the HHCAHPS measures.

Exhibit ES-3. Summary of Primary D-in-D Findings in Fifth Annual Report

Measure Domain	Impact Measure	Cumulative HHVBP Model Effect	D-in-D Estimate	Relative Change (%) with reference to 2013-2015 Average in HHVBP States
Utilization	*Unplanned Hospitalization among First FFS HH Episodes*	↓ **Decrease**	-0.15%	-1.0%
	Unplanned Hospitalization among All FFS HH Episodes	↓ **Decrease**	-0.27%	-1.6%
	ED Use (no Hospitalization) among First FFS HH Episodes	↑ **Increase**	0.29%	2.5%
	ED Use followed by Inpatient Admission among First FFS HH Episodes	↓ **Decrease**	-0.16%	-1.1%
	Total ED Use (Outpatient or Inpatient Claims) among First FFS HH Episodes	⇄ **N.S.**	0.13%	0.5%
	SNF Use among All FFS HH Episodes	↓ **Decrease**	-0.34%	-6.9%
Medicare Spending	Average Medicare Spending per Day among FFS HH Beneficiaries during and following HH Episodes of Care	↓ **Decrease**	-$2.17	-1.6%
	Average Medicare Spending per Day among FFS HH Beneficiaries during HH Episodes of Care	↓ **Decrease**	-$2.07	-1.4%
	Average Medicare Spending per Day among FFS HH Beneficiaries following HH Episodes of Care	⇄ **N.S.**	$0.08	0.1%
Quality Measures	*Discharged to Community*	↑ **Increase**	0.90%	1.3%
	Total Normalized Composite Change in Self Care	↑ **Increase**	0.04	2.9%
	Total Normalized Composite Change in Mobility	↑ **Increase**	0.01	2.3%
	Improvement in Pain Interfering with Activity	↑ **Increase**	2.02%	2.9%
	Improvement in Management of Oral Medications	↑ **Increase**	2.49%	4.8%
	Improvement in Dyspnea	⇄ **N.S.**	-0.09%	-0.1%
Patient Experience	*How often the HH team gave care in a professional way (Professional Care)*	↓ **Decrease**	-0.21%	-0.2%
	How well did the HH team communicate with patients (Communication)	↓ **Decrease**	-0.24%	-0.3%
	Did the HH team discuss medicines, pain, and home safety with patients (Discussion of Care)	↓ **Decrease**	-0.33%	-0.4%
	How do patients rate the overall care from the HH agency (Overall Care)	⇄ **N.S.**	-0.04%	-0.05%
	Would patients recommend the HH agency to friends and family (Likely to Recommend)	⇄ **N.S.**	-0.01%	-0.01%

Cumulative effect reflects CY 2016- CY 2020. HHVBP measures for CY 2020 are in italics. N.S. = not significant. Statistical significance identified with p-values ≤ 0.10.

Conclusions

Through the first five years of the model (2016-2020), we continue to find reduced rates of growth in Medicare spending for FFS beneficiaries receiving home health care as well as larger improvements in many measures of quality of care in the nine HHVBP states relative to the 41 non-HHVBP states. These effects include declines in unplanned hospitalizations and SNF use that continue to be important drivers of the favorable impact on overall Medicare spending. The analyses for this report suggest there may be increasing savings due to HHVBP, based on slightly larger estimates for 2020 compared to earlier years and larger impact estimates for the most recent three years of the model combined (2018-2020) compared to the initial two years (2016-2017). However, while we modified our analytic approach to account for potential effects of both the introduction of PDGM and the onset of the COVID-19 PHE, we recommend caution in relying too strongly on 2020 data to conclude there is a growing impact of HHVBP.

Our continued findings of reductions in unplanned hospitalizations and in Medicare spending for inpatient services provide evidence of the HHVBP Model's achievement of intended impacts. Hospitalization is an important indicator of health status and the largest driver of expenditures for FFS beneficiaries receiving home health services, accounting for approximately one-third of Medicare spending. Our finding of increased use of frontloading skilled nursing and therapy visits during home health episodes that follow an inpatient stay represents one of the potential mechanisms being used by HHAs to reduce unplanned hospitalizations under the model. The increase in outpatient ED use and associated expenditures that we observed may be an artifact of reductions in ED use that were followed by an inpatient admission, and partially offset other savings. Overall, the observed impacts translate to a cumulative savings to Medicare of over $949 million during 2016-2020.

The effects of the quality-based HHVBP payment adjustments may be moderated by levels of overall agency profitability. The payment adjustments in 2020 reached a maximum of ±6 percent, but only 29 percent of HHVBP agencies received adjustments exceeding ±2 percent. These adjustments were applied in an environment where agency median profit margins were nearly 20 percent. The magnitude of the adjustments in 2020 are somewhat larger than those used in 2019, which reached a maximum of ±5 percent and resulted in 21 percent of agencies receiving payment adjustments exceeding ±2 percent (Arbor Research 2021). We note that maximum payment adjustments of ±5 percent correspond to what CMS will use to adjust payments in 2025 to all agencies under the expanded HHVBP Model.

Our analyses suggest no substantial unintended impacts of the original HHVBP Model through 2020. For example, we found no evidence of an overall HHVBP effect on home health utilization or on access to home health care. We did find differential impacts of HHVBP based on Medicaid coverage and patient race and ethnicity, where we did not observe the favorable impacts of the model on unplanned hospitalizations and improvements in functional outcomes among Medicaid patients or among Hispanic patients. While we observed overall declines due to HHVBP in three of the five measures of patient experience with care, they represented small impacts (e.g., -0.2 to -0.4 percentage points) on measures with high performance (e.g., 82 percent to 86 percent), and there continued to be no effect on the two global measures (willingness to recommend the agency and ratings of overall care). To ensure we have a complete understanding of the effects of the original HHVBP Model, we will evaluate both intended and unintended effects through 2021, the year that agencies received their final payment adjustment (based on their 2019 performance) under the original model.

1. Introduction

The Centers for Medicare & Medicaid Services (CMS) designed the Home Health Value-Based Purchasing (HHVBP) Model to improve the quality and delivery of home health care services to Medicare beneficiaries with specific goals to:

1. Provide incentives to home health agencies (HHAs) under Medicare to provide better quality care with greater efficiency;
2. Study new potential quality and efficiency measures for appropriateness in the home health setting; and
3. Enhance the current public reporting process regarding home health quality measures (CMS, 2016).

By design, the HHVBP Model aims to give HHAs a financial incentive for quality achievement and improvement through adjustments to Medicare payments for home health services. The HHVBP payment adjustments are determined based on an agency's quality performance measures relative to peers in its state. The adjustments are budget neutral within a state, redistributing Medicare payments to reward agencies with relatively higher achieved quality or improved quality and reduce payments to agencies with lower levels of performance. When implemented in January of 2016, CMS required HHAs in nine states – Arizona, Florida, Iowa, Massachusetts, Maryland, Nebraska, North Carolina, Tennessee, and Washington – to participate in the HHVBP Model from calendar year (CY) 2016 through CY 2022. These states were selected at random from nine state regional groupings that contained five to six states each, with each CMS-defined grouping based on geographic location, utilization, demographics, and clinical characteristics (HHS, 2015a).

Under the original HHVBP Model, the maximum adjustment range to an agency's Medicare payment amount increased each year between CY 2018 and CY 2022 (CMS, 2016) with the adjustments modifying the otherwise applicable payment rates for HHAs under the Medicare home health prospective payment system (HH PPS). The first two years of the model (CY 2016- CY 2017) were used as reporting years to set the rates used later in the model (Exhibit 1). Starting in January of 2018, each eligible HHA in the HHVBP states had its Medicare payments adjusted by up to ±3 percent based on the relative Total Performance Score (TPS) it achieved in 2016.

In CY 2020 – the most recent year of data included in this report – the payment adjustments had a maximum range between -6 percent and 6 percent based on HHA quality performance levels achieved during CY 2018. Based on CMS' original design of the HHVBP Model, the performance of agencies in the nine model states during 2020 would have determined payment adjustments of up to ±8 percent in 2022. However, plans for CY 2022 were modified when CMS' proposal to expand the HHVBP Model nationally was finalized in November of 2021 (HHS, 2021). By expanding the model, CMS identified CY 2022 as a pre-implementation year in which no HHVBP payment adjustments will be applied to agencies in the nine states included in the original model. Instead, CY 2023 will be the first performance year of the expanded model, and agency performance in CY 2023 will be used to adjust payments of up to ±5 percent to agencies nationally in CY 2025.

Exhibit 1. Original HHVBP Model Payment Adjustment Amounts, by Calendar Year

Calendar Year	Payment Adjustment?	Maximum Payment Adjustment
2016	No	--
2017	No	--
2018	Yes, based on 2016 TPS	±3%
2019	Yes, based on 2017 TPS	±5%
2020	Yes, based on 2018 TPS	±6%
2021	Yes, based on 2019 TPS	±7%
2022*	Yes, based on 2020 TPS	±8%

**In November 2021, CMS finalized its plans to expand the HHVBP Model nationally in January 2023 and ended the original HHVBP Model one year early with no HHVBP payment adjustments applied in the original nine model states in CY 2022 (HHS 2021).*

CMS contracted with Arbor Research Collaborative for Health (Arbor Research), in collaboration with L&M Policy Research, to understand how the financial incentives under the HHVBP Model may influence agency behavior and impact quality of care, Medicare expenditures, beneficiary experience, and the utilization of Medicare services. This is our fifth Annual Report that examines these and other outcomes of interest. We begin with a brief background about the Medicare home health care benefit and HH PPS to provide context for understanding how the HHVBP Model modifies the existing payment approach under Medicare and corresponding financial incentives. We then discuss the HHVBP Model measures and conclude with an overview of the analyses presented in this report.

1.1 Background: Medicare's Home Health Benefit and Payment System

In 2019 Medicare served approximately 3.3 million beneficiaries and paid a total of $17.8 billion for home health care under the HH PPS, reflecting a slight decrease from the previous year's spending of $17.9 billion and a nearly 90 percent increase in spending since 2002 (MedPAC, 2020). Medicare's home health care benefit covers skilled nursing, physical therapy, occupational therapy, speech therapy, aide services, and medical social work services provided to Medicare beneficiaries who need intermittent skilled care or therapy services and cannot leave their homes without considerable effort. The goal of home health care is to treat illness and injury to enable patients to regain or maintain independence. While the need for skilled care is a requirement for home health eligibility, Medicare standards do not require that skilled visits comprise the majority of services a patient receives. A physician may initiate home health care as follow-up after a hospitalization or post-acute care stay (34 percent of initial home health episodes) or as a referral from the community (66 percent of initial home health episodes) (MedPAC, 2020). That is, unlike skilled nursing facility (SNF) services, Medicare does not require a preceding hospitalization for home health coverage (and the share of these home health episodes has steadily increased since 2001) but expects HHAs and physicians to follow program requirements for determining medical necessity and beneficiary care needs. Medicare's standards of care permit a broad range of services that can be delivered under the home health care benefit but does not include services such as homemaker or personal care or more than intermittent care. Similarly, although being homebound is a requirement for receiving home health care, many patients use physician visits or some form of outpatient services (likely with assistance) during their home health care episode, as the homebound requirement does not prohibit receipt of Medicare services outside of the home (CMS, 2012; see Section 30.1).

Since 2001, home health services are paid for under Medicare's HH PPS, which pays HHAs a predetermined amount for each 60-day episode of care that is adjusted for case-mix, service use, geographic variation in wages, as well as other factors to account for episodes associated with especially low or high resource use overall.[1] On January 1, 2020, CMS implemented the Patient-Driven Groupings Model (PDGM), a new method for determining the per fee-for-service (FFS) episode reimbursement amount for HHAs. Changes to this new case-mix adjustment methodology include using a 30-day period as the basis for payment, rather than 60 days; placing greater emphasis on clinical characteristics to assign patients to payment categories; and eliminating the use of counts of therapy services to determine case-mix adjusted payments (HHS, 2019). The PDGM uses patient characteristics (e.g., diagnosis, functional status, and comorbid conditions), timing of episode, and admission source to categorize home health episodes into 432 case-mix groups, or home health resource groups (HHRGs) to distinguish relatively uncomplicated patients from those who have more severe medical conditions or functional limitations. Each of the 432 HHRGs has a relative weight designed to reflect the average costliness of patients in that group relative to the average Medicare home health patient.

Under the PDGM, CMS generates the HHRGs' weights using Medicare home health FFS claims as well as data obtained from the Outcome and Assessment Information Set (OASIS), an instrument used to conduct a comprehensive assessment of adult home care patients.[2] HHAs are required to complete and submit OASIS assessments for all their served Medicare and Medicaid beneficiaries, as well as patients with other insurance coverage. As discussed in the next section, OASIS assessments, FFS claims, and other data sources are also integral to home health quality measurement, including Home Health Compare (HHC), the Star Ratings program that allows consumers to more easily assess agency quality, and for measuring agency performance in the HHVBP Model.

1.2 HHVBP Performance Measures and Scores

1.2.1 HHVBP Performance Measures and Data Sources

As noted above, an agency's TPS determines the payment adjustments for eligible HHAs in the nine original HHVBP states. For the first two performance years (2016-2017), an HHA's TPS was derived from its performance on 20 HHVBP Model performance measures (see Exhibit 2 below). Since then, the composition of the measure set has evolved:

- In performance year 2018, CMS removed the Drug Education on Medications Provided to Patient/Caregiver OASIS-based process measure from the HHVBP measure set for 2018 and subsequent performance years (HHS, 2017).
- In performance year 2019:
    - CMS removed the remaining two OASIS-based process measures (Influenza Immunization Received for Current Flu Season and Pneumococcal Polysaccharide Vaccine Ever Received) for 2019 and subsequent performance years.
    - CMS replaced three improvement OASIS-based outcome measures (Improvement in Bathing, Improvement in Bed Transferring, and Improvement in Ambulation-

[1] For example, the HH PPS has an outlier policy to adjust payment for short-stay and high-cost outliers, including a low-utilization payment adjustment (LUPA) and partial episode payment (PEP) adjustment (HHS, 2017).
[2] Agencies do not have to complete OASIS for patients under 18 years of age or those receiving services for pre- or post-natal conditions.

Locomotion) with two composite function measures: Total Normalized Composite (TNC) Change in Self-Care and Total Normalized Composite (TNC) Change in Mobility (HHS, 2018). The HHVBP Implementation contractor calculates these two composite measures from OASIS data for HHAs in the HHVBP states.

Except for the three HHA self-reported measures, the measures included in the HHVBP measure set are already collected from the following sources: Medicare claims; OASIS; or the Home Health Care Consumer Assessment of Healthcare Providers and Systems (HHCAHPS), a survey designed to measure the experiences of individuals receiving home health care from Medicare-certified HHAs. Additionally, most of these measures are publicly reported on CMS' HHC site and included in the CMS Star Ratings prior to the start of the model (Exhibit 2).

1.2.2 Agency Total Performance Scores

2020 was the third year in which agencies received payment adjustments of up to ±6 percent based on their performance in 2018; see Exhibit 1.[3] To determine the payment adjustments for each HHA, the HHVBP Implementation contractor calculates a TPS for each HHA based on its scores for each of the performance measures achieved two years prior to that year. For the 13 HHVBP performance measures used in 2020,[4] HHAs receive points based either on their achievement level relative to baseline threshold values or improvement relative to their baseline performance; these points are calculated separately for each measure in each model state.[5] For HHAs that were in operation prior to the start of 2015, their baseline period for measuring improvement is 2015. For HHAs that opened during 2015 or later, their baseline period for measuring improvement is determined based on their first full calendar year in operation. For the three HHA self-reported measures, HHAs receive points for reporting these measures; the agency's performance on these measures does not affect the TPS.

[3] While Medicare HH PPS payments were not adjusted in the first two performance years of the original HHVBP Model (i.e., 2016 and 2017), agencies in HHVBP states were still incentivized to achieve high TPS values since scores from each of those years affected payment rates in CY 2018 and CY 2019, respectively.
[4] See 2 below for HHVBP performance measures used for earlier years.
[5] For states with at least eight small HHAs (i.e., exempt from collecting HHCAHPS performance measures), CMS calculates the resulting payment adjustment separately for large HHAs and small HHAs.

Exhibit 2. HHVBP Performance Measures for Years 1-5 of the Original HHVBP Model (CY 2016-2020)

HHVBP Performance Measures	Measure Type	Data Source	Publicly Reported
Emergency Department (ED) Use without Hospitalization	Utilization Outcome	Medicare claims	HHC
Unplanned Acute Care Hospitalization (ACH)	Utilization Outcome	Medicare claims	HHC, Used in Star Ratings
Discharged to Community	Outcome	OASIS	N/A
Improvement in Ambulation-Locomotion[1]	Outcome	OASIS	HHC, Used in Star Ratings
Improvement in Bathing[1]	Outcome	OASIS	HHC, Used in Star Ratings
Improvement in Bed Transferring[1]	Outcome	OASIS	HHC, Used in Star Ratings
Improvement in Dyspnea	Outcome	OASIS	HHC, Used in Star Ratings
Improvement in Management of Oral Medications[2]	Outcome	OASIS	HHC
Improvement in Pain Interfering with Activity[3]	Outcome	OASIS	HHC, Used in Star Ratings
Total Normalized Composite (TNC) Change in Self-Care[4]	Composite Outcome	OASIS	N/A
Total Normalized Composite (TNC) Change in Mobility[4]	Composite Outcome	OASIS	N/A
Drug Education on Medications Provided to Patient/Caregiver during Episodes of Care[5]	Process	OASIS	N/A
Influenza Immunization Received for Current Flu Season[1]	Process	OASIS	HHC
Pneumococcal Polysaccharide Vaccine Ever Received[1]	Process	OASIS	HHC
How often the home health team gave care in a professional way (Professional Care)	Patient Experience Outcome	HHCAHPS	HHC, Used in Star Ratings
How well did the home health team communicate with patients (Communication)	Patient Experience Outcome	HHCAHPS	HHC, Used in Star Ratings
Did the home health team discuss medicines, pain, and home safety with patients (Discussion of Care)	Patient Experience Outcome	HHCAHPS	HHC, Used in Star Ratings
How do patients rate the overall care from the home health agency (Overall Care)	Patient Experience Outcome	HHCAHPS	HHC, Used in Star Ratings
Would patients recommend the home health agency to friends and family (Likely to Recommend)	Patient Experience Outcome	HHCAHPS	HHC, Used in Star Ratings
Influenza Vaccination Coverage for Home Health Care Personnel	Process	HHA Self-report	N/A
Herpes Zoster (Shingles) Vaccination for Patient	Process	HHA Self-report	N/A
Advance Care Plan	Process	HHA Self-report	N/A

Source: (HHS, 2016), (CMS, 2018a), (HHS, 2019). HHC=Home Health Compare. Note that CMS granted an exception to the HH Quality Reporting Program for Q4 2019-Q2 2020 due to the COVID-19 PHE (CMS, 2020b).

[1] These measures were dropped for performance year 2019 and all subsequent years of the HHVBP Model (HHS, 2018).

[2]This measure was added to the CMS Star Ratings in April 2019 (CMS, 2018a).

[3]Agencies were required to submit data for this measure through CY 2020, but it was dropped from public reporting in April 2020 (HHS, 2019).

[4]These measures were added for performance year 2019 and all subsequent years of the HHVBP Model (HHS, 2018).

[5]This measure was dropped for performance year 2018 and all subsequent years of the HHVBP Model (HHS, 2017) and dropped from the CMS Star Ratings in April 2019 (CMS, 2018b).

For the TPS calculation, HHAs receive the maximum points of either their achievement score or improvement score for each performance measure. In calculating an HHA's TPS, one sums and adjusts the points for each measure for the number of eligible measures reported. To be eligible for inclusion in the TPS calculations and subsequent payment adjustments, an agency must have data for at least five measures in both the baseline and performance periods, with 20 or more episodes of care (for OASIS- and claims-based measures) and/or at least 40 completed HHCAHPS surveys (for HHCAHPS-based measures) in both the baseline and performance periods. Agencies must also have a Medicare participation date prior to their baseline year for measuring improvement. Therefore, to receive a TPS for 2020, agencies must have a Medicare participation date prior to 2019. In addition, to be eligible for a payment adjustment, agencies must be in operation for the entire performance year.[6]

1.3 Scope of this Annual Report

This Fifth Annual Report examines the original HHVBP Model after the first five years of implementation, including CY 2020, the third year that HHAs in the nine original HHVBP states are subject to payment adjustments of up to ±6 percent. We use data available from CY 2013- CY 2020, which includes a baseline period (CY 2013- CY 2015) and the first five years of the HHVBP Model (CY 2016- CY 2020).

In addition to addressing the impact of HHVBP on cost, quality utilization, and patient experience, this report expands upon our analyses from previous reports. We conducted several new analyses to better understand the model in its fifth year, including how the introduction of the PDGM and the onset of COVID-19 Public Health Emergency (PHE) – two exogenous events in CY 2020 - could have implications for our evaluation of the HHVBP Model. We explored whether there have been changes over time in both realized and potential access to higher quality home health services since HHVBP was implemented. Building on previous qualitative findings, we conducted a case study of a large national home health chain operating in both HHVBP and non-HHVBP states to assess potential of chain-driven spillover.

Based on findings from last year, we continued to expand several of our ancillary analyses to explore unintended consequences of the model, including the impact of HHVBP on:

- historically underserved populations;
- case-mix of home health patients who are less likely to improve;
- frontloading of visits during HH episodes among patients at high risk for re-hospitalization; and
- potential substitutes for home health services among post-acute care beneficiaries with specific conditions.

We conclude the report with a summary of our plans for future analyses of the original HHVBP Model.

[6] However, since the performance of HHAs prior to their closure is of interest for this evaluation, we include agencies that close during their final HHVBP performance year in the analyses of TPS for this report.

2. Evaluation Approach

This section summarizes our approach for the evaluation. We provide an overview of our evaluation design for the HHVBP Model, including quantitative analyses of claims, OASIS, and HHCAHPS data, selection of a comparison group for individual and aggregated HHVBP states, and analysis of agency TPS. We provide additional details regarding our analytic approach in the Technical Appendix.

2.1 Overview of the HHVBP Evaluation Design

Our evaluation of the model spans an eight-year timeframe that covers the original HHVBP Model's entire period (HHS, 2021).[7] We employ a mixed methods research design that incorporates quantitative and qualitative analytic approaches. This evaluation examines how impact measures of interest related to Medicare spending and the quality of home health care change over time in the HHVBP Model states, reflecting changes for a comparison population that would have been observed in the absence of the HHVBP Model. Primary research questions addressed over the course of this evaluation are:

- What is the impact of the HHVBP Model on the performance measures of quality, utilization, and patient experience used in the HHVBP Model for payment adjustments? (RQ1)
- What is the impact of HHVBP on home health utilization and other home health quality, Medicare home health costs and payments, and home health beneficiary experience measures, other than the model's performance measures? (RQ2)
- How does HHVBP impact HHA operations, characteristics of HHAs in operation, and fiscal solvency? (RQ3)
- Are there unintended consequences of HHVBP? (RQ4)
- Do other CMS initiatives, external initiatives, or other policies have implications for the effects of HHVBP? (RQ5)
- What is the impact of HHVBP on Medicare more broadly? (RQ6)
- What is the anticipated effect of CMS' expansion of the HHVBP Model on supporting CMS's goals of providing better care, lower costs, and improved health? (RQ7)

This year's evaluation analyzes secondary data (e.g., Medicare FFS claims and OASIS data) to provide information about the behavior of providers under the model and the potential impact on beneficiaries. In prior years, we conducted and analyzed interviews with agencies in HHVBP states to better understand agency operations. Analysis of these qualitative data highlighted issues for further investigation and provided context for interpreting our quantitative analytic results.

2.2 Quantitative Analytic Approach

We designed our quantitative analysis to address the question: What was the impact of the HHVBP Model on the quality of health care, health care utilization, health outcomes, and health care costs? Our analyses examine whether the HHVBP Model is achieving its overarching goal—to improve the quality of home health services and efficiency of care—and examines potential unintended consequences (see Section A.1.3 [Page 5] in the Technical Appendix for details of the evaluation's conceptual framework).

[7] As discussed in Section 1, CMS finalized its plan to expand the HHVBP Model to all Medicare-certified HHAs in the 50 states, territories and District of Columbia beginning January 1, 2023, with CY 2022 functioning as a pre-implementation year in which no HHVBP payment adjustments will be applied in the original nine model states (HHS, 2021). CY 2023 will be the first performance year of the expanded model, and agency performance in 2023 will be used to adjust CMS payments of up to ±5 percent to all agencies in CY 2025, the first payment year of the expanded model.

To address the research questions of interest for this evaluation, we examined a range of impact measures (Exhibit 3).

Exhibit 3. Impact Measures Used to Evaluate the HHVBP Model

Measure	Unit of Analysis
HHA Total Performance Score (TPS) [a] (Section 5)	HHA-Level
Home Health Utilization Measures (Section 3)	
Percent of FFS Beneficiaries with at Least One HH Episode	County-Year
Number of HH Days of Care per FFS Beneficiary	County-Year
FFS Claims-Based and OASIS-Based Case-Mix Measures (Section 3)	
Hierarchical Condition Categories (HCC) Score at the Start of Care	FFS Episode-Level
Conditions at Risk of Limited Functional Improvement	OASIS Episode-Level
Count of Hierarchical Condition Categories (HCC) Present at Start of Care	OASIS Episode-Level
Total Normalized Composite (TNC) Mobility at Start of Care	OASIS Episode-Level
Total Normalized Composite (TNC) Self-Care at Start of Care	OASIS Episode-Level
FFS Claims-Based Measures Examining Post-Acute Care (Section 3)	
Home Health Care	FFS Hospital Discharge-Level
Skilled Nursing Facility	FFS Hospital Discharge-Level
Any Institutional Post-Acute Care (i.e., SNF, Inpatient Rehabilitation, or Long-term care hospitalization)	FFS Hospital Discharge-Level
Hospital Outpatient Therapy	FFS Hospital Discharge-Level
Self-Care (i.e., no formal post-acute care)	FFS Hospital Discharge-Level
Self-Care or Outpatient Therapy	FFS Hospital Discharge-Level
FFS Claims-Based HHA Operations Measures (Section 4)	
Frontloading Skilled Nurse Visits*	FFS Episode-Level
Frontloading Therapy Visits*	FFS Episode-Level
FFS Claims-Based Utilization Measures (Section 6)	
Unplanned Acute Care Hospitalization/First FFS HH Episodes	FFS Episode-Level
Outpatient ED Use (No Hospitalization)/First FFS HH Episodes [b]	FFS Episode-Level
ED Use Followed by Inpatient Admission/First FFS HH Episodes [b]	FFS Episode-Level
Total ED Use (Outpatient or Inpatient Claims)/First FFS HH Episodes [b]	FFS Episode-Level
Unplanned Acute Care Hospitalization/All FFS HH Episodes	FFS Episode-Level
Skilled Nursing Facility (SNF) Use/All FFS HH Episodes	FFS Episode-Level
FFS Claims-Based Spending Measures [c] (Section 7)	
Average Medicare Spending per Day during and following FFS HH Episodes of Care	FFS Episode-Level
Average Medicare Spending per Day during FFS HH Episodes of Care	FFS Episode-Level
Average Medicare Spending per Day following FFS HH Episodes of Care	FFS Episode-Level
OASIS-Based Outcome Quality Measures (Section 8)	
Discharged to Community	OASIS Episode-Level
Total Normalized Composite (TNC) Change in Self-Care	OASIS Episode-Level
Total Normalized Composite (TNC) Change in Mobility	OASIS Episode-Level
Improvement in Dyspnea	OASIS Episode-Level
Improvement in Management of Oral Medications	OASIS Episode-Level
Improvement in Pain Interfering with Activity	OASIS Episode-Level

Measure	Unit of Analysis
FFS Claims-Based Quality Measure (Section 8)	
Mortality Rate/All FFS Home Health Episodes	FFS Episode-Level
HHCAHPS-Based Patient Experience Measures (Section 9)	
How often the home health team gave care in a professional way (Professional Care)	HHA-Level
How well did the home health team communicate with patients (Communication)	HHA-Level
Did the home health team discuss medicines, pain, and home safety with patients (Discussion of Care)	HHA-Level
How do patients rate the overall care from the home health agency (Overall Care)	HHA-Level
Would patients recommend the home health agency to friends and family (Likely to Recommend)	HHA-Level

Section numbers refer to corresponding sections in the main summary report. HHVBP Measures indicated by italic text.). | We do not include the three measures that are self-reported by HHAs since these are only available for HHAs in the HHVBP states. |All measures have a baseline period of 2013-2015 except for HHA Total Performance Score which has a baseline period of 2015 | [a] *As discussed in Section 2.2.5, a D-in-D approach is not used for analysis of agency TPS. *We also analyzed frontloading measures stratified by post-institutional and community referral categories.*

[b] *For each of the three ED use measures, we analyzed common condition specific categories: Abdominal pain, Non-specific chest pain, Superficial injury, Urinary tract infection and Other. |* [c] *For each of the three spending measures, we also analyze their components: Medicare Part B carrier and DME combined, HH, Hospice, Inpatient, Outpatient ED and Observation Stays, other Outpatient/Outpatient types combined, and SNF.*

To evaluate the impact of HHVBP, we used a difference-in-differences (D-in-D) framework to compare changes in impact measures observed over time in the HHVBP states with those in the comparison group, consisting of home health populations receiving care from HHAs located in the 41 states that were not selected for inclusion in the HHVBP Model. The D-in-D design enables us to control for common changes to all beneficiaries over time, as well as for unmeasured differences between model and comparison states that do not change over time. Positive (or negative) D-in-D estimates can be interpreted to mean the HHVBP group has higher (or lower) measure values than estimated in the absence of HHVBP. The D-in-D framework offers a quasi-experimental design that can address many threats to validity and rests on the critical assumption that, in the absence of the HHVBP Model, the impact measures in the two groups would have changed in a parallel manner over time.

We established a common comparison group approach for use across all of the quantitative analyses to ease interpretation of findings across impact measures. A key challenge for the evaluation is that there are numerous and diverse impact measures of interest that correspond to different sub-populations (e.g., based on insurance providers and other patient characteristics), involve different units of analysis (e.g., episode, agency), and are measured using different data sources (e.g., Medicare claims, OASIS assessments, HHCAHPS). Claims-based measures correspond to Medicare FFS beneficiaries who receive home health care, while other measures (e.g., OASIS-based measures) include all home health patients with Medicare or Medicaid coverage. Some measures are applicable only to a subset of home health patients based on their functional or clinical status (e.g., OASIS outcome measures of improvement in functioning); there is also considerable variation in the proportion of OASIS episodes that contribute to several impact measures of interest. Further, certain impact measures, such as agency TPS, are only defined at the agency level.

To avoid biased and imprecise impact estimates, we aimed to define a comparison population with characteristics that were as similar as possible to the HHVBP population during the baseline period. The randomized selection of nine HHVBP states and mandatory participation of all HHAs in these selected states helps to guard our analysis against selection bias, which would occur if HHAs with greater ability to improve the quality and efficiency of services were more likely to participate in the HHVBP Model. Such selection bias, if not accounted for, would result in attribution of more favorable effects to the model than its true effects. The results of our descriptive analyses (Section B.1 [Page 119] in the Technical Appendix) show similarity in most beneficiary and HHA characteristics associated with the impact measures of interest between HHVBP and non-HHVBP states, providing assurance that the randomization of states for the intervention was effective for many characteristics.

Given the diversity in beneficiary and HHA characteristics and treatment patterns across states, randomization at the state level alone was not able to achieve similarity on all factors between the HHVBP and comparison states during the three-year baseline period or to avoid differential yearly trends in all factors during this period. We therefore used statistical methods to control for imbalances observed between treatment and comparison populations in the baseline period for a few factors, including beneficiary race, agency chain affiliation, and agency size. We also controlled for unmeasured differences between states' markets and beneficiary populations that do not change over time on average (see Sections A.1.4 [Page 8] and A.1.5 [Page 22] in the Technical Appendix for more details).

Beginning in January 2019, the OASIS assessment form was updated from version C2 to D, which included removal of four indicators of clinical status of patients at the start of home health care (without replacement) that the HHVBP Evaluation used as covariates in our D-in-D analyses in the Third Annual Report. Due to these changes in OASIS data collection, from the Fourth Annual Report onwards, we updated the core list and included the three clinical factors as additional covariates: oxygen indicator, Patient-Driven Groupings Model (PDGM) home health admission source, and PDGM defined clinical grouping (see Section A.1.4.2 [Page 9] in the Technical Appendix for details) that helped to achieve balance in the baseline period between the HHVBP and non-HHVBP states and importantly, satisfied the parallel trends assumption for the measures. Despite adding these new covariates, there were measure sets (e.g., FFS claims-based Medicare spending measures and OASIS-based outcome measures) that still showed evidence of a lack of parallel trends during the baseline period. We incorporated state-specific linear time trends for the HHVBP and comparison populations to control for these differences. Details regarding the revised covariate list, approaches used to test the parallel trends assumption of our D-in-D approach, and steps taken to mitigate non-parallel trends in cases that do not satisfy tests to support this assumption (e.g., state linear trends), are provided in Section A.1.4.2 (Page 9), Section A.1.5.2 (Page 25), and Section A.1.5.3 (Page 38) of the Technical Appendix. For additional information regarding the D-in-D approach and the methods used to control for differences between the HHVBP and comparison populations, see Section A.1.5 (Page 22) in the Technical Appendix.

We are unable to use a D-in-D approach for the three self-reported HHVBP performance measures (Influenza Vaccination Coverage for Home Health Care Personnel, Herpes Zoster [Shingles] Vaccination for Patient, Advance Care Plan) for which data are only available for HHAs in the HHVBP states. Instead, we focus on reporting rates among HHAs in the nine HHVBP states for these measures (see Section 4.5). We use an alternative analytic approach for examining agency TPS values, as described in Section 2.2.5 below).

Given the phase-in structure of HHVBP Model payment adjustments, we examined if there was a difference in the impact of the HHVBP Model on measures between early years (2016-2017) versus later years (2018-2020) of the post-implementation period. In particular, we compared the average estimated HHVBP impacts on the measures in 2018-2020, when HHAs received performance-based payment adjustments, versus the average impact during HHVBP Model years 2016-2017, prior to payment adjustments. For details on estimation of these effects, see Section A.1.5.1 (Page 23) in the Technical Appendix.

2.2.1 Impact of Other CMS Initiatives

A potential confounder for our evaluation of the HHVBP Model involves other CMS initiatives and Alternative Payment Models (APMs) that may affect HHA operations, beneficiary use of home health services, and outcomes for beneficiaries using home health services. Some of these other models were either introduced or expanded during the time period for our evaluation. We therefore adjusted for the impact of beneficiary alignment to Innovation Center APMs on HHVBP outcomes of interest. We ascertained whether FFS beneficiaries were aligned to three Accountable Care Organization (ACO)-based APMs at any time during a home health episode: the Medicare Shared Savings Program (MSSP), the Pioneer ACO model, and the Next Generation ACO model. We also determined beneficiary alignment to the Comprehensive Care for Joint Replacement (CJR) and Oncology Care Models (OCM), both of which began in 2016. Similarly, we ascertained beneficiary alignment to Models 2 and 3 of the Bundled Payment for Care Improvement (BPCI) initiative and the BPCI Advanced model, which succeeded BPCI at the end of 2018. Given observed differences in APM penetration between HHVBP and non-HHVBP states during the time period of our evaluation (see Exhibit A-7 [Page 19] of the Technical Appendix), changes in APMs may potentially affect our claims-based impact measures of interest. Hence, we incorporated an adjustment for individual APMs in our D-in-D regression models for FFS beneficiaries receiving home health care.

In 2020, CMS commenced or continued implementation of the Review Choice Demonstration (RCD) in five demonstration states (Illinois, Ohio, Texas, North Carolina and Florida). The demonstration began in Illinois in June of 2019. Home health claims in these states with billing periods beginning during a participation cycle are subject to review under the requirements of the choice selected by an agency participant in the demonstration. Various phases of the demonstration commenced in additional demonstration states (Ohio, Texas, North Carolina and Florida) during 2020, and home health claims in all demonstration states with billing periods beginning on or after August 31, 2020 were subject to review under the requirements of the demonstration. Due to the COVID-19 pandemic, CMS phased in participation in the RCD for some HHAs in participating states to help ease transition during the public health emergency. Since the demonstration has only recently begun in all five states, its full impact is still undetermined. However, it may have impacts on how HHAs provide care, and potentially on the case-mix of patients admitted to home health care in those five states. Because the demonstration has only been implemented in two of the HHVBP states during the fifth year of the HHVBP Model, and it affects both HHVBP states (Florida and North Carolina) and non-HHVBP states (Ohio, Texas and Illinois), we included covariate adjustments in our claims-based analyses to mitigate the potential confounding this may pose for estimation of HHVBP impacts. Using agency-level information about participation in the RCD, we created flags for Medicare home health beneficiaries whose home health episode began while their providing agency was (1) either actively participating in an RCD cycle or (2) had previously participated in an RCD cycle but was between cycles or (3) was not an active participant in any RCD cycle

prior to or on the home health episode start date. Like the APMs discussed above, we incorporated an adjustment for these RCD covariates in our D-in-D regression model for FFS beneficiaries receiving home health care to account for any affect that this initiative may have on HHA performance.

2.2.2 Changes in 2020

There were two exogenous events in 2020 that had implications for our evaluation of the HHVBP Model, including the introduction of the Patient-Driven Groupings Model (PDGM) and the onset of the COVID-19 Public Health Emergency (PHE). If either of these changes affect our outcomes of interest in the nine HHVBP states differently than those in the 41 comparison states, our estimates of the impact of HHVBP during 2020 may be biased. We discuss how we mitigated this concern for each event below.

Implementation of PDGM

In January 2020, CMS implemented the PDGM, a revised case-mix adjustment methodology for payment for all FFS home health claims. Among PDGM's changes was a change in the unit of payment, from 60-day to 30-day episodes of care. This change from 60-day to 30-day episodes did not affect the two HHVBP claims-based measures (Unplanned hospitalizations and Emergency Department (ED) Use [No Hospitalization] among First Home Health Episodes) nor two of the other claims-based measures we analyze (ED Use Followed by Inpatient Admission and Total ED Use [Outpatient or Inpatient Claims] among First FFS Home Health Episodes). The denominator for these four measures is restricted to only the first home health episode in the sequence, and the measure lookout period is 60 days from the start of the episode, regardless of the length of the episode (see Section A.2.2 [Page 64] in the Technical Appendix for additional detail on measure definitions). However, this change in episode length affected our definitions for other measures we examine that include all home health episodes in a sequence. This included our measures of Medicare spending as well as the other two claims-based utilization measures (e.g., Unplanned Hospitalizations and Skilled Nursing Facility (SNF) Use among All FFS HH Episodes). Each group of measures are discussed below.

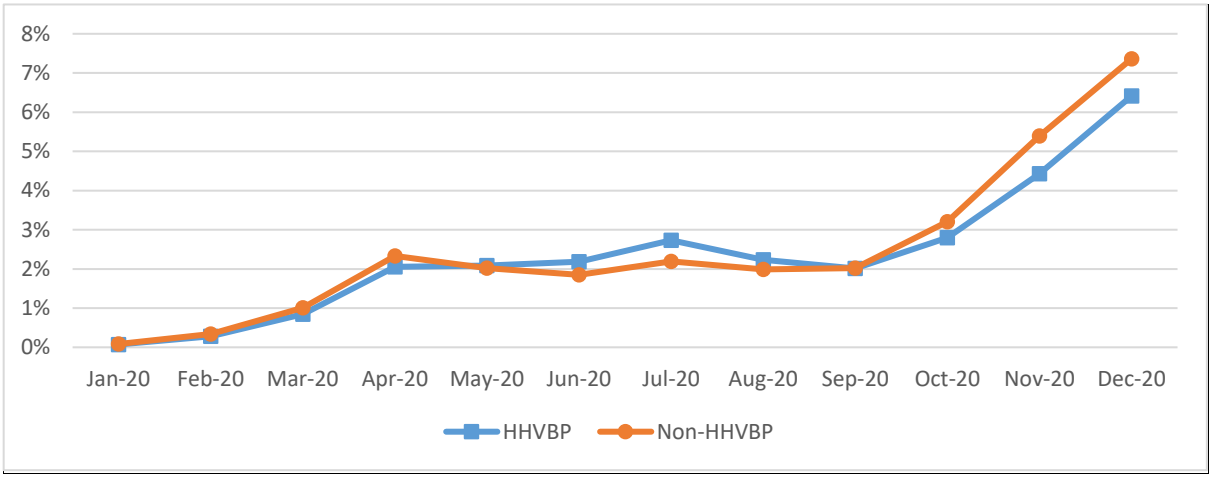
For the spending measures, we noted a differential change in the follow-up period between HHVBP and non-HHVBP states. PDGM is likely to be the driver of a differential shift in eligible days for our measure of spending during HH episodes of care and, consequently, in average spending per day between HHVBP and non-HHVBP states. The concern for our evaluation is that based on our D-in-D analyses, we might falsely attribute a change in average spending in HHVBP states relative to non-HHVBP states in 2020 to the HHVBP Model instead of attributing it to PDGM. To mitigate this potential source of bias due to PDGM, we opted for an alternative approach to defining Medicare spending measures in 2020. For the estimation of impacts in 2020, we used a standardized follow-up period for measuring spending during HH episodes of care rather than an approach that based the measurement period on the timing of the last HH visit during the episode (i.e., the approach used in previous Annual Reports). The standardized approach used to estimate impacts in 2020 reflects use of a standard 60-day follow-up period for model years prior to 2020, and a standard 30-day follow-up period during 2020. This approach thereby avoids a PDGM-induced differential change between HHVBP and non-HHVBP states in the follow-up period for spending per day measures. For our analysis of model impacts in 2016-2019, we continue to use the same approach that was followed in the previous Annual Reports (see Exhibits A-42 through A-44 [Page 64] in the Technical Appendix). Hence, we estimated impacts on spending measures for 2016 through 2019 from one regression model and impacts for 2020 from a separate regression model using the alternative approach. For more details, please refer to Section A.1.4.2 in (Page 9) in the Technical Appendix.

For the two utilization measures that included all home health episodes in a sequence (Unplanned Hospitalizations among All Home Health Episodes, SNF Use/All FFS HH Episodes), the decline in the follow-up days with the introduction of PDGM was relatively similar in both HHVBP and non-HHVBP states. Though this does not suggest that PDGM represents an important source of confounding, we conducted a sensitivity analysis to examine the impact of the HHVBP Model on all-episode utilization measures where we standardized the follow-up period of the episodes in 2020 to also be 60 days. We adjusted the timing of the subsequent episodes so that the follow-up period of all the episodes in 2020 was equivalent to that in the pre-PDGM years. This is discussed more in Section 6.3 and in Section A.2.11 of Technical Appendix.

COVID-19

The onset of the COVID-19 PHE was another new development in 2020 that was exogenous to the HHVBP Model. To explore the potential implications of the COVID-19 PHE on the HHVBP Model, we compared the incidence of COVID-19 among FFS home health beneficiaries in HHVBP and non-HHVBP states (Exhibit 4). Overall, we observed relatively similar trends in the percentage of HH episodes with an initial COVID-19 diagnosis in the two groups of states throughout 2020. The first wave of COVID-19 resulted in approximately 2 percent of FFS home health beneficiaries having an initial COVID-19 diagnosis reported in claims in both HHVBP and non-HHVBP states in April of 2020. After remaining at similar levels through September, the incidence of COVID-19 reported in claims rose more steeply in the final quarter of 2020 in both HHVBP and non-HHVBP states. Overall, these trends in initial COVID-19 diagnoses do not suggest that the pandemic had a markedly different impact on home health beneficiaries in HHVBP states and non-HHVBP states during 2020.

Exhibit 4. Percentage of HH Episodes with an Initial COVID-19 Diagnosis, January to December 2020



Though we observed similar trends between the two groups, we included covariate adjustments in our D-in-D models of claims-based measures to account for potential confounding of HHVBP Model effects due to the COVID-19 PHE. The risk-adjustment variables we included are: (1) county-month-level rates of Medicare FFS inpatient stays associated with COVID-19 diagnoses; (2) county-month-level rates of incidence of COVID-19 diagnoses from USAFacts.org; and (3) episode-level variables that indicate a COVID-19 diagnosis found in claims data during the episode, following the episode through 30 days, or within 90 days prior to the episode start (see Exhibits A-4 and A-5 [Page 15] in the Technical Appendix). For our analyses of OASIS-based and HHCAHPS-based measures, we included covariate adjustment for

the two county-month-level rates only (Exhibit A-4) since episode-level COVID-19 diagnoses were not available for the non-FFS patients (see Section A.2.1.2 [Page 56] of the Technical Appendix for more details). Our approach assumes that unobserved geographic variation due to COVID-19 is similar to observed variation in the COVID-19 indicators that we control for in the D-in-D models.[8]

Enhanced Linking Methodology

Since completing the analyses for the Fourth Annual Report, we made several changes that improved our linking technique between claims and OASIS assessments, especially for 2019. These changes were incorporating the Health Insurance Claim Number (HICN), using claims occurrence code instead of claims authorization code and shortening the date range used in matching. Overall, these enhancements improved the linkage between HH claims and OASIS assessments by decreasing the missing rate for many of the OASIS-derived covariates and increasing our 2013-2019 sample size for the D-in-D models by approximately 2 percent, with the largest increase occurring for 2019. For more details, refer to Section A.4 (Page 100) of the Technical Appendix.

2.2.3 Subgroup Analyses

In this year's report, we also continued to evaluate possible heterogeneity in model impacts among subgroups of beneficiaries that may have implications for health equity. Specifically, we examined whether there are differential impacts of the HHVBP model based on Medicaid coverage or based on race and ethnicity. These analyses are presented in Section 10.

We also examined the impact of HHVBP on the likelihood of admission to home health care among subgroups determined by alignment with an ACO and among subgroups of patients who have conditions that make them at risk of limited improvement in functional status while receiving home health care (see Section 3.6). Furthermore, we estimated heterogeneous impacts of HHVBP on the use of frontloading—that is, distributing a greater share of home health visits earlier in HH episodes—by skilled nurses and therapists across subgroups with varying levels of clinical severity (Section 4.3). We identified such variation in clinical severity by 1) differentiating referral from institutional and community providers; 2) identifying high, medium, and low HCC score from the prior year measured at the start of care; and 3) identifying the presence of complications and comorbidities during hospital stays that preceded HH admission.

2.2.4 Comparison Groups for State-Level Analyses

In addition to analyzing measures at the national level, we evaluated the impact of HHVBP among individual states included in the model. In establishing what would have happened to home health patients in each HHVBP state if the HHVBP Model had not been implemented, we aimed to define comparison groups with characteristics that were as similar as possible to the HHVBP state during the baseline period. We examined the regional group from which the HHVBP states were randomly selected (Exhibit 5). As explained in the Third Annual Report, the states in regional groups were already determined to closely resemble each other in terms of utilization, demographics, and clinical characteristics, lending support to the parallel trends assumption for a D-in-D approach (Arbor Research, 2020). Collectively, these groups included all 41 states not selected for inclusion in the model, so a

[8] We also conducted a sensitivity analysis and evaluated the impact of HHVBP from a regression model that did not adjust for these COVID-19 covariates. Details are provided in Section A.2.11 (Page 88) of the Technical Appendix.

comparison group approach based on these regional groups helps to reconcile findings at the national level with those at the state level.

For each HHVBP state and its respective regional group (Exhibit 5), we used the same statistical adjustment approach as for the national-level analyses to account for the minority of factors for which the comparison group differed significantly on average from the HHVBP states.

Exhibit 5. HHVBP States and their Corresponding Regional Group

HHVBP State	Non-HHVBP States in Regional Group
Arizona	New Mexico, California, Nevada, Utah, Colorado
Florida	Texas, Oklahoma, Louisiana, Mississippi
Iowa	North Dakota, South Dakota, Montana, Wisconsin, Minnesota
Massachusetts	Vermont, Maine, Connecticut, Rhode Island, New Hampshire
Maryland	Delaware, New Jersey, Pennsylvania, New York
North Carolina	Alabama, Georgia, South Carolina, Virginia
Nebraska	Ohio, West Virginia, Indiana, Missouri, Kansas
Tennessee	Illinois, Kentucky, Arkansas, Michigan
Washington	Oregon, Alaska, Hawaii, Wyoming, Idaho

As noted in the Third Annual Report, we assessed the validity of the comparison group by testing the assumption of parallel baseline trends in impact measures between the HHVBP states and their respective regional comparison groups (Arbor Research, 2020). The tests concluded that using a regional group (Exhibit 5) as the comparison group for each of the nine HHVBP states helped to achieve an overall pattern of reasonably similar baseline trends for many of the impact measures of interest for this evaluation. As we did at the national level for impact measures exhibiting a lack of parallel trends during the baseline period, we incorporated state-specific linear time trends for measure sets where this was relevant at the state level. At the state level, these measure sets were FFS claims-based utilization measures, FFS claims-based Medicare spending measures, and the OASIS-based measures. Further details are included in Sections A.1.6 (Page 42) of the Technical Appendix.

2.2.5 Analytic Approach for Agency Total Performance Scores

As a metric that combines agency performance on the range of quality measures included in HHVBP, and that is used to determine Medicare payment adjustments for HHAs in the HHVBP states, the TPS represents a broad measure of agency performance under HHVBP. As such, the TPS is of interest as an overall performance indicator for comparison between agencies in model states with those in non-model states where this metric does not affect Medicare payments to HHAs. To evaluate the impact of the HHVBP Model on overall agency performance, we compared CY 2016- CY 2020 TPS in model states with those in non-model states using multivariate linear regression, with adjustments for agency size, chain status, ownership type, age, and freestanding versus hospital-based, as well as indicators of patient demographic characteristics and insurance.

A D-in-D approach to examining TPS is not optimal over the duration of this evaluation since the methodology for computing TPS has changed over time, including changes to the HHVBP measure set during performance years 2018 (HHS, 2017) and 2019 (HHS, 2018).[9] Additionally, CMS changed the

[9] See Section 1.2.1 above for more detail on the HHVBP measure set.

weighting distribution of the measures for CY 2019, which translated to a substantial increase in the weights for the claims-based measures (HHS, 2018). These changes in TPS methodology make TPS values from different payment years less comparable, as changes in TPS values across payment years may, in part, reflect changes in the components of the TPS rather than changes in agency performance. Additionally, as discussed in Section 1.2.2, the TPS already captures changes over time in an agency's performance.[10] For these reasons, we employed a cross-sectional regression analysis, as opposed to a D-in-D approach, for examining agency TPS values. Section A.1.7 (Page 44) in the Technical Appendix contains further details regarding our rationale for using this analytic approach.

2.2.6 Interpreting the Findings

Adhering to best practices for evaluation research (Wasserstein, 2019), the HHVBP evaluation team synthesized the evidence presented in this report to identify meaningful patterns in results across multiple analyses. We carefully weighed the strength of the evidence in terms of magnitude of point estimates, consistency with prior hypotheses about impacts, consistency of impact findings over multiple time periods and HHVBP states analyzed, statistical significance at the $p<0.10$ level, and support from previous years' qualitative findings to draw conclusions about impacts of the HHVBP Model. We expect this strategy to facilitate policymakers' subsequent use of the findings for decision-making purposes.

2.3 Structure of the Following Sections

The following Sections present key findings based on our evaluation of the experience of home health patients, agencies, and chain organizations during the first five years of the original HHVBP Model (2016-2020). Section 3 examines changes in agency entry and exit, home health utilization, utilization and availability of higher quality HHAs, case-mix of beneficiaries receiving care, and the use of alternative post-acute care options relative to home health care. In Section 4, we study the frequency and types of visits and impact of frontloading of visits during home health episodes, as well as the impact of HHVBP on frequency of visits early in home health episodes and present a case study of HHA chain-driven spillover effects. Section 5 presents our analyses of the impact of the HHVBP Model on overall agency performance by comparing TPS in HHVBP states with those in non-HHVBP states, and includes further analyses of agency TPS, profitability, and payment adjustments. We examine HHVBP impacts on Medicare utilization and spending in Sections 6 and 7, respectively, before presenting results for the OASIS-based quality measures and mortality in Section 8. In Section 9, we examine patient experience with care. We consider potential implications for health equity by testing for differential effects of the model among beneficiary subgroups Section 10, and conclude with a discussion of future activities in Section 11.

[10] See Section A.2.7 (Page 84) in the Technical Appendix for more information on the TPS calculation.

3. Results: No Evidence That HHVBP Has Adversely Impacted Access to Home Health Care

3.1 Introduction

In this section we evaluate whether the HHVBP Model has implications for beneficiary access to home health care. We consider multiple ways in which the model could affect access to care, either positively or negatively. In establishing quality performance incentives for HHAs and aiming to promote improvements in the quality of care, HHVBP may have the unintended consequence of reducing access to home health care for some beneficiaries. In seeking to meet or exceed quality performance standards under the model which now have more than modest financial implications for HHAs, HHAs may be discouraged from serving populations of beneficiaries either having certain characteristics or located in certain geographic areas that they perceive as limiting the likelihood that they can be successful under the model. Alternatively, by establishing financial incentives for the delivery of higher quality care, the model could improve beneficiary access to high quality home health care.

We begin this section with an overview of characteristics of the home health industry in HHVBP and non-HHVBP states, followed by analyses of the utilization of home health care and the case-mix of beneficiaries receiving home health care in the two groups. Both the number of HHAs and the utilization of home health care among FFS beneficiaries have continued to decline over time in HHVBP and non-HHVBP states, building on declines that predated the HHVBP Model. Based on data through the first five years of HHVBP, we continued to find no evidence of lower utilization emerging among Medicare FFS beneficiaries in HHVBP states compared with non-HHVBP states as a potential unintended consequence of the model.

Using indicators of quality of care for HHAs from both the CMS star ratings and HHVBP, we explored whether there have been changes over time in both realized and potential access to higher quality home health services since HHVBP was implemented. An analysis of trends in both utilization and availability of higher quality HHAs shows larger overall improvements in HHVBP states compared to non-HHVBP states following implementation of HHVBP. However, we note differences in access to higher quality home health services that persist for certain subgroups of beneficiaries.

Further, while we observed a pattern of increasing clinical severity over time among home health patients for five case-mix measures, these trends were generally similar in HHVBP and non-HHVBP states. For four measures of health and functional status at the start of care, 1) a composite measure of patient mobility, 2) a composite measure of self-care, 3) presence of a condition at risk of limited functional improvement, and 4) count of HCC conditions at the start of care, we found no evidence of HHVBP impacts. For the Hierarchical Condition Category (HCC) risk score, we found evidence of lower growth in severity among patients receiving care from agencies in HHVBP states relative to agencies in non-HHVBP states in all years of the post-implementation period. Because the HCC risk score is the only indicator for which we find evidence of possible case-mix selection from multiple analyses testing for such an effect of HHVBP, we do not conclude there is strong evidence of a significant agency response to HHVBP to select beneficiaries based on case-mix. This finding is consistent with findings in our previous Annual Reports based on a slightly different set of case-mix measures (Arbor Research, 2020; Arbor Research, 2021). It will be important to continue to examine whether HHVBP encourages agency

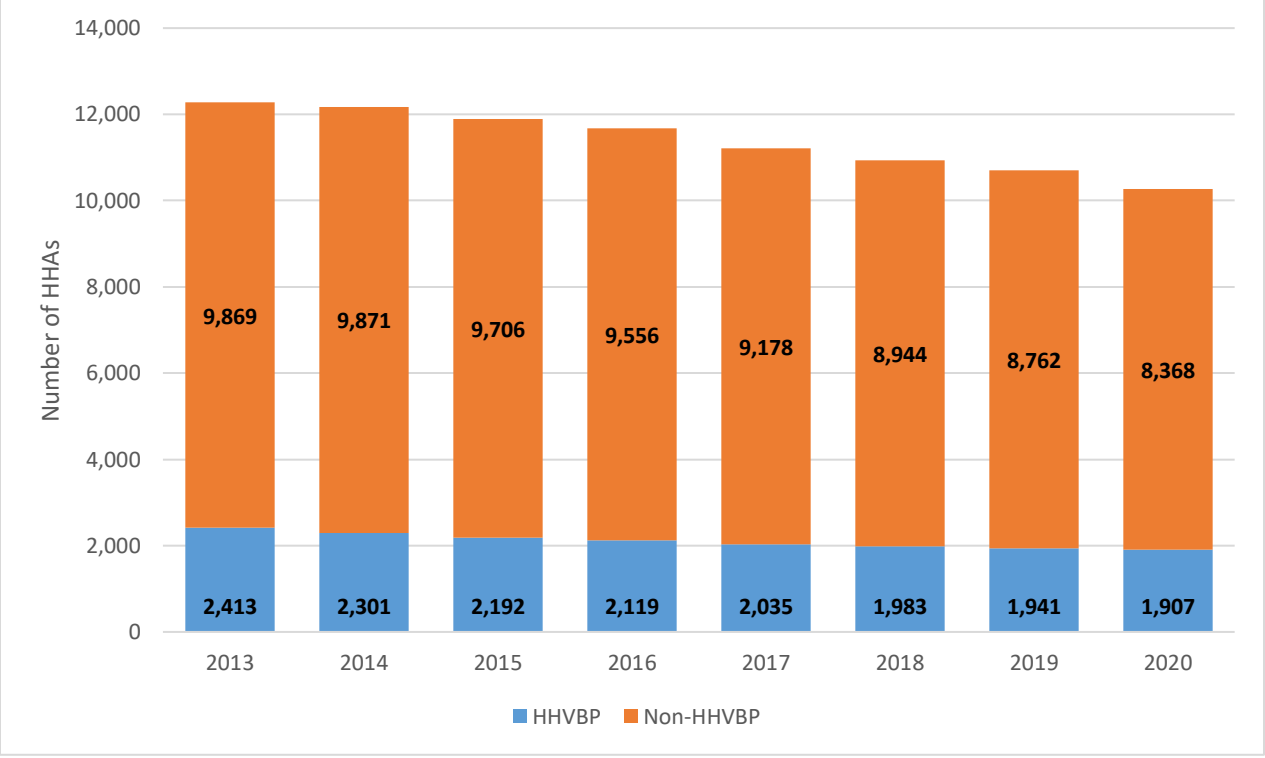
practices of admitting patients based on their case-mix, especially as the HHVBP Model is expanded beyond the original nine states.

In a hospital discharge-level analysis, we found evidence that HHVBP contributed to a slightly greater likelihood in 2018, 2019, and 2020 of beneficiaries transitioning to home health care within 14 days relative to other forms of post-acute care (PAC). Furthermore, we found no evidence that HHVBP contributes to any changes in PAC use of home health care among hospital discharges at risk of limited functional improvement from home health care nor among discharges under the care of accountable care organizations. In related analyses, we examined how patient characteristics, including case mix, influence PAC selection for three common conditions and found no significant evidence that HHVBP has changed how patient characteristics influence PAC choice. These findings are all consistent with other analyses reported in this section that showed no signs of emerging access problems due to HHVBP.

3.2 Continued Decline in the Number of Home Health Agencies

Overall, there has been a decline in the number of HHAs from 2013-2020 in both HHVBP and non-HHVBP states which began prior to the HHVBP Model implementation (Exhibit 6). The rate of decline in HHAs was higher among the nine HHVBP states compared with the 41 non-HHVBP states over the eight-year period (21.5 percent decrease vs. 15.2 percent decrease, respectively). The decreasing number of HHAs among HHVBP states was almost entirely driven by Florida, which experienced a 35 percent decline in the number of agencies over the eight-year period (from 1,399 to 914; not shown); this decline reflects the effect of the CMS moratorium on new Medicare HHAs in Florida. In 2020, Florida accounted for 48 percent of HHAs in HHVBP states, a decrease from 58 percent in 2013 (see Exhibit B-7 [Page 134] in the Technical Appendix).

Exhibit 6. Steeper Rate of Decline in the Number of Home Health Agencies in HHVBP States versus Non-HHVBP States, 2013-2020

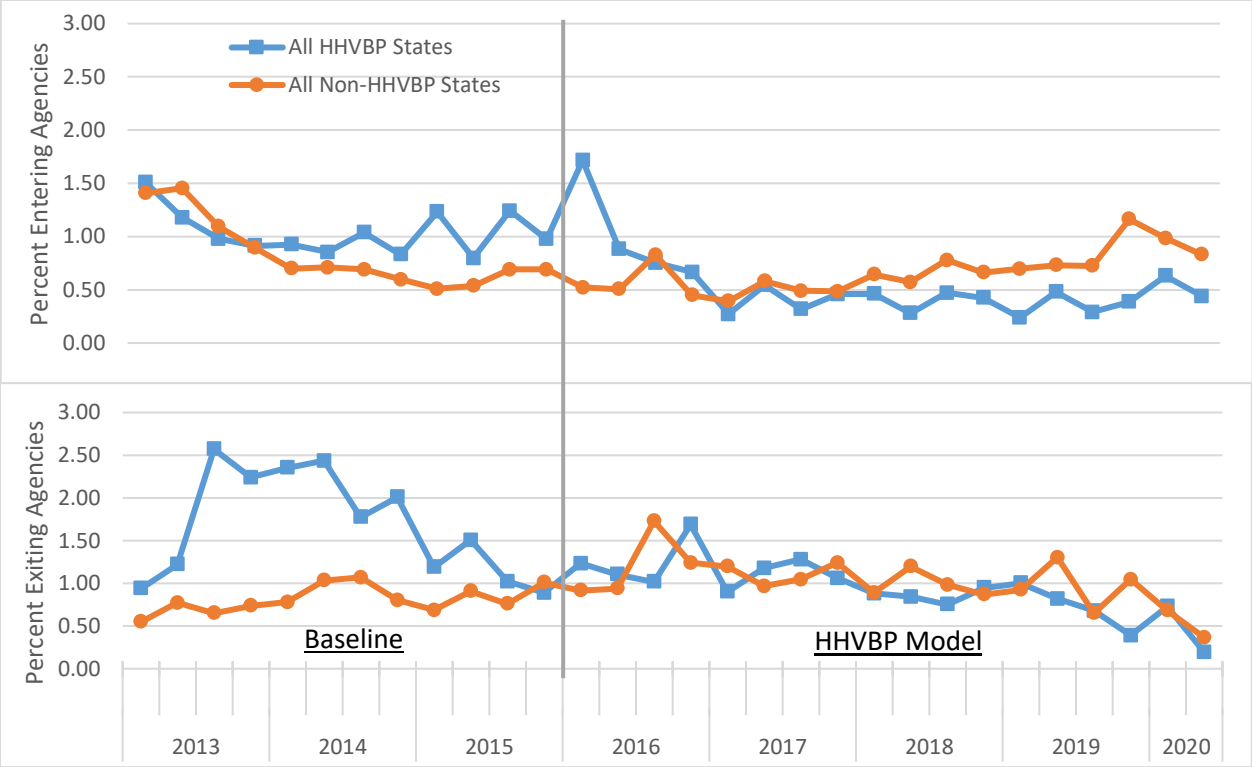


In the context of these pre-model declines in the number of HHAs in HHVBP and non-HHVBP states, we examined whether the model may have affected the overall rate at which new agencies appeared or the overall rate at which they terminated. The HHVBP Model could affect the delivery of home health services by influencing the market entry and exit decisions of HHAs, which, in turn, could affect availability of agencies with implications for utilization of home health services and beneficiary access to home health care.

Similar to our findings in previous reports we found that the decreases in the number of agencies in operation through Quarter 2 of 2020 were due to the total number of agencies exiting the market exceeding the number of new agencies entering the market (Arbor Research, 2020; Arbor Research, 2021). In general, prior to the implementation of HHVBP in January 2016, HHVBP states had higher agency entry rates and higher agency exit rates than non-HHVBP states, indicating greater volatility in the supply of HHAs in HHVBP states.

In Q1 of 2013, approximately 1.5 percent of all open agencies in HHVBP and non-HHVBP states were new, and this percentage decreased over time, with a larger decline in non-HHVBP states through 2014 (Exhibit 7). An exception is the spike in the number of new agencies in HHVBP states in 2016 Q1 which is largely due to new agencies in Massachusetts. While agency entry rates were similar in HHVBP and non-HHVBP states during the first two years following model implementation, trends diverged between the two groups in 2018 due to an increase in entry rates in non-HHVBP states for the remainder of the post-implementation period.

Exhibit 7. Similar Quarterly Percentages of Terminating HHAs in HHVBP States and Non-HHVBP States Following the Implementation of HHVBP and an Increase in New HHAs in Non-HHVBP States Since 2018 that is Not Observed in HHVBP States, 2013 Q1-2020 Q2



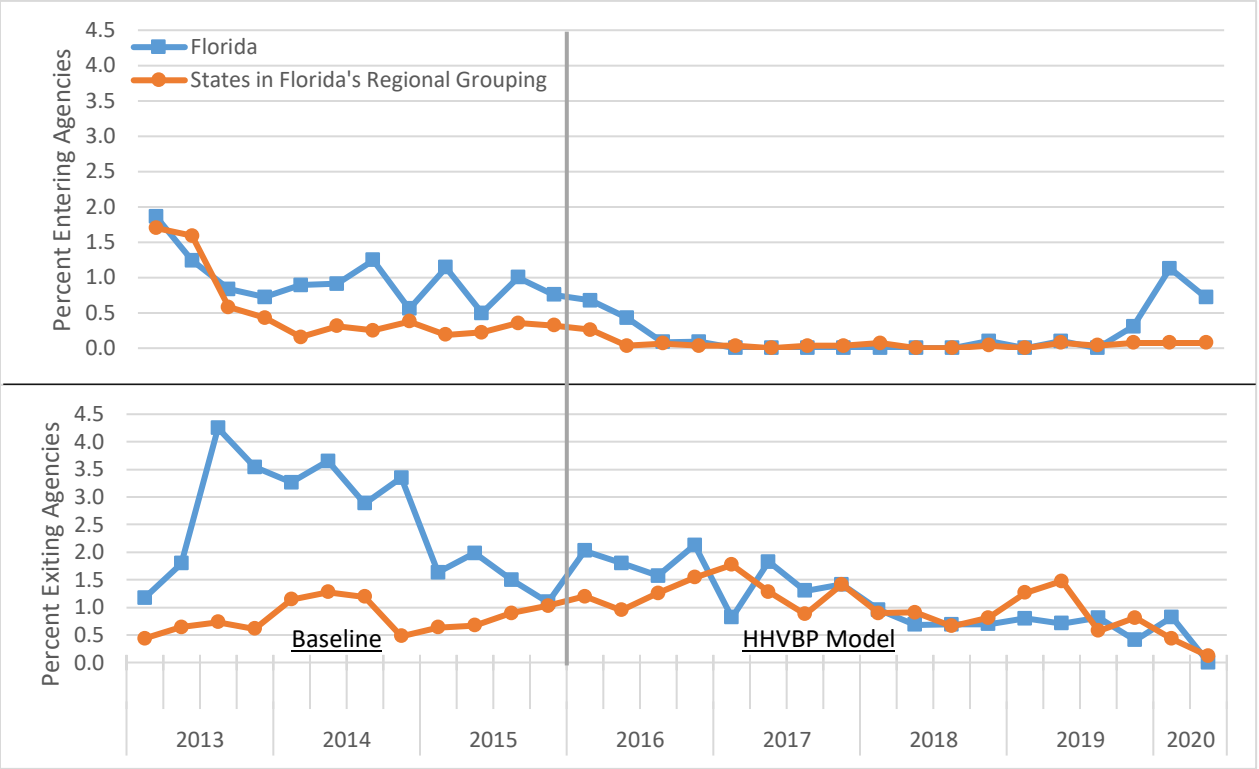
Unlike entry rates, we observed large differences in quarterly agency exit rates between HHVBP and non-HHVBP states prior to HHVBP implementation, with rates sometimes twice as high in HHVBP states compared with non-HHVBP states. For example, exit rates of open HHAs in HHVBP states ranged from 0.9 percent to 2.6 percent from 2013 through 2015, whereas exit rates in non-HHVBP states ranged from 0.5 percent to 1.1 percent (Exhibit 7). Post-implementation, quarterly agency exit rates have remained similar for the two groups through Q2 of 2020.

A number of HHVBP states—specifically, Florida, Massachusetts, Arizona, and Iowa —strongly influenced the differences between HHVBP and non-HHVBP states during the pre-implementation period, with the majority of new agencies in HHVBP states located in these states. The number of agencies opening in Florida decreased after implementation of the HHVBP Model and eventually stopped completely (Exhibit 8), reflecting the effect of the CMS moratorium on new Medicare HHAs in Florida. Meanwhile, agencies continued to open in other HHVBP states (Exhibit 9)—primarily in Massachusetts, Arizona, and Iowa. In Florida, we observe new HHAs opening in late 2019 after CMS lifted the moratorium in early 2019 (CMS, 2021).

Florida also influenced the relatively high exit rates among HHVBP states observed in the pre-implementation period, although its difference from states in its regional grouping became smaller in late 2015 (Exhibit 8). As with the overall rates at which new agencies entered (Exhibit 7), agency exit

rates were relatively similar overall for Florida and its regional grouping in the post-implementation period.

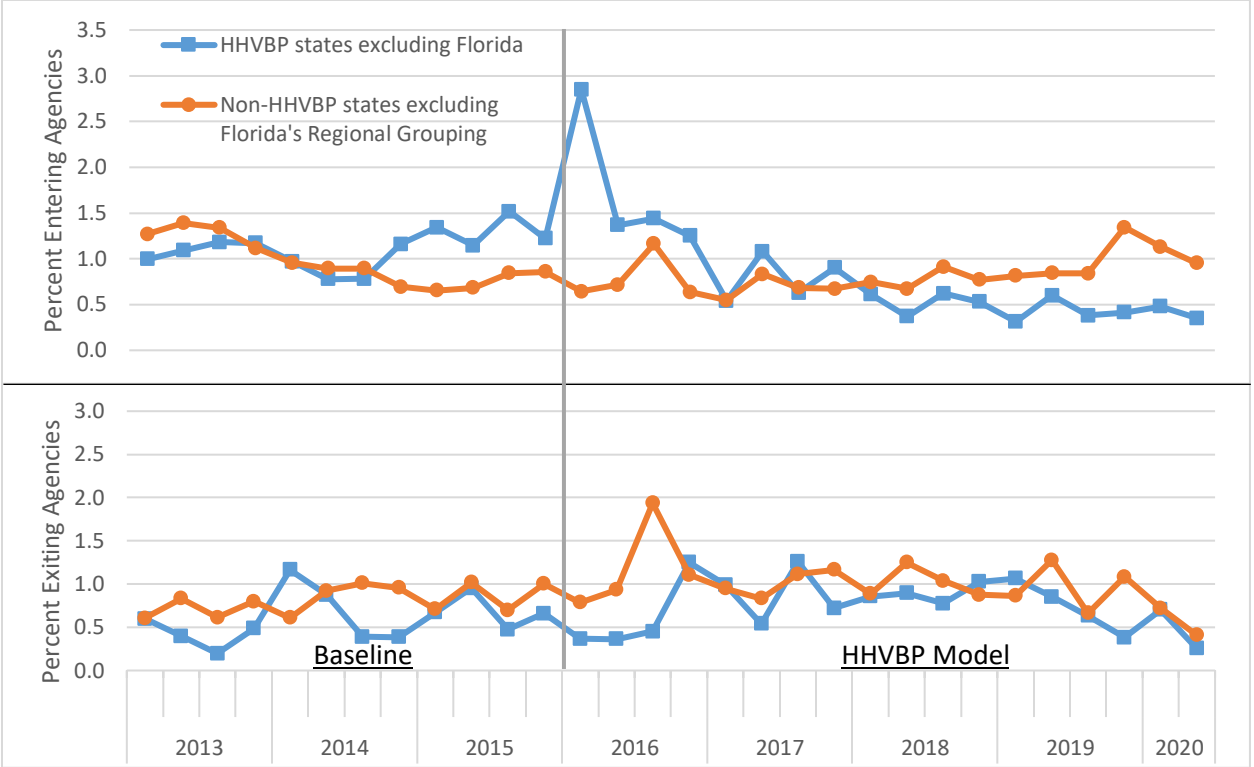
Exhibit 8. Quarterly Percentages of New and Terminating HHAs in Florida Generally Remained Similar to its Regional Grouping during the Post-Implementation Period, 2013 Q1-2020 Q2



For Regional Grouping definitions, see Exhibit 5.

When comparing trends for the eight HHVBP states other than Florida and their combined regional groupings, we note a divergence in entry rates between the two groups since 2018 that is due to an increase in entries among the non-HHVBP states (Exhibit 9). In contrast, exit rates have remained relatively similar for the two groups following model implementation.

Exhibit 9. Similar Quarterly Percentages of Terminating HHAs in HHVBP and Non-HHVBP States When Excluding Florida and its Regional Grouping and a Divergence in New HHAs between the Two Groups Since 2018, 2013 Q1-2020 Q2



For Regional Grouping definitions, see Exhibit 5.

3.3 Overall Decline in Utilization of Home Health Care by FFS Beneficiaries

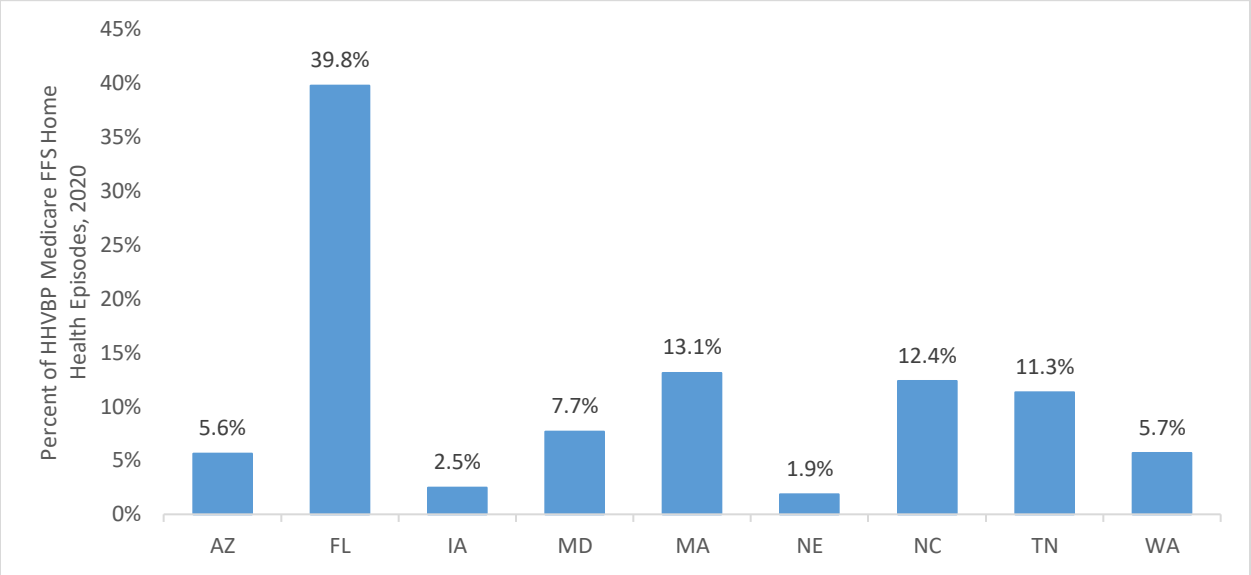
As demonstrated in the previous section, CMS implemented HHVBP in a market where the number of agencies in operation nationally had been declining over time. While there has been no apparent overall impact of HHVBP on the number of agencies in operation, including any wide-ranging effects on the market entry and exit decisions of agencies, we also examined whether utilization of home health care among Medicare FFS beneficiaries has changed because of the model. However, in evaluating effects of the model, it is important to understand how the characteristics of the home health populations in the HHVBP and non-HHVBP states compared to each other before model implementation. As we discuss below, we found differences among the nine HHVBP states in the underlying levels of home health utilization.

Overall, the nine HHVBP states and 41 non-HHVBP states were largely similar with regard to a range of home health beneficiary, agency, and episode characteristics during 2013-2015 (see Section B.1 [Page 119] in the Technical Appendix for additional information). These comparisons informed the development of our analytic approach, including the use of regression adjustment to account for factors with somewhat less balance between the treatment and comparison groups (see Section A.1 [Page 4] in the Technical Appendix for details).

In 2020, the 1,907 HHAs operating in HHVBP states (Exhibit 6) provided nearly 2.1 million home health episodes to 734,951 Medicare FFS beneficiaries; the 8,368 HHAs in the 41 non-HHVBP states provided over 6.9 million home health episodes to 2.3 million Medicare FFS beneficiaries (see Exhibit B-4 [Page

124] in the Technical Appendix). The states that comprise the HHVBP group differ substantially in the size of their home health populations. As Exhibit 10 shows, Florida alone accounted for 39.8 percent of all FFS home health episodes in the HHVBP states in 2020. At the other extreme, Nebraska and Iowa accounted for just 1.9 percent and 2.5 percent of episodes in the HHVBP states, respectively.

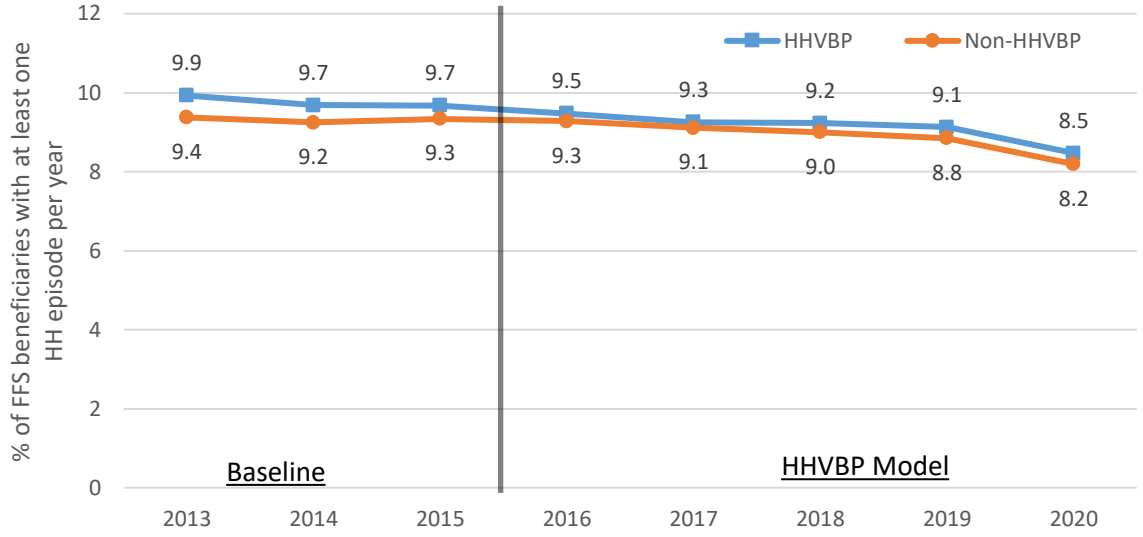
Exhibit 10. Florida Accounts for Largest Percent of HHVBP Medicare FFS Home Health Episodes, 2020



To explore the potential impact of HHVBP on home health utilization, we examined trends among Medicare FFS beneficiaries in HHVBP and non-HHVBP states using two measures: the percent of Medicare FFS beneficiaries with at least one home health episode in a given year, and the number of home health days of care per FFS beneficiary per year.

Just under one in ten Medicare FFS beneficiaries utilized home health services each year from 2013-2020 in HHVBP and non-HHVBP states (Exhibit 11). Throughout the eight years examined, the percentage of the Medicare FFS population utilizing home health care has remained slightly higher in HHVBP states compared with non-HHVBP states (Exhibit 11). We observed a decrease in Medicare FFS beneficiaries with at least one home health episode in both groups both before and after implementation of HHVBP. Between the year prior to model implementation (2015) and the most recent year of the model (2020), there was a 1.2 percentage point decline in HHVBP states and a 1.1 percentage point decline in non-HHVBP states. Both HHVBP and non-HHVBP states had their largest decline in 2020 (from 9.1 to 8.5 percent in HHVBP states, and from 8.8 to 8.2 percent in non-HHVBP states).

Exhibit 11. Slight Decline in Home Health Utilization among Medicare FFS Beneficiaries in both HHVBP and Non-HHVBP States, 2013-2020

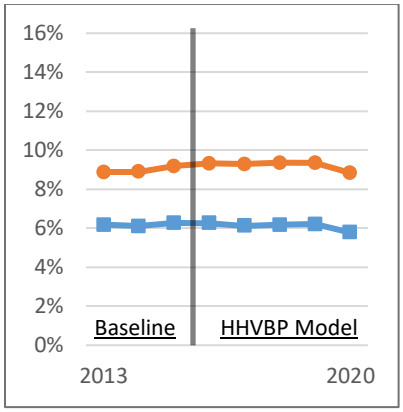


Prior to the implementation of HHVBP, levels of home health utilization varied across HHVBP states, but trends in home health utilization for each HHVBP state were similar to the non-HHVBP states in their regional grouping, which are used as the comparison groups for state-level analyses in this report (Exhibit 12). Among the nine HHVBP states, the percentage of Medicare FFS beneficiaries using home health services during the pre-HHVBP period ranged from a high of approximately 14 percent in Florida to a low of approximately five percent in Iowa. The patterns observed across states remained relatively similar from 2013 to 2020, with the percent of Medicare FFS beneficiaries utilizing home health care remaining approximately 2.5 times higher in Florida than in Iowa during both the pre-HHVBP and post-HHVBP periods.

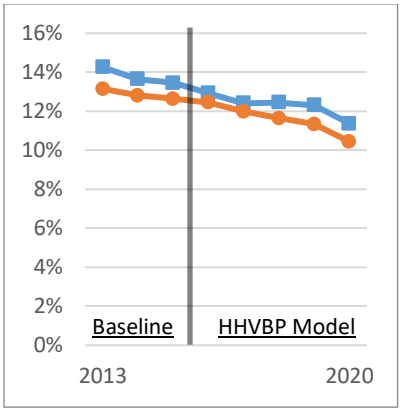
The decline in home health utilization among Medicare FFS beneficiaries in 2020 was observed in all nine HHVBP states as well as their regional groupings (Exhibit 12). In prior years, there was variation among the HHVBP states, with declines in home health utilization among Medicare FFS beneficiaries in Florida and also to a lesser extent in Iowa, Massachusetts, and Tennessee. Meanwhile, home health utilization remained relatively more stable over the eight-year period in Arizona, Maryland, Nebraska, North Carolina, and Washington.

Exhibit 12. Similar Trends in the Utilization of Home Health Services among Medicare FFS Beneficiaries in HHVBP States and their Corresponding Regional Groupings

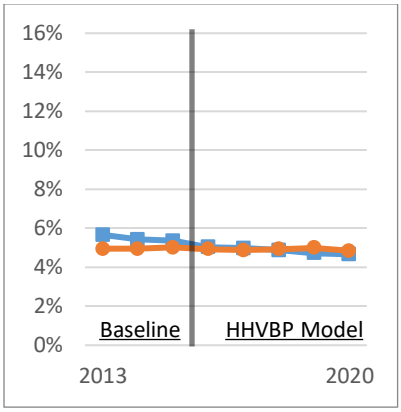
Arizona



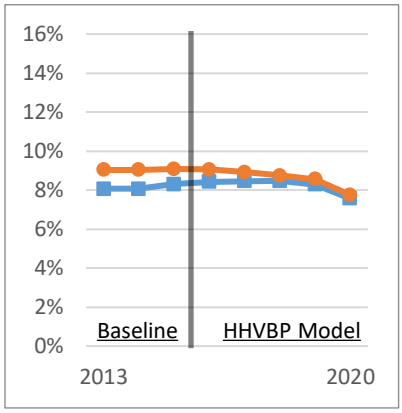
Florida



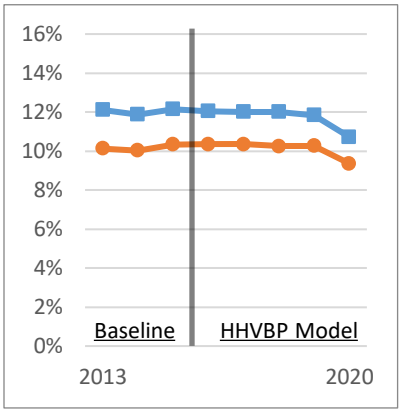
Iowa



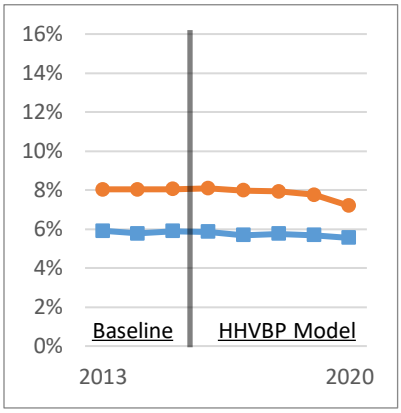
Maryland



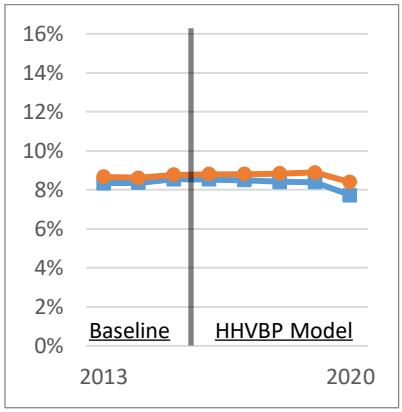
Massachusetts



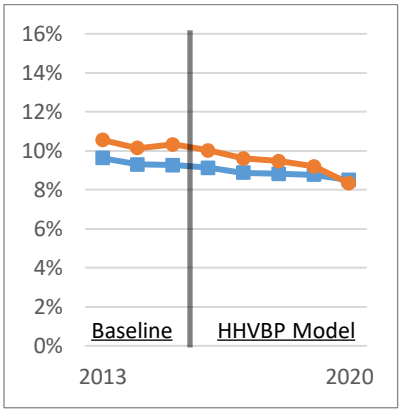
Nebraska



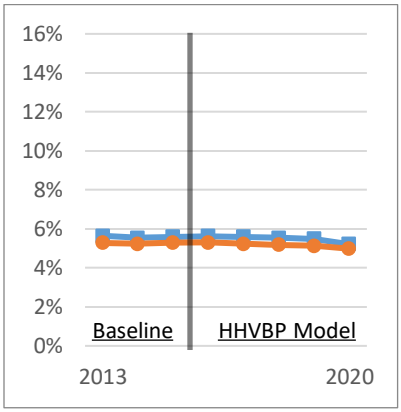
North Carolina



Tennessee



Washington

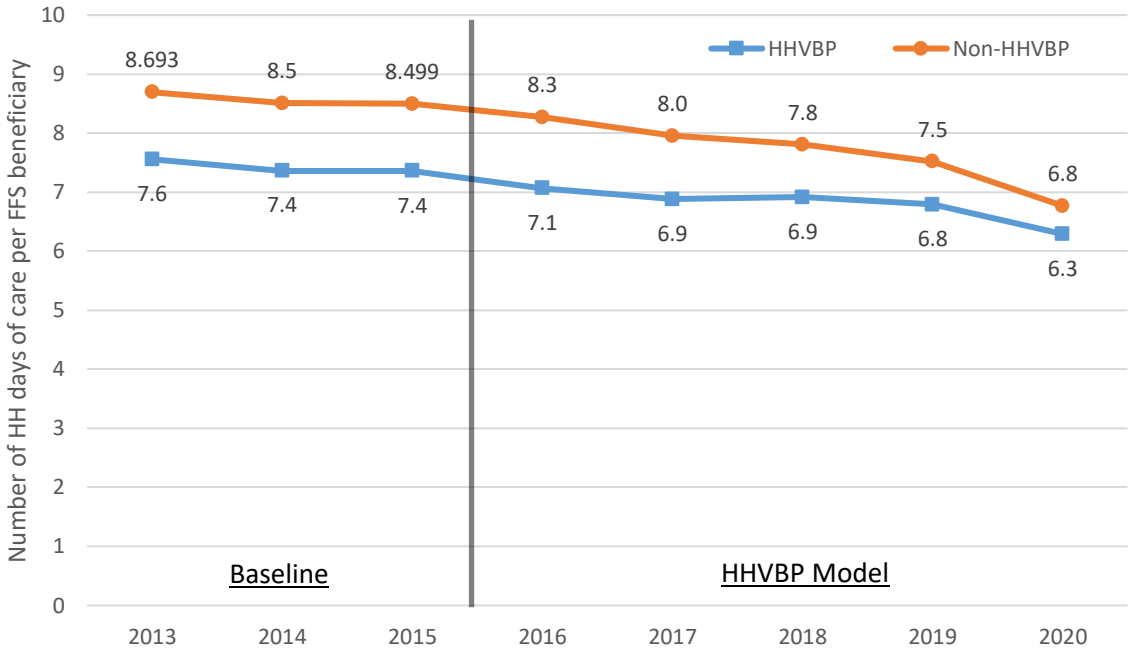


HHVBP
Non-HHVBP

"Non-HHVBP" reflects the states in the corresponding HHVBP state's Regional Grouping (Exhibit 5).

We also examined home health utilization based on a measure of volume: the number of home health days of care per Medicare FFS beneficiary. This measure of the volume of home health services reflects a combination of the frequency of home health episodes and duration of episodes that is similarly applicable both before and after the introduction of PDGM.[11] Nationally, differences during the pre-HHVBP baseline years (2013-2015) were consistent with a difference of about 1.1 home health days of care per FFS beneficiary between HHVBP and non-HHVBP states for each of the three years (Exhibit 13). Similar to our findings above, we found evidence of a decline over time in the number of home health days of care per FFS beneficiary for both groups prior to implementation of HHVBP, with HHVBP states having a somewhat steeper decline of -2.6 percent relative to -2.3 percent for non-HHVBP states. This downward trend continued into the post-implementation period for HHVBP and non-HHVBP states. With the introduction of PDGM in 2020, the duration of home health episodes changed from 60 days to 30 days under the home health PPS. Similar to the other home health utilization measure explored above (Exhibit 11), the largest decline in volume of home health care was also in 2020 (from 6.8 to 6.3 days in HHVBP states, and from 7.5 to 6.8 days in non-HHVBP states; Exhibit 13).

Exhibit 13. Average Number of Home Health Days of Care Trends Downward among Medicare FFS Beneficiaries in Both HHVBP and Non-HHVBP States, 2013-2020



Expanding on our descriptive analyses that showed similar declines in home health utilization across HHVBP and non-HHVBP states, we conducted D-in-D analyses of both utilization measures with adjustment for a limited number of FFS beneficiary characteristics, state fixed effects, and state-specific linear time trends. These analyses yielded non-significant D-in-D estimates, suggesting that the

[11] In previous reports we used home health episodes per 1,000 FFS beneficiaries to examine home health volume. With the introduction of the PDGM in 2020 that changed the length of home health episodes from 60 days to 30 days, we instead use home health days per FFS beneficiary to examine home health volume so that the measure is comparable both pre- and post-PDGM. See Exhibit A-40 [Page 64] in the Technical Appendix.

implementation of HHVBP did not impact home health utilization for Medicare FFS beneficiaries differentially in HHVBP states relative to non-HHVBP states, either overall during 2016-2020, or in most individual years of the model (Exhibit 14).

Exhibit 14. Difference-in-Differences Analyses Reveal No Impact of HHVBP on Home Health Utilization among FFS Beneficiaries, 2013-2020

	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	% Relative Change
	D-in-D	p-value	Lower 90% CI	Upper 90% CI		
Percent of FFS Beneficiaries with at Least One HH Episode[a]						
2016	-0.07	0.06	-0.13	-0.01	9.76%	-0.7%
2017	0.0005	0.99	-0.13	0.13		0.01%
2018	0.20	0.23	-0.07	0.46		2.0%
2019	0.35	0.19	-0.09	0.78		3.6%
2020	0.38	0.25	-0.16	0.93		3.9%
Cumulative	0.17	0.31	-0.10	0.44		1.7%
Number of HH Days of Care per FFS Beneficiary						
2016	-0.11	0.22	-0.26	0.04	7.43	-1.5%
2017	0.07	0.62	-0.17	0.32		0.9%
2018	0.31	0.20	-0.09	0.71		4.2%
2019	0.52	0.16	-0.08	1.11		7.0%
2020	0.66	0.14	-0.08	1.40		8.9%
Cumulative	0.29	0.25	-0.13	0.70		3.9%

[a] D-in-D and 90% CI values represent percentage point changes. | CI= Confidence Interval. | See Section A.1.4.2 [Page 9] of the Technical Appendix for a description of the beneficiary characteristics included in the D-in-D models. | See Exhibit 14n (Page 197) in the Technical Appendix for each measure's sample size.

As with our findings for all HHVBP states combined, we found no evidence of an HHVBP effect on home health utilization in most individual states. The exceptions include Iowa and Tennessee, where there is evidence of a relative increase in home health utilization compared with their regional groupings. Tennessee shows a relative increase in both utilization measures compared to the states in its regional grouping, whereas for Iowa there is evidence of a relative increase in the volume measure only. Based on the D-in-D models, the cumulative D-in-D estimate for the percent of FFS beneficiaries with at least one home health episode was 0.70 percent for Tennessee, which corresponds to a 7.4 percent change from its baseline average of 9.4 percent. Results from the cumulative D-in-D model for the measure of volume (i.e., number of home health days of care per FFS beneficiary) suggested similar patterns for Tennessee and Iowa, with a 16 percent increase for both states relative to baseline averages of 9.9 days and 3.2 days of home health care per FFS beneficiary, respectively. See Exhibit B-10 (Page 135) in the Technical Appendix for additional detail.

3.4 Larger Overall Improvements in Beneficiary Access to Higher Quality Home Health Care in HHVBP States

While the HHVBP Model incentivizes home health agencies to improve the quality of care delivered to beneficiaries, both where beneficiaries live and where they can receive home health services is unevenly clustered across geography. This uneven distribution of beneficiaries and services contributes to

variation in who has access to higher quality home health care and, in turn, who might be benefiting (or facing unintended consequences) from the model. The purpose of this analysis is to understand whether and how model incentives are impacting access to higher quality HHA care, and whether any beneficiary subgroups are inequitably benefiting or bypassed. To more fully examine access, we consider both potential and realized access – examining the utilization of higher quality home health services within the context of its availability where a beneficiary lives.

Our prior analyses documented broad differences in who utilized higher quality home health (defined by star ratings)[12] and where higher quality care was available (Arbor Research, 2020). Comparing the pre-HHVBP period (2014-2015) to the early HHVBP Model years (2016-2017), we observed increases in the number of home health episodes delivered by higher quality HHAs for both HHVBP and non-HHVBP states, but more so in HHVBP states. Further, analyses across a variety of sociodemographic characteristics also revealed that these increases were reflected across most beneficiary communities, with certain small, but critical, exceptions. Specifically, despite an overall 9.4 percentage point increase in the number of home health episodes delivered through higher quality HHAs in HHVBP states, two beneficiary groups did not benefit from this increase in the quality of care: Medicaid enrollees and Hispanic beneficiaries (Arbor Research, 2020). To investigate this trend in utilization of higher quality home health, we extend the initial analysis with an additional two years of data and examine whether these trends continue and whether variation in the supply of higher quality HHAs where beneficiaries live is driving any observed differences in utilization.

3.4.1 Summary of Approach

For a dimensional picture of access, we examine both potential access (i.e., supply, availability) and realized access (i.e., utilization). We first update previous descriptive analyses of realized access with more recent model year data (2018 and 2019), calculating the distribution of home health episodes delivered by 4-, 4.5-, and 5-star rated HHAs over time and stratified by HHVBP and non-HHVBP agencies. For these analyses we leverage the CMS star ratings, which reflect multiple dimensions of quality and are standardized at a national level. While the set of measures used in the star ratings and in HHVBP vary over time, the majority of the star rating measures have been included in the annual TPS scores (see Exhibit 2). We also integrate a second quality measure – the percentage of episodes delivered in agencies with a 'low' ACH rate – to compare and corroborate the results from the overall star rating. The low ACH rate captures a single dimension of quality which is based on claims data (versus being agency-assessed) and corresponds to one of the HHVBP performance measures, whereas the overall star rating reflects multiple dimensions of agency performance and incorporates both agency- and patient-reported data. The distributions are further analyzed by beneficiary sociodemographic characteristics to identify whether there are particular groups of beneficiaries that are more or less likely to use higher quality HHAs.

We next examine potential access to help understand the extent to which availability of higher quality HHAs where a beneficiary lives helps explain differences in the use of higher quality HHAs. Specifically, we seek to understand the correlation between higher quality HHA availability and utilization using the measures of realized and potential access in Exhibit 15 below.

[12] In our Third Annual Report (Arbor Research, 2020), we defined higher quality as HHAs rated as 3.5-, 4-, 4.5- or 5-star agencies. In this report we change the definition slightly to exclude ratings of 3.5. Sensitivity analyses show that this refinement does not have an important impact on our findings.

Exhibit 15. Measures of Realized and Potential Access

Realized Access	Potential Access
Percentage of episodes delivered to beneficiaries in 4-, 4.5-, and 5-star rated agencies	Percentage of episodes delivered to beneficiaries living in counties with more 4-, 4.5-, and 5-star rated agencies per 1,000 home health users[b]
Percentage of episodes delivered to beneficiaries in agencies with 'low' ACH rate[a]	Percentage of episodes delivered to beneficiaries living in counties with more agencies with 'low' ACH rate per 1,000 home health users[b,c]
Difference between the percentage of episodes in 2014-2015 and 2018-2019 delivered to beneficiaries in (i) 4-, 4.5-, and 5-star rated agencies and (ii) low ACH HHAs	Comparison of availability of (i) 4-, 4.5-, and 5-star and (ii) `low' ACH HHAs in 2014-2015 and 2018-2019 by county of residence classified as: always low availability; decreasing availability; increasing availability; or always high availability

[a] Defined as agencies ranked in the top half of ACH distribution (i.e., lowest ACH rates) for the particular year.
[b] Agencies with fewer than 10 episodes per year in a county were excluded from the availability measures.
[c] Counties with more 4-, 4.5-, and 5-star rated HHAs or low ACH rate HHAs for a particular period are those ranked in the top two terciles of the respective availability distribution in 2015 ranking; the lowest tercile reflects low/lower availability of 4-, 4.5-, and 5-star rated HHAs or low ACH rate HHAs. Rankings are based on the number of such HHAs per 1,000 home health users.

Finally, it is important to acknowledge the heterogeneity of HHVBP participating states, from beneficiary populations, episode volumes, HHA characteristics, and other health care infrastructure and patterns. Overall trends in these factors may obscure the experience that beneficiaries living in a particular state may have compared to their counterparts in other states. Thus, we supplement the overall realized and potential access analysis with a stratified analysis by HHVBP state to assess whether beneficiaries in all HHVBP states are experiencing similar quality increases.

3.4.2 Changes in Realized Access to Higher Quality Home Health Agencies

Exhibit 16 refreshes previous analysis with data from the 2018-2019 period, presenting episode distributions across a range of beneficiary characteristics, comparing the periods prior to (2014-2015) and since (2016-2019) the HHVBP Model was implemented and episodes in HHVBP and non-HHVBP HHAs. These distributions allow us to observe which type of beneficiaries are experiencing changes in use of higher quality HHAs over time, and whether those with disproportionately lower utilization are able to close the gap by the 2018-2019 period (see Exhibit B-13 [Page 138] in the Technical Appendix for the distribution of all episodes across each of the five star-rating categories for the three time periods).

As in the previous analysis, the percentage of beneficiaries using a 4-, 4.5-, or 5-star rated agency increased from 2014 to 2019, especially across HHVBP episodes (13.9 percentage points) though also in non-HHVBP episodes (7.4 percentage points; upper panel of Exhibit 16). However, these increases were not evenly reflected across all beneficiary populations and also varied over time. Importantly, disparities in utilization across race and ethnicity, as well as between rural and urban residing beneficiaries, largely disappeared in the HHVBP states. In non-HHVBP states, however, there remained a sizeable gap for Hispanic beneficiaries and the gap reversed for rural beneficiaries, leaving urban beneficiaries receiving

fewer episodes in higher quality agencies. We also see persistent disparities in access to higher quality HHAs for Medicaid enrollees in both HHVBP and non-HHVBP states.[13,14]

Exhibit 16. Overall Increases in Utilization of Higher Quality HHAs in the Post-HHVBP Period Were Larger in HHVBP States Compared to non-HHVBP States, But Differences Persisted for Some Beneficiary Subgroups

	HHVBP				Non-HHVBP			
	2014-2015	2016-2017	2018-2019	Change (2014-2019)	2014-2015	2016-2017	2018-2019	Change (2014-2019)
	%	%	%	Ppt	%	%	%	Ppt
Percent of episodes delivered by 4-, 4.5-, and 5-star rated agencies								
All	37.5	48.3	51.3	13.9	29.5	33.5	36.8	7.4
Race/Ethnicity								
Black	31.0	45.2	50.9	19.9	27.0	30.9	37.0	10.0
Hispanic	40.5	39.9	49.7	9.2	24.0	25.8	28.8	4.8
White	38.1	49.7	51.7	13.6	30.3	34.9	37.8	7.4
Medicaid enrollment								
No	38.4	50.0	53.0	14.6	30.1	34.4	37.7	7.7
Yes	26.9	28.7	30.1	3.2	24.0	25.4	27.8	3.8
Dual eligibility								
No	38.5	49.3	51.9	13.5	30.1	33.7	36.8	6.8
Yes	34.7	45.3	49.4	14.7	27.9	33.0	36.9	9.1
Beneficiary residence								
Urban	37.8	48.4	51.4	13.6	29.7	33.1	36.3	6.6
Rural	28.8	47.2	50.5	21.7	25.7	39.0	43.6	17.8
Percent of episodes delivered by agencies with low ACH rates								
All	32.9	38.1	39.2	6.3	35.7	36.2	35.6	-0.1
Race/Ethnicity								
Black	30.0	32.9	34.9	4.9	33.4	31.6	29.7	-3.7
Hispanic	46.7	42.7	37.9	-8.8	46.4	47.4	43.3	-3.1
White	31.7	38.4	39.9	8.1	34.6	35.5	35.5	0.8
Medicaid enrollment								
No	33.2	38.9	39.9	6.7	36.4	36.8	36.1	-0.3
Yes	29.0	29.1	30.2	1.2	30.2	31.4	30.8	0.6

[13] While Medicaid beneficiaries are not specifically targeted by the model, their OASIS-based outcomes factor into TPS scores and thus HHA payment adjustments. Moreover, agency operations may be affected by the proportion of Medicaid beneficiaries served giving rise to the potential for unintended consequences of the model. As HHAs increase their quality improvement efforts in response to model incentives, we note that not all patients may benefit from the changes in quality.

[14] Limitations to our findings about Medicaid beneficiaries are the uncertainty around the accuracy of the Medicaid enrollment data on the OASIS assessment and the potential variation in how Medicaid status is coded across states.

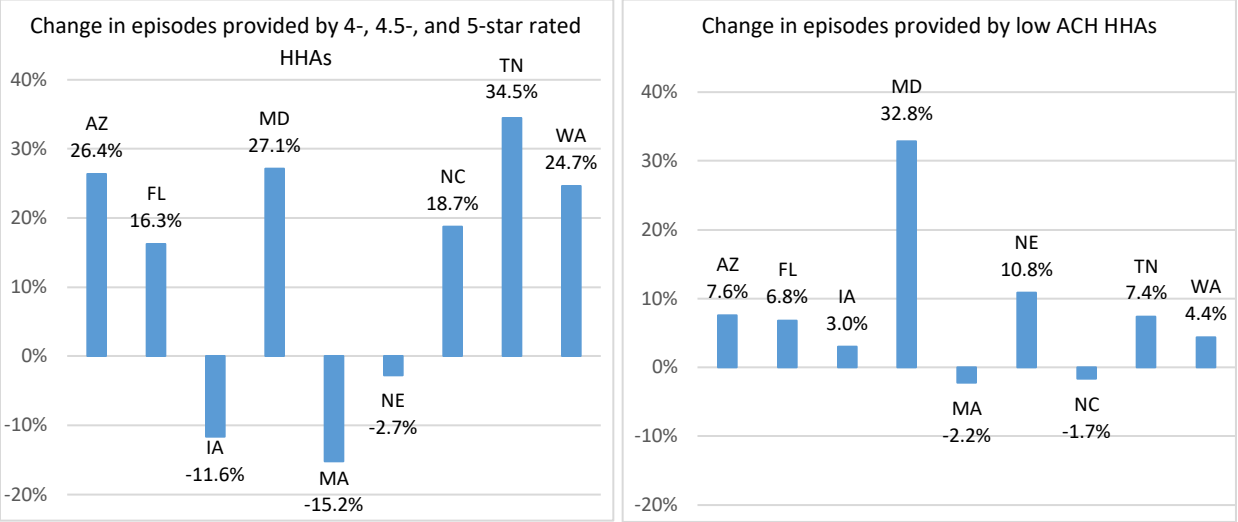
	HHVBP				Non-HHVBP			
	2014-2015	2016-2017	2018-2019	Change (2014-2019)	2014-2015	2016-2017	2018-2019	Change (2014-2019)
	%	%	%	Ppt	%	%	%	Ppt
Dual eligibility								
No	32.3	38.7	40.0	7.7	34.8	35.5	34.8	0
Yes	34.4	36.1	36.4	2.0	38.1	38.3	37.9	-0.2
Beneficiary residence								
Urban	33.1	38.3	39.4	6.3	36.2	36.7	35.7	-0.5
Rural	28.1	33.2	33.1	5.0	30.0	30.5	34.2	4.3

Ppt= percentage. | Low ACH reflects agencies ranked in the top half of ACH distribution.

When performing similar analyses that focus on the ACH measure as one specific dimension of agency performance (see lower panel of **Error! Reference source not found.**), we note both similarities and differences from the star rating results. As with the star ratings, we observe a fairly constant disparity between Hispanic beneficiaries and both Black and White beneficiaries in non-HHVBP states, but a substantial attenuation of the disparity between these groups in HHVBP states. Notably, this attenuation in HHVBP states comes at the expense of Hispanic beneficiaries, who experience an 8.8 percentage point *decrease* in episodes delivered by agencies with low ACH rates compared to the nearly five to eight percentage point *increase* for beneficiaries in other racial and ethnic categories. Using the low ACH measure, the urban-rural gap widens in HHVBP states rather than reversing as with the star ratings measure, and there is a pattern of smaller increases over time in utilization among Medicaid/dual eligible beneficiaries in HHVBP states that is not observed in non-HHVBP states.

Across both measures, we see sizeable increases in the proportion of episodes delivered by higher quality HHAs in HHVBP states – 13.9 percentage points with the star ratings measure and 6.3 percentage points for the ACH measure (Exhibit 16). These increases, however, mask dramatic variation across the HHVBP states. As seen in Exhibit 17, there is a notable range in the changing share of episodes delivered by highly rated HHAs across HHVBP states; for the star ratings measure, we observe an increase of 34.5 percentage points in Tennessee to a decline of 15.2 percentage points in Massachusetts. The range is slightly smaller for the low ACH measure, with a high of 32.8 percentage points in Maryland and a decrease of 2.2 percentage points in Massachusetts.

Exhibit 17. Post-HHVBP Changes in Realized Access to Higher Quality Agencies Vary across HHVBP States



Change reflects pre-HHVBP period (2014-2015) to post-HHVBP Model (2018-2019.) | Low ACH reflects agencies ranked in the top half of ACH distribution.

3.4.3 Changes in Availability of Higher Quality Home Health Agencies

In this section, we investigate changes in availability of higher quality home health services – using the two definitions of availability described in Exhibit 15 – to understand their contribution to observed changes in utilization. For each year, we defined counties as having low or high availability to distinguish between areas with high availability that experience small gains and those with lower availability that experience large gains.

Exhibit 18 presents the share of episodes delivered to beneficiaries living in counties with higher quality HHAs. As with utilization, availability of 4-, 4.5-, or 5-star rated agencies increases from pre- to post-implementation of HHVBP across both HHVBP and non-HHVBP states, with a larger increase in HHVBP states (8.8 percentage points) than non-HHVBP states (5.8 percentage points). However, we again observe different patterns across some of the sociodemographic characteristics. Potential access for Hispanic beneficiaries increases over the time period in non-HHVBP states, although less so than for Black and White beneficiaries, leaving Hispanic beneficiaries facing slightly lower availability. In HHVBP states, while Hispanic beneficiaries have comparable, or greater, access than Black and White beneficiaries in the 2018-2019 period, availability of 4-, 4.5-, or 5-star rated agencies where they live appears to decline over time. In both non-HHVBP and HHVBP states, there is greater pre-HHVBP availability of more highly rated agencies for rural residents than for urban residents, with the gap widening in the post-HHVBP period.

Exhibit 18. Overall Increases in Potential Access to Higher Quality HHAs in the Post-HHVBP Period Were Larger in HHVBP States Compared to non-HHVBP States, but Differences Persisted for Some Beneficiary Subgroups

	HHVBP				Non-HHVBP			
	2014-2015	2016-2017	2018-2019	Change (2014-2019)	2014-2015	2016-2017	2018-2019	Change (2014-2019)
	%	%	%	Ppt	%	%	%	Ppt
Percent of episodes delivered in counties with more 4-, 4.5-, or 5-star rated agencies								
All	62.9	71.1	71.7	8.8	62.4	66.6	68.2	5.8
Race/Ethnicity								
Black	58.2	74.3	78.3	20.0	59.8	62.5	67.1	7.4
Hispanic	81.4	76.5	79.8	-1.6	61.2	64.3	65.0	3.8
White	61.8	70.5	70.3	8.5	62.8	67.5	68.8	6.0
Medicaid enrollment								
No	64.9	73.0	73.7	8.8	63.6	67.9	69.6	5.9
Yes	39.4	49.1	45.2	5.8	51.8	54.9	54.8	3.0
Dual eligibility								
No	61.6	70.7	71.5	9.8	62.3	66.2	67.9	5.6
Yes	66.2	72.4	72.3	6.1	62.9	67.7	69.4	6.5
Beneficiary residence								
Urban	62.6	70.7	71.0	8.6	61.8	65.2	66.9	5.1
Rural	70.2	81.3	83.4	13.2	70.7	84.7	85.8	15.1
Percent of episodes delivered to beneficiaries living in counties with more low ACH agencies								
All	47.7	48.3	45.5	-2.2	61.1	59.5	59.1	-2.0
Race/Ethnicity								
Black	42.3	40.0	39.6	-2.7	59.2	53.7	51.9	-7.3
Hispanic	77.1	66.6	64.6	-12.5	72.3	73.4	71.7	-0.6
White	45.5	48.1	45.0	-0.5	60.0	58.8	58.9	-1.1
Medicaid enrollment								
No	48.5	49.8	46.8	-1.7	62.0	60.4	60.1	-1.9
Yes	37.9	30.5	28.9	-9.1	53.0	50.5	48.8	-4.2
Dual eligibility								
No	45.5	47.8	44.9	-0.6	60.1	58.6	58.4	-1.8
Yes	53.5	49.8	47.3	-6.2	63.6	61.9	61.3	-2.3
Beneficiary residence								
Urban	46.6	47.0	44.0	-2.6	60.3	58.6	57.9	-2.4
Rural	72.0	77.9	80.5	8.4	71.0	71.3	75.1	4.1

Ppt= percentage. | Low ACH reflects agencies ranked in the top half of ACH distribution.

In contrast to the star ratings measure, results for the ACH measure (see the lower panel of Exhibit 18) show availability declining slightly across the study period, by 2.2 and 2.0 percentage points in HHVBP and non-HHVBP states, respectively. Across both groups of states, Hispanic beneficiaries appear to face substantially better availability than Black and White beneficiaries, though Black beneficiaries experienced the largest declines in non-HHVBP states, and Hispanic beneficiaries experienced the largest declines in HHVBP states. We see both improved and greater availability for rural residents

across the board compared to urban residents. Across both measures, large disparities persist in both potential and realized access for Medicaid enrollees compared to those not enrolled in Medicaid.

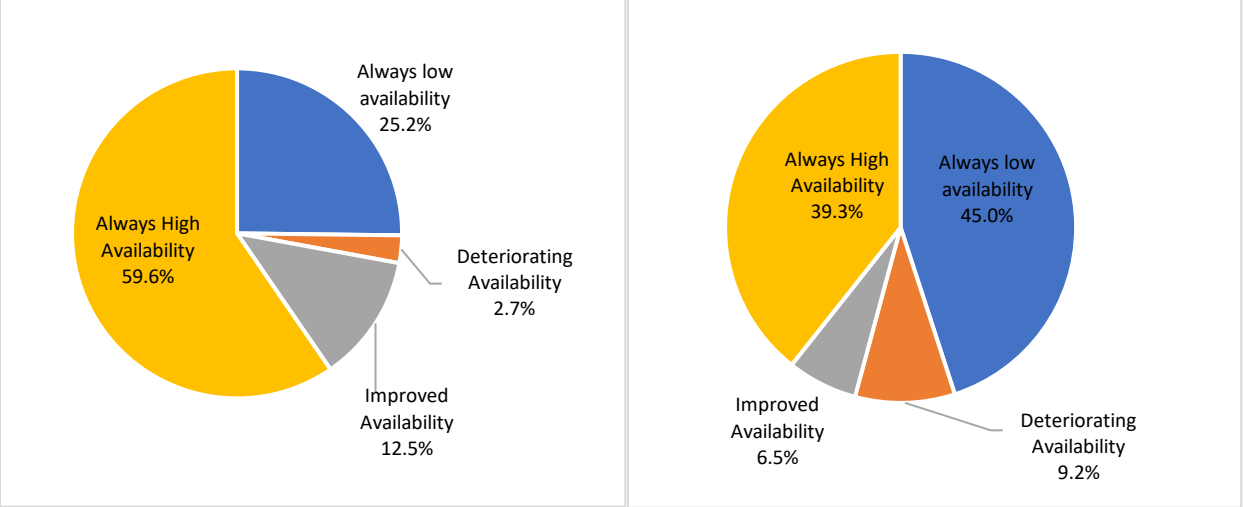
3.4.4 Gains and Losses in Availability of Higher Quality HHAs across HHVBP States

Given the larger overall increase in availability of higher quality HHAs in HHVBP states, we also assessed the distribution of episodes across counties categorized by how availability has changed over time. That is, comparing availability in 2014-2015 and 2018-2019, we examine the proportion of these episodes delivered in counties that:

- always have higher quality HHAs available,
- experienced improvements in availability of higher quality HHAs,
- experienced declines in the availability of higher quality HHAs, or
- always have low availability.

For the star rating measure, we find that the majority of episodes were delivered in counties that have maintained high availability of 4-, 4.5-, or 5-star rated HHAs (59.6 percent of episodes in 2018-2019), while a much smaller percentage of episodes (12.5 percent) were delivered in counties where potential access improved (Exhibit 19). Based on the low ACH measure, we see a much larger share (45.0 percent) of episodes associated with counties with continuous low availability of higher quality HHAs.

Exhibit 19. Most Home Health Episodes are Provided in Counties with Either Persistently High or Low Availability of Higher Quality Agencies between 2014-2015 and 2018-2019, based on Star Ratings (left panel) and Low ACH Rate (right panel)

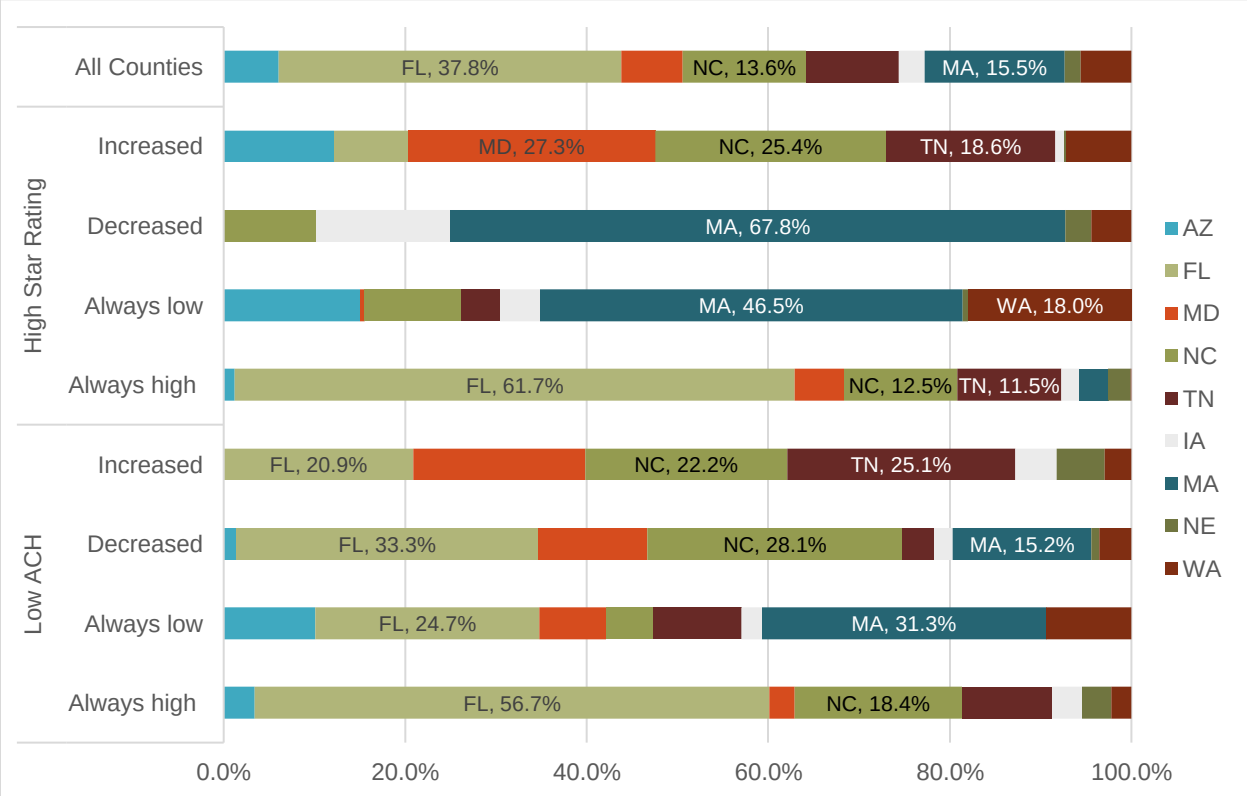


Counties are categorized by how availability of higher quality HHAs has changed between pre-HHVBP (2014-2015) and post-HHVBP (2018-2019) periods, based on the availability of 4-, 4.5-, or 5-star agencies or the availability of agencies with low ACH rates (i.e., agencies ranked in the top half of ACH distribution).

These distributions are shown in more detail in Exhibit 20, with the top bar presenting the distribution of home health episodes for all counties across HHVBP states and providing a benchmark for interpreting the state-focused distributions in the remainder of the chart. For example, the top bar shows that 15.5 percent of all episodes in 2018-2019 were delivered to beneficiaries in Massachusetts. In comparison, when using the star ratings measure to define changes in availability of higher quality HHAs, we see that Massachusetts comprises 46.5 percent of episodes in the persistently low availability category and

nearly 68 percent in the category with declining availability (Exhibit 20), both far higher than the 15.5 percent overall share. This suggests that beneficiaries in Massachusetts have notably and disproportionately low access to higher quality HHAs compared to their counterparts in other HHVBP states and that the observed increases in access to higher quality HHAs are bypassing Massachusetts beneficiaries. In addition to Massachusetts, Washington and Arizona are both over-represented in the always low availability category, while Arizona is overrepresented in the category of increased improvements in availability. By contrast, Florida, the largest state by overall episode volume (37.8 percent), has no counties with always low or decreased availability, but accounts for 61.7 percent of episodes in counties with always high availability.

Exhibit 20. Distribution of Home Health Episodes across HHVBP States Varies among Counties Classified by Changes in the Availability of Higher Quality HHAs between 2014-2015 and 2018-2019



Counties are categorized by how availability of higher quality HHAs has changed between pre-HHVBP (2014-2015) and post-HHVBP (2018-2019) periods. Percentages shown in the exhibit represent the percent of episodes in each type of county (e.g., counties with an increased availability of higher quality HHAs over time based on star ratings) that correspond to each HHVBP state. High star rating = 4-, 4.5-, & 5-star rated. Low ACH = agencies ranked in the top half of ACH distribution.

In addition to wide variation in episode volume, HHVBP states differ in beneficiary demographic and health characteristics in ways that affect how different beneficiary subpopulations are likely to fare with respect to availability. For example, in supplemental analyses (not shown), we found that Hispanic beneficiaries are more highly concentrated in particular HHVBP states, as almost two-thirds (65.8 percent) of the counties defined as “high Hispanic” were located in Florida, in comparison to just over one-quarter (25.9 percent) in Massachusetts and 7.0 percent and 1.2 percent, respectively, in Arizona

and Washington. This finding highlights that an underlying cause of the disparity in use of higher quality HHAs facing Hispanics is their geographic concentration in states with lower availability.

Using the low ACH rate to define availability of higher quality HHAs, beneficiaries living in Massachusetts counties continue to disproportionately experience low availability (Exhibit 20), and those in Florida continue to be over-represented in the always high availability group (56.7 percent). Availability of higher quality agencies in North Carolina appears to be undergoing considerable change, with counties over-represented in those decreasing and increasing in availability (28.1 percent and 22.2 percent, respectively).

3.5 Four of Five Patient Case Mix Indicators Show Little Evidence that HHVBP Causes Agency Selection of Less Sick Patients

To explore further how HHVBP may have affected home health utilization and access to care, we also examined changes in the case-mix of home health beneficiaries. The change in financial incentives faced by HHAs in HHVBP states may affect agencies' decisions to accept patients for care. For example, agencies may engage in patient selection to obtain a favorable risk profile that enables them to obtain a higher TPS. However, such patient selection would be contrary to the intended impacts of HHVBP if this behavior, for example, reduces access to quality home health care for some patients at greater risk of hospitalization.

To understand how HHVBP may affect agencies' acceptance of patients based on their risk for health complications, we examined five patient case-mix measures:

(1) HCC score during the year prior to the start of the earliest episode in a sequence (which we refer to as, "HCC score at the start of care"), based on Medicare claims.
(2) A composite measure of mobility at the start of care, which includes OASIS information about ambulation/locomotion, toilet transferring, and bed transferring. This is the start of care measure used in the total normalized composite (TNC) change in mobility measure.
(3) A composite measure of self-care at the start of care, which includes OASIS information about ability to groom, to dress upper and lower body, bathing, toileting hygiene, and eating. This is the start of care measure used in the TNC change in self-care measure.
(4) A measure indicating the presence of conditions at risk of limited functional improvement, using primary and secondary diagnosis codes from OASIS at the start of care.
(5) The count of HCC conditions present at the start of care, using primary and secondary diagnosis codes from OASIS.

For all five measures, higher values indicate increased patient severity. See Section A.5.1.1 of the Technical Appendix (Page 101) for more detail on these case-mix measures.

The CY 2020 final rule for the HHVBP Model noted many public comments suggesting the use of performance measures of stabilization, which identify patients whose function has not declined, including both those who have improved or stay the same (HHS, 2019). That final rule, in summarizing comments supporting stabilization measures for the HHVBP Model, noted that stabilization is sometimes a more realistic goal than improvement for some patients. The risk adjustment methodology for the TNC change in self-care and change in mobility measures was designed to account for instances where the goal of home health care is to maintain the patient's current condition or prevent or slow

further deterioration (HHS, 2021). However, it remains an empirical question whether the risk adjustment of these performance measures in the HHVBP Model adequately mitigates incentives that agencies may face to avoid certain types of patients for whom improvement during home health care may not be an appropriate goal as opposed to goals of stabilization or decreased deterioration of function. If the risk adjustment of these measures is inadequate, then barriers to accessing home health care may increase for patients who have greater risk of limited or no improvement during home health care as measured by the TNC change in self-care and change in mobility measures.

In an effort to evaluate possible unintended adverse effects of HHVBP on access to home health care for patients at risk of limited improvement, we added two new measures to our case-mix analysis for this report (measures (4) and (5) listed above). We created these measures using HCC indicators based on primary and secondary International Classification of Disease (ICD) ninth and tenth edition diagnosis codes on the OASIS form at the start of care (see A.2.1.2 for a description of the construction of HCC indicators). The first of the two measures focused on patients with HCC conditions that are associated with lower average TNC change in self-care and change in mobility measure values before the HHVBP Model took effect (see Exhibit A-39 [Page 58] in the Technical Appendix to see these baseline averages by HCC condition). The second measure focuses on the number of HCC conditions a patient has at the start of care. Preliminary exploration of this measure shows that generally, as the number of HCC conditions increases, both the baseline and post-HHVBP averages of TNC change in self-care and change in mobility measures decrease (see Exhibit A-63 [Page 102] in the Technical Appendix). This suggests that patients with more HCC conditions at the start of care may have a lower chance of functional improvement in terms of self-care and mobility. The association between these two new measures and lower improvement in self-care and mobility during the baseline period made these measures good candidates to identify patients who were relatively less likely to improve in functional status and allowed us to evaluate if these patients were less likely to be selected for care based on an agency's HHVBP status.

Broadly, we found increases of 2 to 24 percent over time in patient severity measures from 2013-2020 for all five measures of case-mix in HHVBP and non-HHVBP states (Exhibit 21). For example, average HCC scores at the start of care increased by 0.3 (11 and 12 percent of the respective baseline values) in both groups, from 2.7 in the baseline period to 3.0 in the HHVBP states and from 2.6 to 2.9 in non-HHVBP states. With the exception of HCC score and count of HCC conditions at the start of care, HHVBP states had a higher increase in the case-mix measures between the baseline period and post-HHVBP period compared to the non-HHVBP states.

Exhibit 21. Small Increases in Means for Measures of Case-Mix Severity from Baseline to Post-HHVBP Period in HHVBP and Non-HHVBP States

Measure	HHVBP States		Non-HHVBP States		Change in Mean	
	Baseline (2013-2015)	Post-HHVBP (2016-2020)	Baseline (2013-2015)	Post-HHVBP (2016-2020)	HHVBP States	Non-HHVBP States
HCC Score at the Start of Care	2.7	3.0	2.6	2.9	0.3	0.3
TNC Mobility at Start of Care	5.0	6.2	5.0	6.1	1.2	1.1
TNC Self-Care at Start of Care	9.7	11.4	9.6	11.1	1.7	1.5
Conditions at Risk of Limited Functional Improvement	22.8%	23.5%	21.9%	22.3%	0.7	0.4
Count of HCC Conditions Present at Start of Care	1.7	1.9	1.8	2.0	0.2	0.2

For each measure of patient case-mix, we estimated a D-in-D model, adjusted for agency characteristics (i.e., agency size, chain affiliation, ownership type), county level characteristics (i.e., rural status, education), interactions between HHVBP status and agency characteristics and county characteristics, county-level COVID-19 rate categories, county-level COVID-19 inpatient hospitalization rate, state fixed effects, and state-specific linear trends to examine differences between HHVBP and non-HHVBP states. We included state linear trends in the regression model to account for a lack of parallel trends found in the baseline period between HHVBP and non-HHVBP states in three of the five health status measures (see Section A.1.5.3 [Page 38] of the Technical Appendix).

We found a decline in average HCC score at the start of care across the five years, as well as individually for each of the five years, in HHVBP states relative to non-HHVBP states (Exhibit 22). The cumulative average estimate of -0.07 for this measure translates to a decrease of 2.6 percent per year relative to the baseline average of 2.67. Given the relationship between HCC scores and average spending in the entire Medicare FFS population (CMS, 2018), which was approximately $10,369 per Medicare FFS beneficiary during the HHVBP Model period, the average estimated impact on HCC score of -0.07 translates into an annual impact on predicted spending of approximately -$726 per beneficiary. The yearly estimate of this impact on HCC risk score increased in magnitude each year, and may suggest an emerging impact on patient selection, which will be something to continue to monitor as the HHVBP Model progresses. In contrast, we did not find evidence of a cumulative impact of HHVBP on patient severity at the start of care for the two composite measures of functional status (Exhibit 22). However, we note evidence of a decline in functional impairment for the latest two years (2019 and 2020) in HHVBP states compared with non-HHVBP states (Exhibit 22). We saw a similar trend in the measure indicating the presence of conditions at risk of limited functional improvement, with no evidence of a cumulative impact but negative yearly estimates that increase in magnitude over time showing some evidence of a decline in later years for HHVBP states compared to non-HHVBP states. There is also no evidence of a difference between HHVBP and non-HHVBP states cumulatively or yearly in the measure of count of HCC conditions at the start of care.

Exhibit 22. Slower Growth in Patient Severity for One of Five Case-mix Measures in HHVBP States Compared to Non-HHVBP States

	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	Percent Relative Change
	D-in-D	p-value	Lower 90% CI	Upper 90% CI		
HCC Score at the Start of Care						
2016	-0.01	0.03	-0.02	-0.004	2.67	-0.4%
2017	-0.04	<0.001	-0.06	-0.02		-1.5%
2018	-0.07	<0.001	-0.09	-0.05		-2.6%
2019	-0.10	<0.001	-0.13	-0.07		-3.7%
2020	-0.12	<0.001	-0.15	-0.08		-4.5%
Cumulative	-0.07	<0.001	-0.09	-0.05		-2.6%
TNC Mobility at Start of Care						
2016	0.04	0.15	-0.01	0.08	4.98	0.8%
2017	0.03	0.45	-0.04	0.11		0.6%
2018	-0.04	0.51	-0.13	0.06		-0.8%
2019	-0.13	0.09	-0.25	-0.003		-2.6%
2020	-0.21	0.02	-0.37	-0.06		-4.2%
Cumulative	-0.06	0.28	-0.16	0.03		-1.2%
TNC Self-Care at Start of Care						
2016	0.05	0.23	-0.02	0.13	9.71	0.5%
2017	0.01	0.87	-0.12	0.15		0.1%
2018	-0.10	0.35	-0.28	0.08		-1.0%
2019	-0.26	0.08	-0.50	-0.01		-2.7%
2020	-0.44	0.02	-0.75	-0.14		-4.5%
Cumulative	-0.15	0.18	-0.33	0.03		-1.5%
Conditions at Risk of Limited Functional Improvement						
2016	-0.10	0.57	-0.38	0.18	22.8%	-0.4%
2017	-0.19	0.51	-0.65	0.28		-0.8%
2018	-0.59	0.08	-1.15	-0.04		-2.6%
2019	-0.69	0.10	-1.38	0.01		-3.0%
2020	-0.95	0.06	-1.79	-0.10		-4.2%
Cumulative	-0.50	0.12	-1.04	0.03		-2.2%
Count of HCC Conditions Present at Start of Care						
2016	0.003	0.72	-0.01	0.02	1.67	0.2%
2017	0.02	0.24	-0.01	0.04		1.2%
2018	0.01	0.59	-0.02	0.03		0.6%
2019	0.003	0.86	-0.03	0.03		0.2%
2020	-0.01	0.59	-0.05	0.03		-0.6%
Cumulative	0.004	0.80	-0.02	0.03		0.2%

[a] D-in-D and 90% CI values represent percentage point changes. | CI = Confidence Interval. | See Exhibit 22n (Page 197) in the Technical Appendix for each measure's sample size.

Our state-specific analysis suggests that our overall finding of a significant decline in HCC score at start of care primarily reflects agency behavior in four states: Arizona, Florida, Iowa, and Tennessee (see Exhibit B-12 [Page 137] in the Technical Appendix for additional detail). For Tennessee in particular, we found evidence of a significantly smaller increase from baseline values relative to the change in its regional comparison group for three case-mix measures (HCC score at the start of care and the two TNC start of care measures), ranging from -4.1 percent for HCC score at start of care to -10 percent for TNC mobility at start of care. Compared with Tennessee, the relative change in HCC scores at the start of care was similar for Arizona (4.1 percent decrease relative to its baseline average of 2.9) and Iowa (3.8 percent decrease relative to its baseline average of 2.6) but smaller for Florida (1.9 percent decrease relative to its baseline average of 2.6). For the two composite measures of functional status, we found an opposite effect for Arizona and non-significant findings for Florida and Iowa. Our state-level D-in-D analyses for the other case-mix measures showed no consistent significant patterns across multiple HHVBP states relative to their respective regional comparison groups. See Exhibit B-12 (Page 137) in the Technical Appendix for additional detail on state-level findings.

3.6 HHVBP May Contribute to a Small Increase in the Likelihood that Medicare FFS Beneficiaries Receive Home Health Care after Hospital Discharge Relative to Other Post-Acute Care Services

Given the degree of discretion that HHAs have over how they provide care, the HHVBP Model's incentives may lead HHAs to engage in patient selection that produces changes in the use of alternative forms of care that can substitute for home health care (e.g., skilled nursing facility [SNF] services) among beneficiaries eligible for multiple forms of PAC. Growing financial disincentives for HHAs to care for beneficiaries with relatively complex health needs may lead to an increase in the use of costly substitutes for home health care, which may result in some beneficiaries receiving sub-optimal PAC relative to their circumstances. Alternatively, HHAs may respond to the HHVBP incentives by admitting more patients who are well-suited to receiving home health care while other patients – better suited to an alternative PAC setting – may receive referrals to institutional PAC settings such as SNFs, inpatient rehabilitation facilities (IRFs), or referrals to hospital outpatient therapy (encompassing physical, occupational, and speech therapy).

To examine potential substitution of care, we used Medicare FFS claims to identify use of PAC within 14 days following discharge from short-term acute care and critical access hospitals. We focused the analysis on four categories of PAC: 1) home health care; 2) institutional PAC (SNF, IRF, long-term care hospitalization [LTCH]); 3) hospital outpatient therapy (physical, occupational, speech); and 4) self-care at home (no claims for other forms of PAC or institutional care found in the 14-day period). We chose to observe the start of PAC within a 14-day period from acute care discharge to align with how CMS designates a home health episode as having an institutional source for the purpose of payment adjustment under the HH PPS. We conducted our analysis of discharges from short-term ACHs and critical access hospitals among all Medicare FFS beneficiaries who had a primary diagnosis that fell within the ten most common Major Diagnostic Categories (MDCs) among beneficiaries who receive home health PAC (see Exhibit 23 for the list of MDCs).

Demographic and clinical characteristics of this group of hospital discharges did not substantially change from the baseline period (2013-2015) to the intervention period (2016-2020) (Exhibit 23). The most common MDC during both periods for HHVBP and non-HHVBP states was the set of primary diagnoses

in the Circulatory System category, which rose slightly in prevalence from 21.9 percent to 22.2 percent in HHVBP states and from 21.7 percent to 22.2 percent in non-HHVBP states. Categories of conditions that had noteworthy changes in prevalence from the baseline to the post-intervention period include the MDCs for Respiratory System (-1.3 and -1.4 percentage point changes for discharges in HHVBP and non-HHVBP states, respectively), Digestive System (-1.1 and -1.0 percentage point changes for HHVBP and non-HHVBP, respectively) and for Infectious and Parasitic Diseases (1.9 and 2.1 percentage point increases for HHVBP and non-HHVBP, respectively).

Exhibit 23. No Substantial Changes in Most Characteristics of Medicare FFS Beneficiary Acute Care Hospitalization Discharges Between Baseline and Post-HHVBP Period

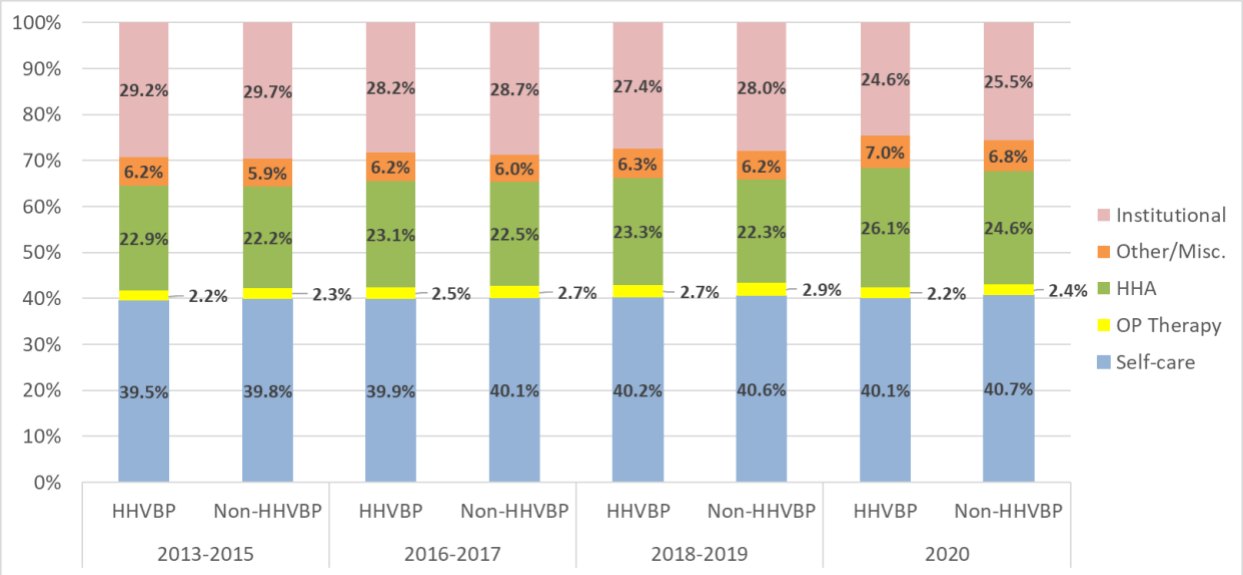
Characteristics of Acute Care Hospitalization Discharges	HHVBP States		Non-HHVBP States	
	Baseline (2013-2015)	Post-Period (2016-2020)	Baseline (2013-2015)	Post-Period (2016-2020)
Beneficiary Characteristics				
Age				
0-64	16.6%	15.2%	17.9%	16.7%
65-84	60.2%	62.8%	59.4%	62.0%
85 and older	23.2%	22.0%	22.7%	21.4%
Female	56.0%	54.7%	56.3%	54.9%
Race/Ethnicity				
White, non-Hispanic	83.3%	83.0%	82.1%	81.8%
Black, non-Hispanic	11.9%	11.5%	12.1%	11.5%
Other, non-Hispanic	2.8%	3.5%	3.7%	4.5%
Hispanic, (regardless of race)	2.0%	1.9%	2.1%	2.2%
Have HCCs at risk of limited improvement during home health care	24.5%	24.9%	24.9%	25.3%
Characteristics of the precipitating hospital stay				
Discharged from short-term acute care hospital	97.3%	97.6%	96.4%	96.7%
Discharged from Critical Access Hospital	2.7%	2.4%	3.5%	3.2%
SNF Eligibility	71.0%	66.9%	71.9%	67.6%
Length of Inpatient Stay (days)	4.7	4.6	4.8	4.6
Rural Hospital Location	6.7%	6.4%	9.9%	9.8%
County-level characteristics				
County-Level Median Household Income 2011-2015, Average	$59,225	$59,662	$59,672	$60,182
County-Level Percent of Persons 25+ Yrs w/<HS Diploma 2011-15, Average	12.2%	12.1%	13.5%	13.4%
County Level Percent of Persons in Deep Poverty 2013-17, Average	6.5%	6.4%	6.7%	6.6%
MDC group				
Nervous System	8.6%	8.5%	8.6%	8.4%
Respiratory System	15.7%	14.4%	15.8%	14.4%
Circulatory System	21.9%	22.2%	21.9%	22.2%
Digestive System	12.4%	11.3%	12.0%	11.0%
Hepatobiliary System And Pancreas	2.9%	2.8%	2.9%	2.8%
Musculoskeletal System And Connective Tissue	15.4%	16.0%	14.9%	15.4%
Skin, Subcutaneous Tissue And Breast	3.0%	2.6%	3.0%	2.6%

Characteristics of Acute Care Hospitalization Discharges	HHVBP States		Non-HHVBP States	
	Baseline (2013-2015)	Post-Period (2016-2020)	Baseline (2013-2015)	Post-Period (2016-2020)
Endocrine, Nutritional And Metabolic System	3.9%	4.1%	4.2%	4.3%
Kidney And Urinary Tract	9.0%	8.7%	8.8%	8.6%
Infectious and Parasitic Diseases	7.4%	9.3%	8.0%	10.1%
APM Flags*				
BPCI2	1.8%	3.2%	1.8%	2.8%
BPCI3	0.1%	0.3%	0.2%	0.3%
BPCI Advanced	0.0%	1.8%	0.0%	2.1%
ACO SSP	19.1%	32.0%	16.3%	30.5%
ACO Next Generation	0.0%	6.1%	0.0%	3.2%
ACO Pioneer	4.2%	0.7%	2.0%	0.1%
CJR	0.0%	0.7%	0.0%	0.8%
OCM	0.0%	1.8%	0.0%	1.8%

** Not all APMs were active for all years of the baseline and intervention periods (see Exhibit A-62 [Page 84] in the Technical Appendix for additional detail).*

The unadjusted percentages of starts to home health care, self-care, and hospital outpatient therapy stay relatively similar from the baseline period (2013-2015) through the first four years of the HHVBP Model (2016-2019) and into 2020 (Exhibit 24). Discharge to self-care without any other form of PAC had the largest share of discharges—approximately 40 to 41 percent in each period in HHVBP and non-HHVBP states. Use of home health care slightly increased in HHVBP states, going from 22.9 to 23.3 percent from the baseline period to the middle HHVBP period (2018 – 2019) with a larger increase to 26.1 percent in 2020, likely due in part to the decreased use of institutional settings that occurred in 2020 as a result of the COVID-19 PHE. Meanwhile, use of home health care remained close to 22 percent in non-HHVBP states from the baseline period through 2019, and as in HHVBP states, experienced a noteworthy increase to 24.6 percent in 2020. Although accounting for a much smaller share of PAC, between two and three percent, use of outpatient therapy visits also increased slightly in HHVBP and non-HHVBP states from the baseline period to the 2018/2019 period but then drifted back down to 2.2 and 2.4 percent, respectively, in 2020—levels that resembled the baseline period. Use of institutional PAC was the only form of PAC to have a (moderate) decline, from 29.2 percent of discharges in HHVBP states during 2013-2015 to 24.6 percent in 2020, and a similar decline in non-HHVBP states from 29.7 percent to 25.5 percent during the same periods (Exhibit 24).

Exhibit 24. Similar Trends in Use of Alternative Post-Acute Care Options among FFS Medicare Beneficiaries in HHVBP and Non-HHVBP States over Time



We used a D-in-D approach with regression adjustment to test whether the HHVBP Model contributed to changes in the percentage of hospital discharges that transition to each form of PAC. Although we found key characteristics of discharges well balanced between HHVBP and non-HHVBP states, we adjusted the D-in-D model for a few characteristics, including beneficiary age, rural hospital location, and participation in a CMS ACO, all of which had greater baseline differences than most across the two groups (Exhibit 23). We also included state fixed effects and state linear trends in the model to account for the lack of parallel trends in transitions to SNF between HHVBP and non-HHVBP states during the baseline period (see Section A.1.5 [Page 22] of the Technical Appendix).

Based on our D-in-D analyses, we found that the HHVBP Model contributed to a slight increase in the use of home health care among FFS beneficiaries who had an inpatient stay. The increase was greatest during the later two years of the model, during which HHVBP accounted for significant increases in the probability of transitions to home health care of two percent in 2019 (relative to the baseline average of 22.9 percent in HHVBP states) and 3.6 percent in 2020 (Exhibit 25.). Although we did not find statistically significant average annual HHVBP impacts on the use of other forms of PAC, we found that HHVBP contributed to significant declines in transitions to institutional and self-care in 2020 (-1.2 percent and -1 percent, respectively in 2020 relative to the baseline period). These relative decreases may account in part for the increased use of home health care we observe during the same period and suggest that HHVBP may contribute to marginally greater use of home health care among beneficiaries recently discharged from a short-term acute care hospitalization who might otherwise receive no Medicare-financed PAC. In a robustness test of our D-in-D model, we adjusted for additional demographic and clinical covariates listed in Exhibit 23 as well as the Medicare Severity-Diagnosis Related Group (MS-DRG) of the index hospitalization and found similar impacts of HHVBP, particularly during the later two years, on transitions to home health care after hospital discharge (see Exhibit B-18 [Page 142] in the Technical Appendix).

Exhibit 25. HHVBP Results in Increase in the Use of Home Health Care during Later Years of the Model among FFS Medicare Beneficiaries Who Had an Inpatient Stay

	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	% Relative Change
	D-in-D[a]	p-value	Lower 90% CI[a]	Upper 90% CI[a]		
Home Health Care						
2016	0.03	0.81	-0.17	0.23	22.9%	0.13%
2017	0.06	0.73	-0.21	0.32		0.26%
2018	0.41	0.03	0.09	0.72		1.8%
2019	0.46	0.03	0.11	0.80		2.0%
2020	0.83	<0.001	0.44	1.22		3.6%
Cumulative	0.33	0.04	0.06	0.60		1.4%
Institutional Care						
2016	-0.21	0.08	-0.40	-0.01	29.2%	-0.7%
2017	-0.04	0.75	-0.27	0.18		-0.1%
2018	-0.15	0.35	-0.40	0.11		-0.5%
2019	-0.14	0.42	-0.42	0.14		-0.5%
2020	-0.34	0.09	-0.68	-0.01		-1.2%
Cumulative	-0.17	0.22	-0.39	0.06		-0.6%
Self-Care						
2016	0.16	0.25	-0.07	0.38	39.5%	0.4%
2017	0.10	0.53	-0.16	0.36		0.3%
2018	-0.11	0.56	-0.41	0.20		-0.3%
2019	-0.07	0.71	-0.39	0.25		-0.2%
2020	-0.38	0.08	-0.73	-0.03		-1.0%
Cumulative	-0.04	0.78	-0.30	0.21		-0.1%
Hospital Outpatient Therapy						
2016	0.03	0.42	-0.03	0.09	2.2%	1.4%
2017	-0.004	0.92	-0.07	0.06		-0.2%
2018	-0.02	0.73	-0.09	0.06		-0.9%
2019	-0.08	0.10	-0.16	<0.001		-3.6%
2020	-0.01	0.87	-0.08	0.07		-0.5%
Cumulative	-0.01	0.66	-0.07	0.04		-0.5%

[a] D-in-D and 90% CI values represent percentage point changes. | CI = Confidence Interval. | See Exhibit 25n (Page 197) in the Technical Appendix for each measure's sample size.

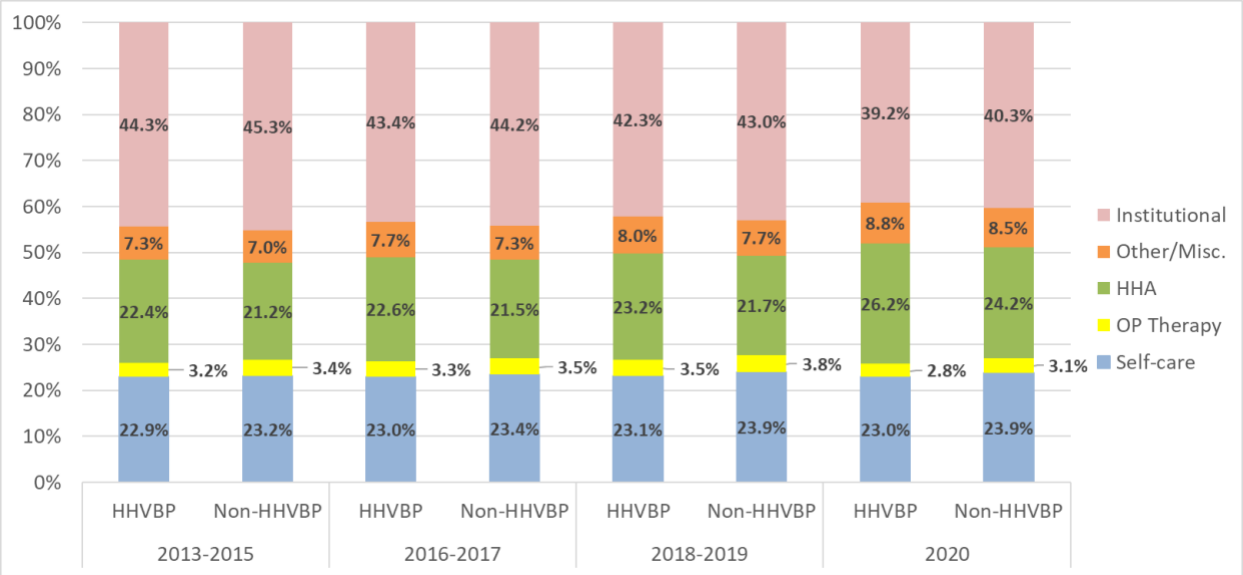
3.6.1 Limited Impacts of the HHVBP Model on Post-Acute Care Selection Did Not Differ Substantially for Beneficiaries at Risk of Limited Improvement During Home Health Care

Given potential incentives that agencies in the HHVBP Model may face to limit the number or share of their patients with clinical features that may present challenges to achieving high quality performance despite risk adjustment of performance measures, we examined PAC selection for acute care discharges

with specific conditions we have found to be associated with limited improvement in functional status (see Section 3.5 of this report). More specifically, we used primary or secondary diagnoses on the acute hospitalization claims to identify discharges with HCC conditions that are associated with lower average baseline TNC change in self-care and change in mobility measure values before the HHVBP Model took effect (see Exhibit A-39 [Page 58] in the Technical Appendix to see these baseline averages by HCC condition). Evaluating the impacts of the HHVBP Model on access to home health care among post-acute patients at risk of limited improvement (referred to as "at-risk discharges" from here onward) contributes to understanding whether the risk adjustment of these HHVBP Model performance measures adequately mitigates incentives that agencies may face to avoid patients for whom goals of stabilizing function may be more appropriate than a goal of improvement during home health care.

The subgroup of at-risk discharges remained nearly constant in their share of all discharges between the baseline and intervention period, accounting for approximately 25 percent of the full set of discharges in both HHVBP and non-HHVBP states (Exhibit 23). Also, within this subgroup, the levels and trends in unadjusted percentages of starts to home health care were similar to those found in the overall population of discharges (Exhibit 24 and Exhibit 26). However, discharges to institutional PAC have a notably greater share in this subgroup relative to the prevalence of this option among all discharges in both HHVBP and non-HHVBP groups. Specifically, the share of discharges to institutional PAC in the at-risk subgroup decreased over the study period from 44.3 and 45.3 percent in HHVBP and non-HHVBP states, respectively, to 39.2 and 40.3 percent, respectively, by 2020 (Exhibit 26). Discharges to self-care have a notably smaller share in the at-risk subgroup relative to their prevalence among all discharges, remaining nearly constant at 23 percent of discharges in HHVBP states from the baseline period through 2020 while increasing slightly in non-HHVBP states from 23.2 percent to 23.9 percent over the same period. Use of outpatient therapy visits in this subgroup had levels about one percentage point greater and trends similar to what they exhibited among all discharges. In general, the relatively larger share of institutional PAC and smaller share of self-care among these at-risk discharges reflects their more complex health needs, which makes them an important group for testing potential unintended effects of HHVBP on access to home health care for clinically at-risk populations.

Exhibit 26. Trends in Use of Alternative Post-Acute Care Options among FFS Medicare Beneficiaries at Risk of Limited Improvement during Home Health Care in HHVBP and Non-HHVBP States



To test whether the impacts of HHVBP varied among patient subgroups defined based on at-risk status, we conducted a difference-in-difference-in-differences (D-in-D-in-D) analysis. These analyses allow for differences in the D-in-D estimates for patient subgroups. In specifying these tests, we supplemented the interactions of treatment group and post-HHVBP indicators in our standard D-in-D models with a third interaction involving the patient subgroup of interest. For details regarding our methods, see Section A.5.1.7 [Page 106] in the Technical Appendix.

Based on the D-in-D-in-D analysis of the subgroups of at-risk and not at-risk discharges, we found that the HHVBP Model had no significant impact on selection of home health care within the at-risk or not at-risk subgroups nor was there a significant difference in HHVBP impacts across the two subgroups (Exhibit 27). We estimated a significant negative D-in-D HHVBP impact of 0.3 percentage points on selection of self-care in the at-risk subgroup. However, we did not find evidence of a significant impact on selection of self-care for discharges not at risk, nor did we find evidence of a significant difference in the HHVBP impact on selection of self-care between the two subgroups.

Exhibit 27. Limited Impacts of HHVBP on PAC Selection Do Not Differ Significantly for Beneficiaries with HCCs at Risk of Limited Improvement During Home Health Care, 2013-2020

Measure	At-Risk HCC			Other			At-Risk HCC - Other		
	D-in-D	p-value	% Relative Change [b]	D-in-D	p-value	% Relative Change [c]	D-in-D-in-D	p-value	% Relative Change [b]
Home Health Care [a]	0.03	0.81	0.1%	0.13	0.39	0.6%	-0.10	0.43	-0.4%
Institutional Care [a]	0.22	0.14	0.5%	0.06	0.66	0.2%	0.16	0.16	0.4%
Self-care [a]	-0.30	0.01	-1.3%	-0.20	0.25	-0.4%	-0.10	0.39	-0.4%
Hospital Outpatient Therapy [a]	<0.01	0.90	<0.1%	0.04	0.30	2.1%	-0.04	0.39	-1.3%

See Section A.5.1.7 (Page 106) of the Technical Appendix for details regarding model specifications. [a] D-in-D values represent percentage point changes. [b] Calculated by dividing the model estimate by the baseline mean for patients

at-risk based on HCCs in HHVBP states (shown in Exhibit B-15 [Page 140] of the Technical Appendix). [c] *Calculated by dividing the model estimate by the baseline mean for other patients in HHVBP states (shown in Exhibit B-15 [Page 140] of the Technical Appendix).*

3.6.2 Limited Impacts of the HHVBP Model on Post-Acute Care Selection Did Not Differ Substantially for Beneficiaries aligned with Accountable Care Organizations

We conducted supplementary analyses to determine if Medicare FFS beneficiaries who are aligned with Accountable Care Organizations (ACOs), which may seek to limit spending on PAC by favoring the substitution of less costly forms of PAC such as home health care for more costly institutional PAC options (McWilliams, 2017). We hypothesized that to the extent that HHVBP Model incentives may contribute to agencies avoiding patients with complex health needs, such incentives may be more muted in the context of beneficiaries aligned with ACOs. Thus, we might expect to find a negative effect of HHVBP on post-acute admissions to home health care among non-ACO patients relative to ACO-aligned patients. We chose to focus this analysis on ACO participation rather than other CMMI models with similar incentive features (e.g., BPCI and CJR) because overlap between HHVBP episodes and participation in other such CMMI models in our data set was considerably more limited (see Exhibit 23).

The share of acute care discharges who were aligned with an ACO increased substantially from the baseline period to the HHVBP Model period. By far the most prevalent ACO program of those represented in our data is the Medicare Shared Savings Program (SSP), which grew in prevalence from 19.1 and 16.3 percent of discharges in HHVBP and non-HHVBP states respectively during 2013 through 2015 period to 32 and 30.5 percent respectively during 2016 through 2020 period (Exhibit 18). The Pioneer ACO Model ended in 2016 and accounted for only 4.2 and 2 percent of discharges respectively in HHVBP and non-HHVBP states during the 2013 through 2015 period. The Next Generation ACO program was not active during the baseline period of the HHVBP Model and accounted for only 6.1 and 3.2 percent of discharges respectively in HHVBP and non-HHVBP states during the first five years of the HHVBP Model, 2016 through 2020.

The subgroup of ACO-aligned discharges had a pattern of shares of discharges represented across each PAC option that was similar to the general population of discharges used in our analysis. Exhibit B-17 (Page 142) in the Technical Appendix shows additional details about shares of discharges across the various PAC options in the ACO-aligned subgroup.

Based on a D-in-D-in-D analysis of the subgroups of ACO-aligned and non-ACO-aligned (other) discharges, we found that the HHVBP Model had no significant impact on selection of home health care within either of these subgroups nor was there a significant difference in HHVBP impacts across the two subgroups (Exhibit 28). Moreover, we did not find evidence of any significant impact of HHVBP on selection of alternative forms of PAC in either the ACO or non-ACO subgroups.

Exhibit 28. Limited Impacts of HHVBP on PAC Selection Do Not Differ Substantially Between FFS Medicare Beneficiaries Receiving Care from ACOs and Those Not, 2013-2020

Measure	ACO			Non-ACO			ACO - Non-ACO		
	D-in-D	P-value	% Relative Change [b]	D-in-D	P-value	% Relative Change [c]	D-in-D-in-D	P-value	% Relative Change [b]
Home Health Care [a]	-0.32	0.23	-1.3%	0.17	0.33	0.8%	-0.49	0.10	-2.0%

Measure	ACO			Non-ACO			ACO - Non-ACO		
	D-in-D	P-value	% Relative Change [b]	D-in-D	P-value	% Relative Change [c]	D-in-D-in-D	P-value	% Relative Change[b]
Institutional Care [a]	0.30	0.33	1.1%	-0.06	0.72	-0.2%	0.36	0.30	1.3%
Self-care [a]	0.04	0.89	0.1%	-0.08	0.67	-0.2%	0.12	0.72	0.3%
Hospital Outpatient Therapy [a]	0.08	0.20	3.8%	-0.04	0.29	-1.8%	0.11	0.06	5.2%

See Section A.5.1.7 (Page 106) of the Technical Appendix for details regarding model specifications. [a] D-in-D values represent percentage point changes. [b] Calculated by dividing the model estimate by the baseline mean for acute care patients treated in ACOs in HHVBP states (shown in Exhibit B-14 [Page 139] of the Technical Appendix). [c] Calculated by dividing the model estimate by the baseline mean for acute care patients not treated in ACOs in HHVBP states (shown in Exhibit B-14 [Page 139] of the Technical Appendix).

3.7 HHVBP Has Not Substantially Changed How Case-Mix Influences Post-Acute Care Selection for Three Common Conditions

Our prior analyses comparing the pre- and post-HHVBP periods documented a substantial increase in the share of OASIS assessments reporting a lower initial functional status for three OASIS measures (Arbor Research, 2021).[15] This increase suggested that home health users represented a less healthy population after the HHVBP Model began compared to before. While we observed these changes in both HHVBP and non-HHVBP states, the changes were somewhat more pronounced in HHVBP states. As noted in the previous report, this trend could be driven by changes over time in the health profiles (case-mix) of home health users and/or, changes in how HHAs are completing the OASIS assessments. In qualitative interviews, for example, HHAs in HHVBP states have reported increased training efforts around OASIS assessments, as well as revisiting their approaches to completing OASIS assessments; such activities could have an effect on the measures through changes in coding practices or the administration of the assessment. Understanding whether and to what extent case-mix or agency behaviors underlie the trend in the OASIS measures are critical to interpreting agency improvement scores and, by extension, model impact.

Though difficult to quantify an effect from coding practices, descriptive and multivariate analyses of health characteristics of home health users over time have shown that case-mix changes do not sufficiently explain the observed declines in functional status as measured in the OASIS assessment. An alternate (or supplemental) explanation for the decline in functional status could be a change in how beneficiaries are selected into a particular PAC setting following an inpatient stay – that is, the likelihood of being discharged to home health care may have changed for different subgroups of beneficiaries, which in turn, could explain the declines in functional status observed between the pre- and post-HHVBP period. Our previous analyses that examined case-mix and functional status changes over time only included observable health covariates of home health users and therefore may not have accounted for factors that influence beneficiary selection into home health versus other PAC settings (Arbor Research, 2021).

[15] This analysis focused on three clinically different cohorts to better observe measure-level changes and were defined based on an inpatient diagnosis of heart failure, pneumonia, or knee/hip replacement. The three OASIS measures used were Ambulation, Improvement in Grooming, and Improvement in Dyspnea.

Our analysis below investigates whether the PAC selection process changed since the implementation of HHVBP and whether it is more or less pronounced in HHVBP than in non-HHVBP states. If we observe that case-mix has meaningfully changed over time such that sicker beneficiaries are discharged to home health over the period, this suggests that HHAs are serving more complex and less healthy beneficiaries. However, if case-mix has remained largely stable, then a change in practices is a more likely driver of decreasing initial functional status reported in OASIS measures, which could have potential implications for measure interpretation.

3.7.1 Summary of the Approach

As in prior analyses, to reduce the influence of confounding factors and improve clinical homogeneity among beneficiaries, we focused on FFS home health users with a prior inpatient stay and falling into one of three "cohorts"—heart failure, pneumonia, or knee/hip replacement—defined by the primary diagnosis associated with the inpatient admission stay that preceded the home health episode. These diagnoses are highly prevalent in the Medicare population,[16] involve beneficiary populations with diverse characteristics, and provide different scenarios through which to observe how case-mix factors could impact performance measures.

For each of these cohorts, we first examine the distribution of beneficiaries discharged to different PAC settings across three time periods: pre-HHVBP (2013-2015); early post-HHVBP implementation (2016-2017) and later post-HHVBP implementation (2018-2019). We used multinomial logit to assess whether there have been changes in the post-discharge PAC selection process – that is, whether the cohort of beneficiaries receiving home health services post-discharge has changed systematically between the pre- to post-HHVBP periods. More specifically, we estimated relative risk ratios (RRR) capturing how the risk of using a PAC setting other than home health compared to the risk of using home health changes with sociodemographic and health status variables. For example, the RRR for a binary independent variable of interest *x*, the respective RRR takes the form:

$$RRR_x = \left(\frac{Prob(nonHH|x=1)}{Prob(nonHH|x=0)}\right) \Big/ \left(\frac{Prob(HH|x=1)}{Prob(HH|x=0)}\right),$$

where *nonHH* is a PAC arrangement other than home health classified in our model as SNF care, self-care (defined as home without formal home health services but including outpatient services), or an institutional arrangement. The latter category, which includes primarily IRF, LTCH, IPF, hospice, and hospital readmissions, is smaller in magnitude and groups those discharge destinations that are less common substitutes for home health. We calculated RRRs for the three beneficiary cohorts across the three time periods, controlling for a range of health-related and geographic factors, to characterize: 1) whether the probability of using a non-HH PAC arrangement after discharge is stable or changing over time, to observe any selection effects towards or away from home health, and, 2) whether selection patterns differ between HHVBP and non-HHVBP states.

3.7.2 Changes in the Use of PAC Settings in HHVBP and non-HHVBP States

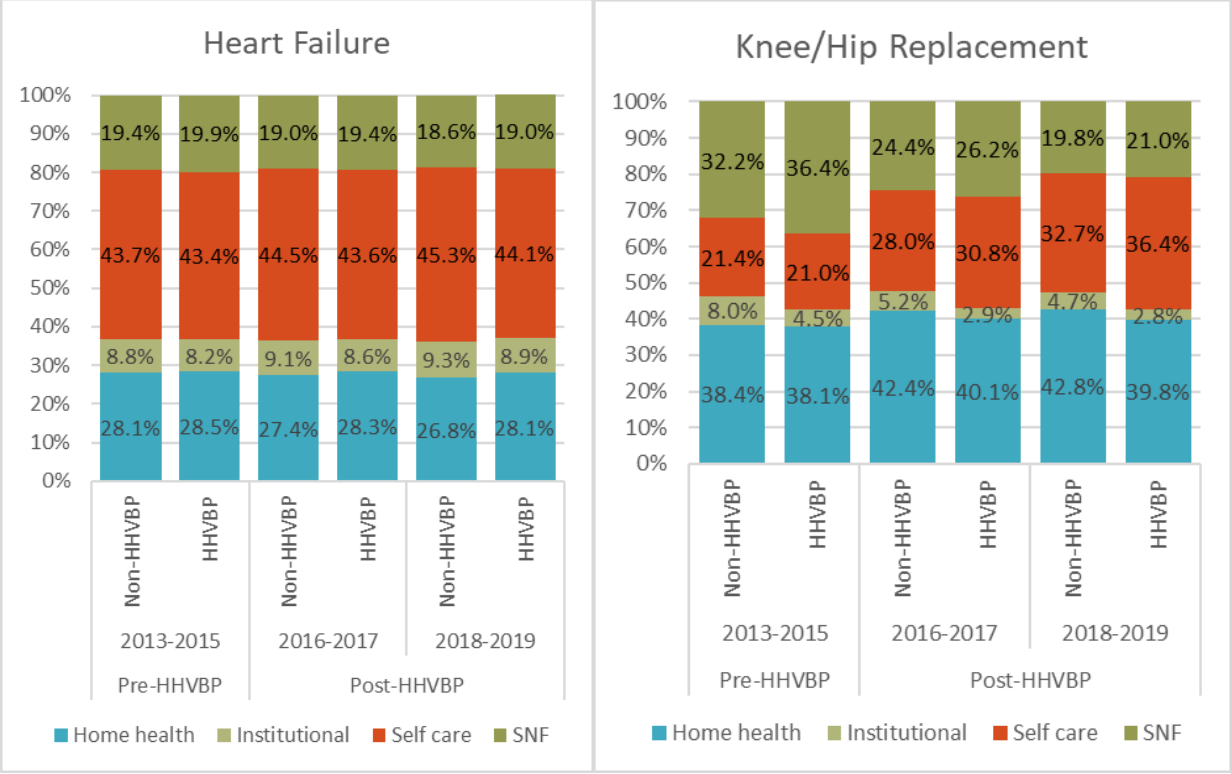
A descriptive look at where beneficiaries end up after an inpatient stay shows some variation by diagnosis cohort and time period (Exhibit 29). For the heart failure cohort, we observed relatively few

[16] Heart failure diagnosis is associated with 5.0 percent of all acute care discharges, pneumonia with 4.4 percent and knee/hip replacement with 6.2 percent (not shown).

changes in the probability of discharge to home health over time (since pneumonia and heart failure show similar patterns, we illustrate these results in the bar chart below for heart failure only, which shows the episodes distribution for beneficiaries discharged from an inpatient stay by post-discharge PAC setting).[17] In non-HHVBP states, the use of home health care and SNF appear to decline slightly from the pre-HHVBP period to the later post-HHVBP period with concomitant small increases in discharge to institutional settings and self-care. The distribution in HHVBP states shows the same pattern, but the changes are even more modest.

The knee/hip replacement cohort, however, shows somewhat larger shifts (right panel of Exhibit 29). There were substantial declines in discharge to SNF (12.4 and 15.4 percentage points, respectively, in non-HHVBP and HHVBP states) and comparable relative declines in discharge to institutional settings (3.3 percentage points for non-HHVBP and 1.7 percentage points in HHVBP states). We also observe increases in self-care, with a slight increase in discharge to home health in non-HHVBP states and an even smaller change in HHVBP states.

Exhibit 29. Modest Changes Over Time in Discharges of Heart Failure Patients to Home Health Care and Other Post-Acute Care; Discharges of Knee/Hip Replacement Patients to SNF and Institutional Settings Declined While Discharges to Self-Care Increased in HHVBP and Non-HHVBP States, 2013 – 2019



To explore whether changes in health might influence PAC discharge setting, we first examined a broad set of health-related beneficiary and inpatient stay characteristics (Exhibit B-20 [Page 144] in the Technical Appendix). A descriptive look at these characteristics shows some change over time and some variation across the heart failure and knee/hip replacement cohorts; however, the trends are similar

[17] Because the overall results are similar for pneumonia and heart failure, we present results throughout for the heart failure and knee/hip replacement cohorts only.

across both HHVBP and non-HHVBP states. While there is a slight increase in the short length of stay (LOS; 0-2 days) category for beneficiaries in the heart failure cohort, a particularly large increase is seen for the knee/hip replacement cohort, which likely explains the relative decrease in SNF use since SNF eligibility requires a three-day inpatient stay. Two of these characteristics, shown in Exhibit 30 and presented in the subsequent discussion of the multivariate results, illustrate the patterns. See Exhibit B-20 [Page 144] in the Technical Appendix for full results of health-related characteristics for the two cohorts and study time periods.

Exhibit 30. Similar Trends for Inpatient Stay and Health Characteristics in HHVBP and Non-HHVBP States Among Hospital Patients with Heart Failure and Knee/Hip Replacement

Beneficiary and Inpatient Stay Characteristics	Non-HHVBP States			HHVBP States		
	Pre-HHVBP	Post-HHVBP		Pre-HHVBP	Post-HHVBP	
	2013-2015	2016-2017	2018-2019	2013-2015	2016-2017	2018-2019
Heart Failure						
HCC score (terciles[a])						
Healthiest	10.7%	9.5%	8.3%	9.2%	7.9%	7.0%
Middle	39.1%	33.6%	30.7%	39.0%	33.6%	31.2%
Least healthy	50.2%	57.0%	61.0%	51.8%	58.5%	61.8%
Inpatient LOS (days)						
0-2	24.9%	26.4%	26.6%	25.7%	26.7%	26.9%
3-6	54.4%	53.6%	53.0%	54.3%	53.0%	52.4%
7-13	17.4%	16.7%	17.1%	16.8%	17.1%	17.3%
Knee/Hip Replacement						
HCC score (terciles)						
Healthiest	79.5%	77.3%	74.9%	78.9%	76.6%	73.9%
Middle	16.3%	17.7%	19.2%	16.9%	18.2%	20.0%
Least healthy	4.2%	5.0%	5.9%	4.3%	5.2%	6.1%
Inpatient LOS (days)						
0-2	32.8%	54.9%	66.8%	31.2%	53.5%	65.0%
3-6	64.9%	43.4%	31.6%	66.5%	44.9%	33.3%
7-13	2.0%	1.5%	1.4%	2.0%	1.5%	1.5%

[a] *HCC score terciles are year-specific and determined based on all acute care discharges.*

3.7.3 Impacts of HHVBP on the Selection Process into PAC Settings

While the descriptive statistics show some differences in the distribution of post-discharge PAC setting, particularly for the knee/hip replacement cohort, and in some beneficiary health-related characteristics, the multinomial logit results allow us to estimate the selection of PAC arrangement controlling for health-related and other demographic and geographic covariates (see Exhibit B-21 [Page 146] in the Technical Appendix for full results from comparisons across the multinomial logits with all health-related

characteristics for the two cohorts and study time periods). While there is some activity in PAC selection observed in these cohorts, it is primarily in the knee/hip replacement cohort over time, which saw the introduction of the CJR Model. We observed few differences in the patterns of PAC selection between HHVBP and non-HHVBP states, suggesting that the model did not impact the composition of beneficiaries with these common conditions discharged to home health care over time. The findings further reinforce that the reported declines in functional status are not explained by changing beneficiary case mix. To illustrate, Exhibit 31, Exhibit 32, Exhibit 34, and Exhibit 35 below show the relative risk ratios (RRRs) for the heart failure and knee/hip replacement diagnostic cohorts for selected health characteristics. As the most likely substitutes for home health care, these figures show the differences in relative risk of beneficiaries being admitted to SNF relative to home health and self-care relative to home health. For each beneficiary characteristic, there is a designated reference group such that the results indicate the relative risk of SNF versus home health care (or self-care versus home health care) for beneficiaries with the particular characteristic, relative to the reference group (typically, the healthiest category of the characteristic). We also present the differences in the RRRs for beneficiaries in HHVBP states and those in non-HHVBP states across the three time periods to observe any potential model impacts.

In looking at the relative risk of selection to non-HH PAC versus home health, we interpret a RRR greater than one to mean that the "risk" of entering the non-HH PAC arrangement is higher for the subgroup of interest relative to the reference group. RRRs less than one are interpreted as a lower or decreased "risk" of entering the non-HH PAC arrangement compared to home health. We calculate these RRRs across a variety of different beneficiary and stay characteristics to help observe the joint effect of these characteristics on the likelihood of a beneficiary selecting to a particular PAC setting. Given the large number of comparison combinations, we present a sample of these data in line graph snapshots for the heart failure and knee/hip replacement cohorts, and only for two characteristics: patient complexity and inpatient length of stay. The full sets of comparisons of RRRs for all health-related characteristics across the multinomial logits in both study time periods are presented in Exhibit B-21 [Page 146] in the Technical Appendix for both cohorts in all PAC settings.

Exhibit 31 and Exhibit 32 below present line graphs of the RRRs for heart failure discharges to SNF versus home health and self-care versus home health, respectively. As shown in the graphs, we see that patterns across the time periods of interest are generally similar across HHVBP and non-HHVBP states with only minimal changes over time, suggesting that any changes are not unique to HHVBP states and are not sufficient to account for the functional status declines we are trying to explain. As may be expected, the risk of entering SNF versus home health is higher for beneficiaries with longer lengths of stay for both HHVBP and non-HHVBP states. The RRRs of less than one for HCC score (suggesting that less healthy beneficiaries are *less* likely be discharged to SNF relative to home health, rather than more likely) are a result of controlling for the other health-related factors. The bivariate relationship between HCC score and the likelihood of being discharged to SNF relative to home health is more intuitive, with the direction reversed, indicating that less healthy beneficiaries are more likely to be discharged to SNF relative to home health (results not shown).

Exhibit 31. Relative Risk Ratios (RRR) Suggest That Heart Failure Patients with Greater HCC Score Are Less Likely to Discharge to SNF Relative to Home Health, Whereas Heart Failure Patients with Longer Lengths of Stay Are More Likely to Discharge to SNF Relative to Home Health in Both HHVBP and Non-HHVBP States, 2013 – 2019

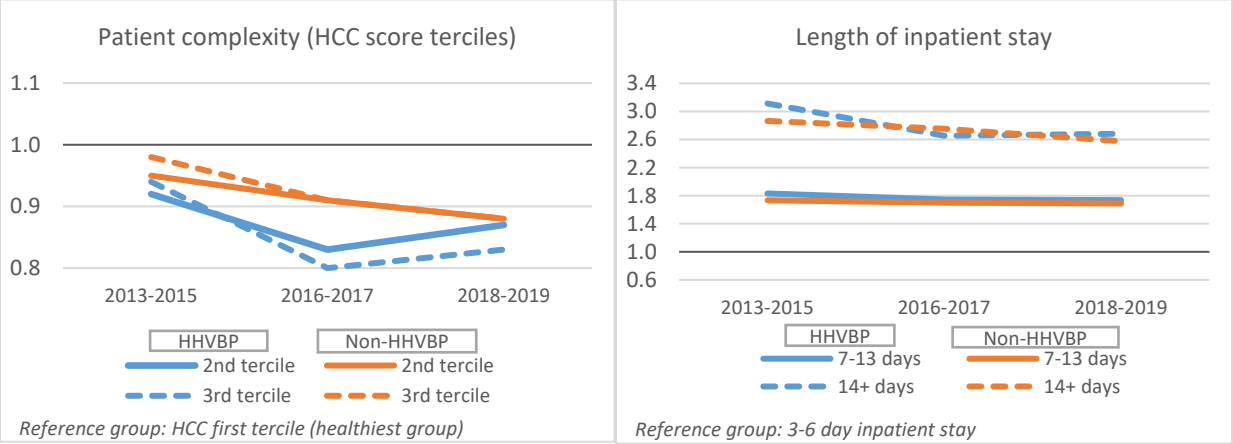


Exhibit 32. Relative Risk Ratios (RRR) Suggest That Beneficiaries with Greater HCC Score and Longer Lengths of Stay Are Less Likely to Discharge to Self-Care Relative to Home Health in Both HHVBP and Non-HHVBP States, 2013 – 2019

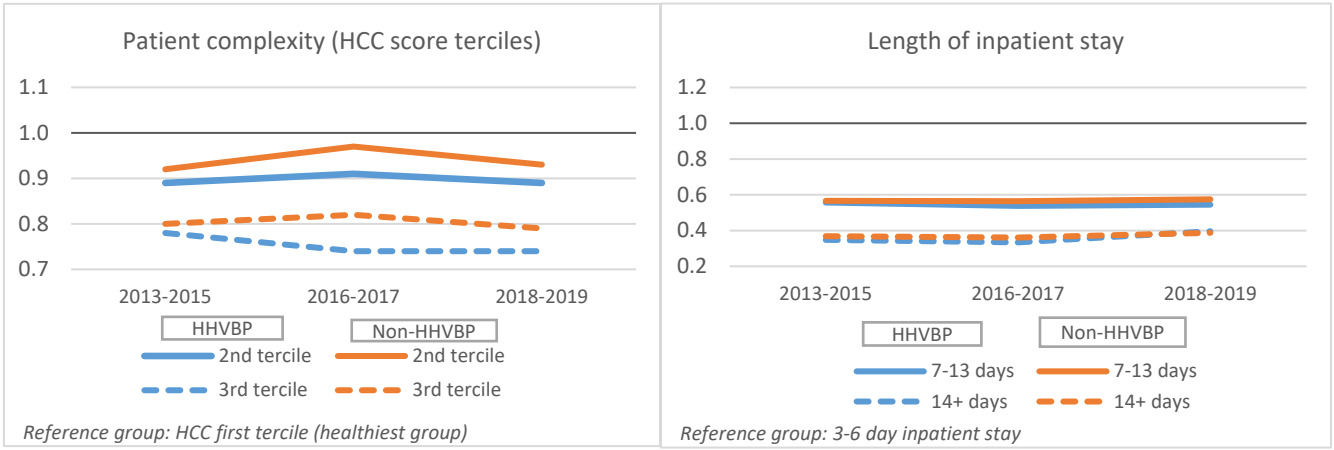


Exhibit 33 below shows the differences in these RRRs to help characterize the size of the change from the pre-HHVBP period to the more recent post-HHVBP period, and whether the difference is statistically significant. For the covariates shown in the Exhibit (as well as others included in the model), there are some statistically significant changes over time, but these changes are generally not significantly different between HHVBP and non-HHVBP discharges (see Exhibit B-21 [Page 146] in the Technical Appendix for differences in RRRs across the two beneficiary cohorts and PAC comparisons).

Exhibit 33. Differences in Relative Risk Ratios Among Heart Failure Discharges for 2013-2015 vs 2018-2019 Are Generally Not Significantly Different Between HHVBP and Non-HHVBP States

Beneficiary and Inpatient Stay Characteristics	Relative Risk Ratios SNF / HH Differences			Relative Risk Ratios Self-care / HH Differences		
	HHVBP 2019/2015	Non-HHVBP 2019/2015	HHVBP vs. Non-HHVBP	HHVBP 2019/2015	Non-HHVBP 2019/2015	HHVBP vs. Non-HHVBP
HCC score (healthiest omitted)						
Middle	-0.04	-0.06*	0.02	0.03	0.05*	-0.02
Least healthy	-0.11*	-0.11*	-0.00	-0.02	0.01	-0.03
Inpatient LOS (days, 3-6 omitted)						
0-2	0.00	-0.01*	0.00	-0.05	0.00	-0.05
7-13	-0.09*	-0.04	-0.05	-0.01	0.01	-0.02
14+	-0.43*	-0.28*	-0.15	0.05	0.02	0.03

**p<0.05.*

Examining results from the clinically different beneficiary cohort of knee and hip replacement discharges, we observe less clear patterns in PAC selection over time (Exhibit 34 and Exhibit 35). Of note, the CJR model launched April 1, 2016, overlapping nearly entirely with the post-HHVBP period and introduced incentives to participating hospitals to increase coordination of care among hospitals, physicians, and PAC providers to improve quality, patient outcomes and reduce episode costs (CMS, 2021). Evaluations of the CJR model to date have found that spending reductions were largely driven by changes in PAC utilization, where beneficiaries were more likely discharged to home than other, higher-acuity PAC arrangements. The graphs show general downward trends for use of SNF relative to home health, which would comport with the CJR findings, and there are few differences between HHVBP and non-HHVBP states.

Exhibit 34. Relative Risk Ratios for SNF versus Home Health Care Among Knee/Hip Replacement Discharges Declined Over Time, 2013 – 2019

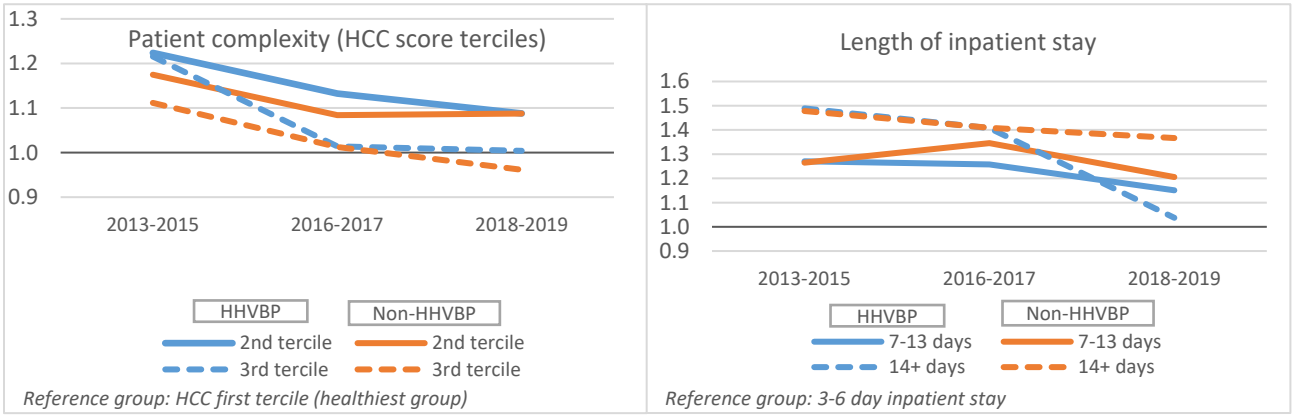
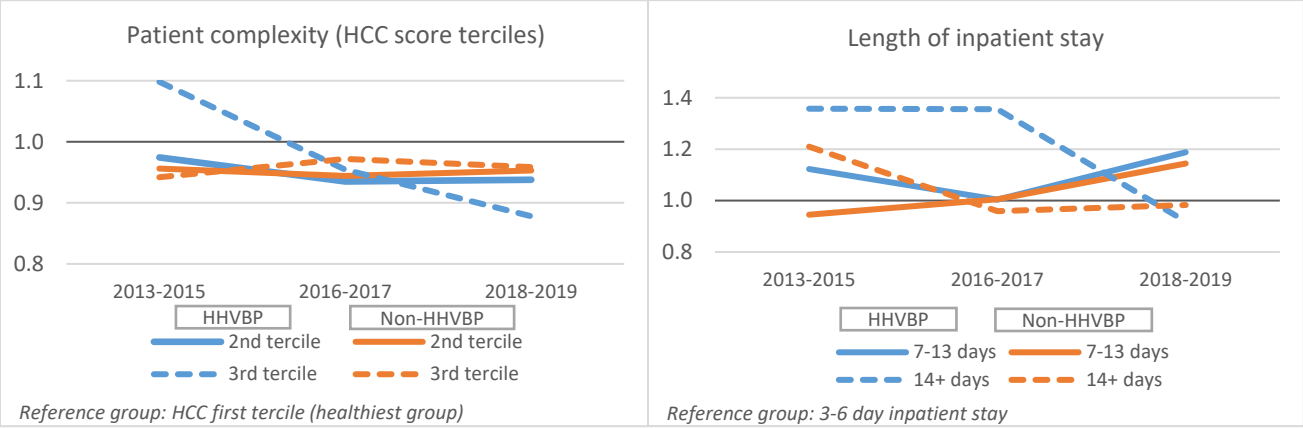


Exhibit 35. Relative Risk Ratios for Self-care versus Home Health Care Among Knee/Hip Replacement Discharges Have Mixed Trends, 2013 – 2019



These findings are reinforced in the table of differences in RRRs (Exhibit 36), where we see that while a number of the changes in RRRs over time are significant, there are few statistically significant differences between HHVBP and non-HHVBP discharges.

Exhibit 36. Differences in Relative Risk Ratios Among Knee/Hip Discharges for 2013-2015 vs 2018-2019 Are Generally Not Significantly Different Between HHVBP and Non-HHVBP Discharges

Beneficiary and Inpatient Stay Characteristics	Relative Risk Ratios SNF / HH Differences			Relative Risk Ratios Self-care / HH Differences		
	HHVBP 2019/2015	Non-HHVBP 2019/2015	HHVBP vs. Non-HHVBP	HHVBP 2019/2015	Non-HHVBP 2019/2015	HHVBP vs. Non-HHVBP
Knee/Hip Replacement						
HCC score (healthiest omitted)						
Middle	-0.11*	-0.06*	-0.05	-0.04	0.01	-0.05
Least healthy	-0.16*	-0.12*	-0.04	-0.21*	0.01	-0.22*
Inpatient LOS (days, 3-6 omitted)						
0-2	0.00	0.02*	-0.03*	0.22*	0.21*	0.00
7-13	-0.12	-0.06	-0.06	0.07	0.20*	-0.13
14+	-0.46	-0.11	-0.35	-0.44	-0.22	-0.22

3.8 Discussion

Overall, we observed similar declines in the number of home health agencies and levels of home health utilization in HHVBP and non-HHVBP states, as well as similar increases in the severity of home health beneficiaries treated. Our analyses of new and terminating agencies also did not point to a clear impact

of HHVBP on market entry and exit decisions. Rather, agency entry and exit rates continue to be similar in HHVBP and non-HHVBP states and relatively stable since model implementation.

Our findings for measures of numbers of agencies and levels of utilization suggest that, for the nine HHVBP states combined, the implementation of HHVBP has not affected the overall rate of home health care utilization among Medicare FFS beneficiaries. Our analysis showed overall declines in rates of utilization of home health services that began prior to implementation of HHVBP. In addition, for most HHVBP states, trends in utilization were similar to those of their regional comparison groups. In particular, while there has been a more pronounced decline in utilization in Florida, we observed a similarly high level and rate of decline in Florida's regional comparison group.

Descriptive analyses of access to higher quality home health services – both realized and potential – reveal overall gains in utilization and availability in both HHVBP and non-HHVBP states. We observed larger improvements in HHVBP states during HHVBP Model implementation and particularly in areas with already high availability. We also observe variation in these findings by beneficiary subpopulations, across geography, and using alternative measures of quality. Our two measures of quality show somewhat different results across different beneficiary subgroups and locations, but reinforce the importance of considering different dimensions of quality. While some of the disparities noted in previous reports appear to have lessened, gaps persist for some beneficiary subgroups, such as with the persisting disparities in both potential and realized access for Medicaid enrollees. The potential access results suggest there is underlying geographic variation in the availability of higher quality HHAs across beneficiary characteristics that contributes to disparities in utilization among beneficiary subpopulations. While these descriptive analyses document that utilization and availability of higher quality home health care increased to a greater extent in HHVBP compared to non-HHVBP states, future multivariate analyses would be valuable to assess the relative contribution of supply (versus other factors) to these increases, as well as any persisting disparities.

Four out of five measures of home health patient case-mix indicated no average difference between HHVBP and non-HHVBP states in the trend of increasing patient severity occurring in both groups of states, including the two new measures focusing on patients less likely to improve in functional status at the start of care. However, we did find evidence that the average HCC score at the start of care for a beneficiary's first home health episode increased at a slightly slower rate in HHVBP states compared with non-HHVBP states, which was largely driven by Arizona, Florida, Iowa, and Tennessee. Because the HCC risk score is the only indicator for which we find a consistent pattern of possible case-mix selection from extensive analyses testing for such an effect of HHVBP, we do not conclude there is strong evidence of a significant agency response to HHVBP to select beneficiaries based on case-mix. The possibility of any such patient selection by HHAs and the potential impact on access to home health care for some groups of underserved patients warrants additional monitoring and analysis as the HHVBP Model is expanded to encompass other states.

During the three latest years of the model, HHVBP incentives contributed to modest increases in admissions to home health care among patients transitioning from acute inpatient settings within 14 days. This finding is consistent with other analyses in this section that showed no signs of emerging access problems due to HHVBP. Furthermore, we found no evidence that HHVBP contributes to any changes in post-acute care use of home health care among hospital discharges at risk of limited functional improvement from home health care nor among discharges not under the care of ACOs. The

findings from these subgroup analyses do not indicate particular challenges among these beneficiaries in accessing home health care despite possible incentives for providers to avoid serving these patients under HHVBP.

Analysis of the RRRs over time and across beneficiary and stay characteristics among discharges with common primary diagnoses of heart failure, knee/hip replacement and pneumonia show that there are no notable changes in beneficiary selection into home health. These results complement a prior analysis of home health users that documented general stability in the health of beneficiaries starting a home health episode (Arbor Research, 2021). Taken together, these robust findings suggest that the observed declines in reported functional status at initial assessment, particularly pronounced in HHVBP episodes, are not being driven by home health selection changes or disproportionate declines in the health of beneficiaries starting home health care. Instead, based on analyses documented in previous reports, there is strong evidence that HHVBP may be affecting how HHAs are approaching OASIS assessments. From interviews with agencies analyzed in previous annual reports, HHAs have reported increased training for staff on how to complete OASIS assessments, trying to maintain consistency in who completes the assessment (i.e., having the same individual complete the initial and final assessments) and considering what type of HHA provider (e.g., nurse, physical therapist) undertakes the assessment (Arbor Research, 2019; 2020; 2021).

Our results show that the HHVBP Model has not substantially altered the process guiding selection of discharge destination for beneficiaries with a prior inpatient stay in our three selected cohorts. However, these results suggest that the OASIS assessments for these cohorts may be subject to changes in procedures or teaching, and potentially related to the level of agency resources. If this is the case, then this may be a disadvantage of relying on the OASIS-based measures for determining quality incentive payments relative to claims-based measures. However, to the extent that OASIS measures account for dimensions of care that are not captured elsewhere, their continued inclusion in performance measurement is important. A fuller understanding of the OASIS measures and how they change is critical to ensuring that the measured quality of care reflects the quality of care delivered to beneficiaries.

4. Results: Home Health Agencies in HHVBP States Moderately Increased Early Visits in a Manner Associated with Lower Risk of Unplanned Hospitalizations

4.1 Introduction

This section examines the impact of HHVBP on practice patterns of home health visits by agencies during the first five years of the model. Updating and expanding on our previous work, we found evidence that ***HHVBP increased the use of frontloading—that is HHVBP agencies shifted the distribution of skilled nursing and therapy visits toward more visits during the first week of care relative to changes in the distribution of home health visits in comparison states over the same time period***. In our updated analyses, we also found evidence that HHVBP has contributed to greater increases in frontloading among post-institutional episodes relative to episodes referred by community-based (that is non-institutional) providers. We also expanded our examination of frontloading by testing for heterogeneous impacts of frontloading and HHVBP impacts on use of frontloading related to patients with clinical risk of poor outcomes and comorbidity status at the start of home health care.

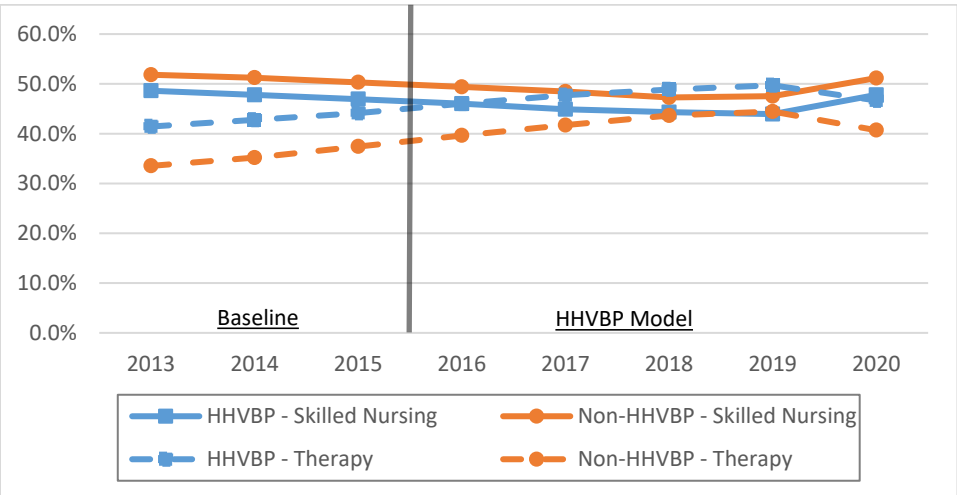
During the last two decades, HHAs have altered the volume of visits and mix of profession types providing services in response to shifting payment incentives. For example, after the implementation of the home health prospective payment system (HH PPS) in 2001, which included marginal payment increases for additional therapy but not for other types of visits, agencies responded by increasing therapy visits and decreasing skilled nurse and aide visits (MedPAC, 2020). Under HHVBP, which further adjusts HHA payments for their quality score, we expect other changes in the number, timing, and types of visits provided, because agencies may perceive changes to these inputs as helpful to achieve higher quality home health care. Specifically, the findings of this analysis suggest that agencies may believe that slowing the trend of decreasing skilled nurse visits early in episodes and accelerating the trend of increasing therapy visits early in episodes can help achieve favorable quality scores under HHVBP. In this manner, HHVBP incentives both restrain and amplify different aspects of agency responses to the HH PPS observed prior to the HHVBP Model.

Our findings of slower growth in claims-based utilization and spending measures in HHVBP states compared to non-HHVBP states that is attributable to the HHVBP Model (see Sections 6 and 7) suggest that HHAs respond to the HHVBP incentives by making changes to their operations and practices to prevent some unplanned hospitalizations. Furthermore, anecdotal reports from our interviews with home health chain organizations and HHAs in 2019 mentioned the use of timely initiation of care and frequent visits early in the episode of care, practices collectively referred to as *frontloading*, as strategically important to achieve HHVBP-related goals (Arbor Research, 2020). The benefits of frontloading may come through a variety of mechanisms. A timely start-of-care visit and multiple early visits in an episode can help the home health care providers: 1) evaluate the patients' needs and initiate a timely needs-based care plan; 2) accurately assess the patient's capacity for self-care and the availability and effectiveness of other care-giving resources, such as family members; 3) reconcile medications to avoid errors and assure adherence to a treatment plan; and 4) provide education to patients about self-care (Jones, 2017; Topaz, 2018).

4.2 Visit Shares by Provider Profession during Home Health Episodes

Medicare home health care consists of skilled nursing, physical therapy, occupational therapy, speech therapy, aide services, and medical social services provided to beneficiaries in their homes. We focused our analyses of visit practices on the two home health professions that account for the largest share of home health visits—skilled nurses and all therapists (combining physical therapists, occupational therapists, and speech therapists into one category). Throughout the study period of 2013-2020, skilled nurses and therapists each accounted for more than 40 percent of home health visits per year among all Medicare FFS home health episodes in HHVBP states (Exhibit 37). During the same period in non-HHVBP states, skilled nurses accounted for 47-52 percent of the annual share of visits among all Medicare FFS episodes, while therapists' annual visit share was in the range of 33-45 percent (Exhibit 37; also see Exhibit B-5 [Page 128] in the Technical Appendix for more details). The share of total visits per episode provided by skilled nurses generally declined in both HHVBP and non-HHVBP states from 2013 through 2019 while the share of visits provided by therapists generally grew during the same years. However, these trends reversed between 2019 to 2020 as expected due to the implementation across all states of the PDGM in 2020, which eliminates the use of therapy service volume to determine case-mix adjusted payments. From 2019 to 2020, skilled nurses' share of visits increased in both HHVBP states (44 to 48 percent) and non-HHVBP states (48 to 51 percent), reversing a gradual decline that had taken place from 2013 through 2019. Meanwhile, therapists' share of visits followed an opposite pattern for both groups, decreasing from 2019 to 2020 after a gradual increase from 2013-2019 (Exhibit 37).

Exhibit 37. Share of Total HH Episode Visits by Skilled Nurses and Therapists Changed at Similar Rates in HHVBP and Non-HHVBP States, 2013 - 2020



In contrast to the larger shares of visits provided by skilled nurses and therapists, the share of visits by home health aides is much smaller and has steadily declined over the years from nine to six percent in HHVBP states and 14 to 8 percent in non-HHVBP states during the study period (not shown). Visits by medical social services professionals also continue to account for a small fraction of total visits—less than 0.8 percent of visits in all years in both groups (not shown). See Exhibit B-5 (Page 128) in the Technical Appendix for additional details about visit type.

These general trends do not indicate that HHVBP contributed to significant differences in change over time among profession-specific visit shares. However, they do highlight how HHAs nationwide have altered their mix of visits by profession type in response to payment incentives that favored increasing

the share of therapy visits through 2019 with a noteworthy reversal of the trend in 2020 as PDGM was implemented, favoring relatively fewer therapist visits compared to skilled nurse visits. It is likely that the introduction of PDGM was most responsible for the change in trends in 2020, but the COVID-19 PHE may have also influenced the mix of episodes requiring less therapy services relative to skilled nursing.

4.3 Frontloading Skilled Nurse and Therapy Visits is Associated with Lower Risk of Unplanned Hospitalizations in Some Circumstances and HHVBP Incentives Caused Moderately More Frontloading of Visits

Frontloading is a concept that is widely discussed in the home health industry as a means to provide high quality care to home health patients, but it lacks a standard definition. In the Fourth Annual Report, we examined alternative approaches to define frontloading operationally using claims-based visit-level data for home health episodes and focused our analysis on episodes that followed within 14 days from an institutional discharge due to the greater risk such episodes have for subsequent unplanned hospitalizations (Arbor Research, 2021).[18] We found robust evidence with an extensive set of case-mix adjustments that first home health episodes with frontloaded visits—defined here as more skilled nursing or therapy visits during the first week relative to the second week—were associated with reduced likelihood of unplanned hospitalizations. Furthermore, we found that the HHVBP Model contributed to increased use of frontloading during first home health episodes relative to the change in frontloaded episodes over the same years in non-HHVBP states. Together, these findings suggested that HHAs view these practices as conducive to improving quality. Moreover, the pattern of increasing magnitudes in the impacts of HHVBP for the first four model years (2016-2019) suggested possible agency responsiveness to increasing maximum payment adjustments over this period (Exhibit 1).

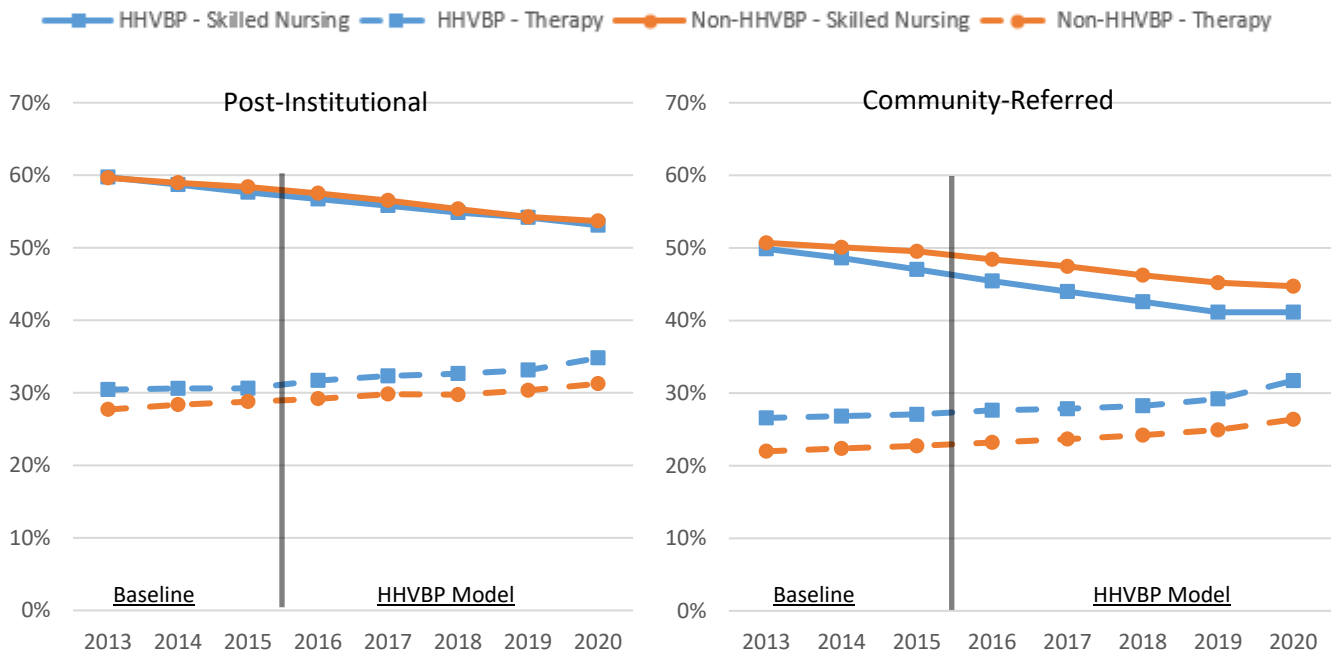
For this annual report, we again identified frontloaded home health episodes as those with more visits of a particular profession (skilled nurses or therapists) in the first week of the episode relative to the second week, and we expanded our analysis to examine if frontloading is associated with more or less benefit for patients 1) referred to home health care by community rather than institutional providers; or 2) for patients with particular clinical features observed preceding the start of home health care. We also used a regression-adjusted D-in-D approach to determine if the HHVBP Model had a discernible impact on agencies' use of frontloading as we have measured it and if those impacts varied according to source of admission to home health care or clinical severity observed prior to the start of care. We hypothesized that HHAs make use of frontloading with skilled nursing and therapy visits to differing degrees depending on the severity of clinical conditions and comorbidities, reflecting variation in the marginal benefit to quality from additional visits by each profession type for each clinical situation. Furthermore, we hypothesized that the impact of the HHVBP Model on agency use of frontloading will vary across episodes with differing clinical severity for the same reason.

Exhibit 38 shows unadjusted trends for percentage of first episodes frontloaded, stratified into two panels by post-institutional (left panel) and community-referred (right panel) episodes. Each panel shows trends further stratified by HHVBP and non-HHVBP episodes and by profession type of visit (i.e., skilled nurse or therapy). The trends in percentage of frontloaded post-institutional first episodes show that the prevalence of frontloading in these episodes is similar between HHVBP and non-HHVBP

[18] Institutional settings include acute care hospital (ACH), skilled nursing facility (SNF), inpatient rehabilitation facility (IRF), inpatient psychiatric facility (IPF), and long-term care hospital (LTCH).

episodes with a larger share of episodes frontloaded with skilled nurse visits relative to therapist visits in each year (Exhibit 38; left panel). Among community-referred first episodes, we see some divergence that grows over time with non-HHVBP episodes having a larger share frontloaded with skilled nurse visits that decreased at a slower rate relative to HHVBP episodes during the same period. However, the observed trends in unadjusted percentages appear to have started early in the baseline years without any significant shift associated with HHVBP implementation. The percentage of community-referred episodes frontloaded with therapy visits increased gradually at similar rates in HHVBP and non-HHVBP states (Exhibit 38; right panel).

Exhibit 38. Unadjusted Trends in the Percentage of Post-institutional and Community Referred Home Health Episodes Frontloaded Show a Decrease in Skilled Nursing and an Increase in Therapy Frontloaded Episodes, by HHVBP and Non-HHVBP States



Trends displayed above represent a subset of first home health FFS episodes in a sequence, (including either 1) post-institutional episodes directly discharged to home health care[left panel], or 2) episodes initiated by referral from community providers [right panel]) that lasted at least 14 days without a hospitalization occurring during that time that belong to the claims-based analytic sample (see Section A.5.1.2 [Page 102] of the Technical Appendix).

To verify the validity of the modeling approach for frontloading, we examined the extent to which our measure was associated with changes in the risk of unplanned hospitalizations and ED visits that did not result in hospitalization (i.e., outpatient ED use) during a home health episode after the first two weeks of care. We evaluated associations of frontloading home health visits during the first two weeks of the episode with hospitalizations and outpatient ED use after those initial two weeks under the assumption that unplanned hospitalizations and outpatient ED use that occur after two weeks of home health care are more likely to reflect the quality of care provided by HHAs rather than unplanned utilization that occurs earlier in a first episode. We used regression adjustment to account for confounding due to differences in case-mix that are associated with differences in the number of visits provided and outcomes. The covariates used for adjustment included all covariates used in our claims-based D-in-D

models as well as the number of outpatient ED visits and the number of skilled nurse and therapist visits during the first two weeks of episodes.[19]

We found that frontloading in both post-institutional and community-referred episodes was associated with a significant decrease in the probability of an unplanned hospitalization after the second week of the episode (-0.47 and -0.21 percentage point differences for skilled nursing visits and therapy visits, respectively during post-institutional episodes; -0.28 and -0.1 percentage point differences respectively during community-referred episodes; Exhibit 39). The magnitudes of these associations were significantly larger for post-institutional relative to community-referred episodes. The estimates for post-institutional episodes correspond to 3.4 and 1.5 percent decreases in the probability of unplanned hospitalizations associated with frontloading of skilled nursing and therapy visits, respectively, relative to the percentage of first home health episodes with an unplanned hospitalization (Exhibit 39). For the other HHVBP claims-based utilization measure—ED use without hospitalization—we found associations between it and frontloading were closer to zero for both visit types and not statistically significant for skilled nursing visits (Exhibit 39).

Exhibit 39. Frontloading Skilled Nursing or Therapy Visits Associated with a Decrease in the Probability of Unplanned Hospitalization but No Consistent Association with ED Use After Two Weeks of Home Health Care, 2013-2020

Referral Source	Frontloading Measure	Model Estimates				Average in All States (2013-2020)	% Relative Difference[c]
		Point Estimate[a]	p-value	Lower 90% CI [a]	Upper 90% CI [a]		
Unplanned Acute Care Hospitalization/First FFS HH Episodes							
Frontloading Skilled Nursing Visits[b]	Post-institutional	-0.47	<0.001	-0.52	-0.42	13.7%	-3.4%
	Community	-0.28	<0.001	-0.32	-0.25	10.8%	-2.6%
	Difference [d]	-0.19	<0.001	-0.25	-0.13		
Frontloading Therapy Visits[b]	Post-institutional	-0.21	<0.001	-0.26	-0.16	13.7%	-1.5%
	Community	-0.10	<0.001	-0.13	-0.06	10.8%	-0.9%
	Difference [d]	-0.12	<0.01	-0.18	-0.06		
ED Use (No Hospitalization)/First FFS HH Episodes							
Frontloading Skilled Nursing Visits[b]	Post-institutional	-0.03	0.28	-0.07	0.02	13.7%	-0.2%
	Community	0.01	0.77	-0.03	0.04	12.9%	0.1%
	Difference [d]	-0.03	0.28	-0.09	0.02		
Frontloading Therapy Visits[b]	Post-institutional	-0.07	0.01	-0.11	-0.02	13.7%	-0.5%
	Community	0.06	<0.01	0.02	0.09	12.9%	0.5%
	Difference [d]	-0.12	<0.001	-0.18	-0.07		

[19] See Section A.1.4.2 (Page 9) in the Technical Appendix for the list of covariates used in the analyses. We omitted episodes in which a hospitalization occurred during the first two weeks in order to avoid confounding between frontloading and hospitalizations.

CI= Confidence Interval. Analysis was performed on a subset of first home health FFS episodes in a sequence (including either post-institutional episodes directly discharged to home health care, or episodes initiated by referral from community providers) without a hospitalization occurring during the first 14 days, and that belong to the claims-based analytic sample (see Sections A.2.1.2 [Page 56] and A.5.1.2 [Page 102] of the Technical Appendix). [a] *Point estimate and CI represent percentage point changes.* [b] *Frontloading is defined as a binary where 1 indicates more visits by the profession type occurred during the first week than the second week of the episode; 0 otherwise.* [c] *Percent relative difference is calculated as 100 multiplied by the point estimate divided by the average in all states.* [d] *Difference between estimated effect of frontloading on probability of unplanned hospitalization for post-institutional and community-referred episodes (post-institutional minus community-referred), estimated separately for frontloading of skilled nursing visits and frontloading of therapy visits.*

4.3.1 Impacts of HHVBP on Frontloading of Skilled Nurse and Therapist Visits by Agencies

Having found evidence that frontloading visits in the first week of first home health episodes is associated with a lower probability of unplanned hospitalizations among post-institutional and community-referred episodes, we tested whether HHAs responded to HHVBP by increasing their use of frontloading for first episodes in a sequence. In particular, we conducted a D-in-D analysis of the impact of HHVBP on the probability that agencies frontload skilled nurse visits, and separately, therapist visits in the first week relative to the second week of episodes.

Overall, we found evidence that the HHVBP incentives resulted in agencies increasing use of frontloading (i.e., changing the distribution of visits within episodes). Relative to changes over time in non-HHVBP states, agencies in HHVBP states increased frontloading of skilled nursing visits by an annual average of 1.28 percentage points for post-institutional episodes and 0.61 percentage points for community-referred episodes (Exhibit 40). These changes correspond to annual average increases of 2.2 percent and 1.3 percent for post-institutional episodes and community-referred episodes, respectively, relative to their baseline levels. Furthermore, HHVBP agencies increased frontloading of therapy visits in the first week of care by annual averages of 2.20 and 1.27 percentage points (7.2 and 3.5 percent relative to their baseline levels) for post-institutional and community-referred episodes, respectively.

Consistent with the hypothesis that agencies may perceive post-institutional episodes to have a more pronounced benefit from frontloaded visits, we found that the average annual HHVBP impact on the probability of frontloading therapy visits was greater for post-institutional episodes than for community-referred episodes (Exhibit 40). Measures of frontloading by both profession types for both episode types had a pattern of positive impacts of HHVBP increasing in magnitude for each year from 2016 through 2020 (Exhibit 40). Moreover, we found significantly greater average impacts in 2018-2020 (the three most recent model years in which agencies received payment adjustments) in contrast with average impacts in 2016-2017 (the two model years preceding payment adjustments) for frontloading of both skilled nurse and therapist visits in post-institutional episodes and frontloading of therapist visits in community-referred episodes (not shown).

Exhibit 40. HHVBP Results in Increase in Frontloading of Skilled Nurse or Therapist Visits During the First Two Weeks of Home Health Care for Post-Institutional and Community-Referred Episodes

Measure	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	% Relative Change
	D-in-D[a]	p-value	Lower 90% CI [a]	Upper 90% CI [a]		
Frontloading Skilled Nursing Visits[b] (Visit Distribution), Post-institutional Episodes						
2016	0.24	0.46	-0.30	0.79	58.7%	0.4%

Measure	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	% Relative Change
	D-in-D[a]	p-value	Lower 90% CI [a]	Upper 90% CI [a]		
2017	0.89	0.09	0.03	1.75		1.5%
2018	1.23	0.07	0.13	2.33		2.1%
2019	1.90	0.02	0.56	3.24		3.2%
2020	2.21	0.02	0.65	3.77		3.8%
Cumulative	1.28	0.04	0.26	2.30		2.2%
Frontloading Skilled Nursing Visits[b] (Visit Distribution), Community-referred Episodes						
2016	0.08	0.87	-0.72	0.88	48.5%	0.2%
2017	0.23	0.77	-1.10	1.57		0.5%
2018	0.53	0.63	-1.27	2.32		1.1%
2019	0.60	0.66	-1.62	2.82		1.2%
2020	1.76	0.28	-0.90	4.41		3.6%
Cumulative	0.61	0.55	-1.08	2.30		1.3%
Difference in SN cumulative impacts[c]	0.68	0.54	-1.12	2.47		
Frontloading Therapy Visits[b] (Visit Distribution), Post-institutional Episodes						
2016	0.99	<0.01	0.49	1.50	30.6%	3.2%
2017	1.36	<0.01	0.59	2.13		4.5%
2018	2.14	<0.001	1.13	3.15		7.0%
2019	2.72	<0.001	1.42	4.02		8.9%
2020	3.92	<0.001	2.39	5.46		12.8%
Cumulative	2.20	<0.001	1.24	3.16		7.2%
Frontloading Therapy Visits[b] (Visit Distribution), Community-referred Episodes						
2016	0.45	0.11	-0.01	0.91	26.8%	1.7%
2017	0.36	0.42	-0.37	1.09		1.3%
2018	0.58	0.32	-0.37	1.53		2.2%
2019	1.07	0.14	-0.13	2.27		4.0%
2020	2.39	0.01	0.95	3.83		8.9%
Cumulative	0.93	0.09	0.02	1.84		3.5%
Difference in therapy cumulative impacts[c]	1.27	0.05	0.23	2.32		

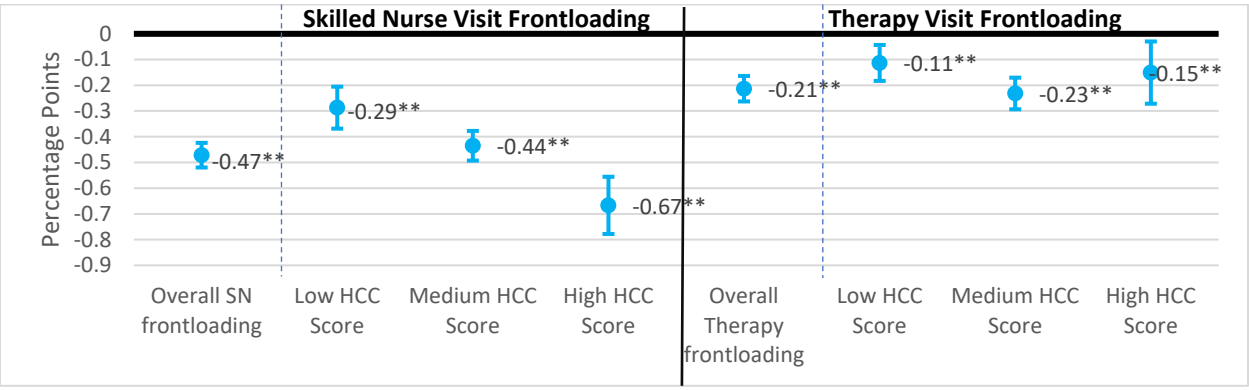
CI = Confidence Interval. See Exhibit 40n (Page 197) in the Technical Appendix for each measure's sample size. Analysis was performed on a subset of first home health FFS episodes in sequences, only including post-institutional and community-referred home health episodes that lasted at least 14 days without a hospitalization occurring during that time, and that belong to the claims-based analytic sample (see Sections A.2.1.2 [Page 56] and A.5.1.2 [Page 102] of the Technical Appendix). [a] D-in-D and CI values represent percentage point changes. [b] Frontloading is defined as a binary variable where 1 indicates more visits by the profession type occurred during the first week than the second week of the episode; 0 otherwise. [c] Difference between cumulative impacts of the D-in-D models for post-institutional and community-referred episodes (post-institutional estimate minus community referred estimate), estimated separately for frontloading of skilled nursing visits and frontloading of therapy visits. The differences between cumulative impacts were estimated by means of a difference-in-differences-in-differences model; see Section A.5.1.7 (Page 106) of the Technical Appendix for details regarding model specification.

4.3.2 HHVBP Contributed to More Frontloaded Skilled Nurse Visits in Low Clinical Risk Episodes and More Frontloaded Therapist Visits in High Clinical Risk Episodes

We conducted supplementary analyses to determine if our findings that frontloading contributes to reduced unplanned hospitalizations during first home health episodes and that HHVBP incentives contributed to increased use of frontloading varies by the clinical status of patients at the start of care. Specifically, we examined the frontloading of home health visits in subgroups determined in separate analyses by 1) HCC score from the year prior to the start of home health (referred to as HCC score subgroups), and 2) the presence of major, non-major, or no complications and comorbidities based on the MS-DRG found in claims for acute care preceding a home health episode. The first grouping scheme uses risk of health care need identified during the year prior to home health care, whereas the second grouping scheme identifies complication and comorbidity status during a hospitalization that immediately preceded a home health episode. The former approach provides a general characterization of health status that is not necessarily directly related to the primary cause of admission to home health care, whereas the latter approach identifies severity of clinical complexity of the recent hospitalization and that likely relates more closely to the cause of admission to home health. Therefore, these two schemes for examining clinical severity prior to the start of home health enable complementary approaches to identifying variation in the potential benefits of frontloading to home health patients.

Regression analyses stratified by HCC score subgroups defined as low (less than the 20th percentile of HCC scores in all episodes), medium (20th percentile to 80th percentile), and high (greater than 80th percentile) reveal a significant stepwise increase in the effect size of frontloaded skilled nursing visits on unplanned hospitalizations during first post-institutional home health episodes (Exhibit 41). We find a 0.29 percentage point decrease in unplanned hospitalizations for the low HCC score group, a 0.44 percentage point decrease for the medium HCC score group, and a 0.67 percentage point decrease for the high HCC score group (Exhibit 41, left panel). The association between frontloaded therapy visits and unplanned hospitalizations were also negative and statistically significant across the range of HCC scores but did not follow the same stepwise pattern (Exhibit 41; right panel).

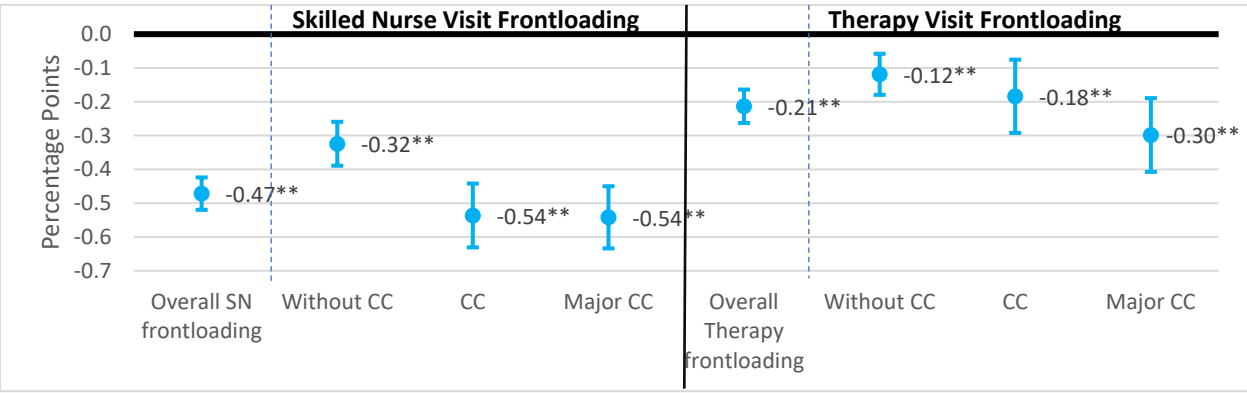
Exhibit 41. Decrease in the Probability of Unplanned Hospitalization Associated with Frontloading Skilled Nursing Visits Increases with Severity of Prior Year HCC Score Whereas Association Between Frontloading Therapy Visits and Decrease in Unplanned Hospitalization Remains Similar Across HCC Scores Among Post-Institutional Episodes



*Graph shows 90% confidence intervals | **p < 0.05 | Each plotted point estimate comes from a regression model estimated on a subgroup of episodes defined based on ranges of hierarchical condition category (HCC) score from the year prior to start of home health care | Low designates HCC score below the 20th percentile HCC score of all first episodes, Medium is HCC score between 20th and 80th percentile, High is HCC score greater than 80th percentile. Analysis was performed on a subset of first home health FFS episodes in sequences, only including post-institutional home health episodes that lasted at least 14 days without a hospitalization occurring during that time, and that belong to the claims-based analytic sample (see Sections A.2.1.2 [Page 56] and A.5.1.2 [Page 102] of the Technical Appendix).*

Regression analyses of the effect of frontloaded home health visits for groups of episodes identified by complication and comorbidity status from a preceding hospitalization shows that the presence of any or major complications and comorbidities was associated with larger negative effect sizes of frontloaded skilled nurse or therapist visits on the probability of subsequent hospitalization compared to overall (Exhibit 42). Episodes with any or major complications and comorbidities from the preceding hospitalization had a 0.54 percentage point reduction in probability of subsequent hospitalization when agencies frontloaded skilled nurse visits and a 0.18 to 0.30 percentage point reduction due to frontloaded therapist visits. Episodes without complications and comorbidities during the prior hospitalization had a 0.32 percentage point reduction in subsequent hospitalizations associated with skilled nurse frontloaded visits and a 0.12 percentage point reduction associated with therapist frontloaded visits (Exhibit 42).

Exhibit 42. Decrease in the Probability of Unplanned Hospitalization Associated with Frontloaded Skilled Nursing and Therapy Visits Is Larger When Hospitalization Preceding HH Episode has Complications and Comorbidities

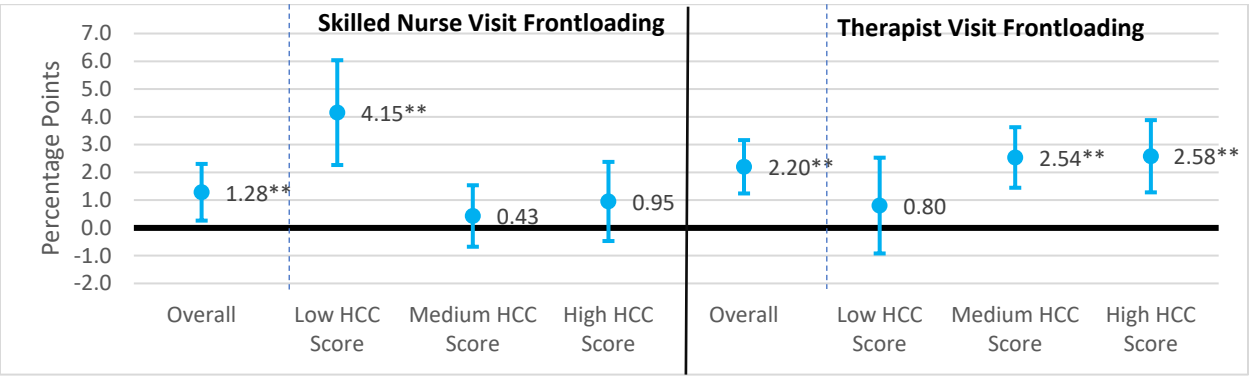


*Graph shows 90% confidence intervals | ** p < 0.05 | Each plotted point estimate comes from a regression model on a group of episodes that belong to a subgroup defined by the identified complication and comorbidity status of the prior acute care hospitalization | CC = complications and comorbidities. Analysis was performed on a subset of first home health FFS episodes in sequences, only including post-institutional home health episodes that lasted at least 14 days without a hospitalization occurring during that time, and that belong to the claims-based analytic sample (see Sections A.2.1.2 [Page 56] and A.5.1.2 [Page 102] of the Technical Appendix).*

Having found evidence that frontloaded home health visits can be associated with greater reductions in the risk of a hospitalization during or shortly after a home health episode when episodes have greater clinical severity at the start of care, we tested whether the impact of the HHVBP Model on the likelihood of frontloaded home health visits varies according to measures of clinical severity. We found that HHVBP incentives increased the use of frontloaded skilled nurse visits for lower severity episodes both when clinical severity is measured by HCC score (4.15 percentage point increase in average annual proportion of episodes with frontloaded visits; Exhibit 43, left panel) and according to the complication and comorbidity status of a prior hospitalization (2.15 percentage point increase; Exhibit 44, left panel).

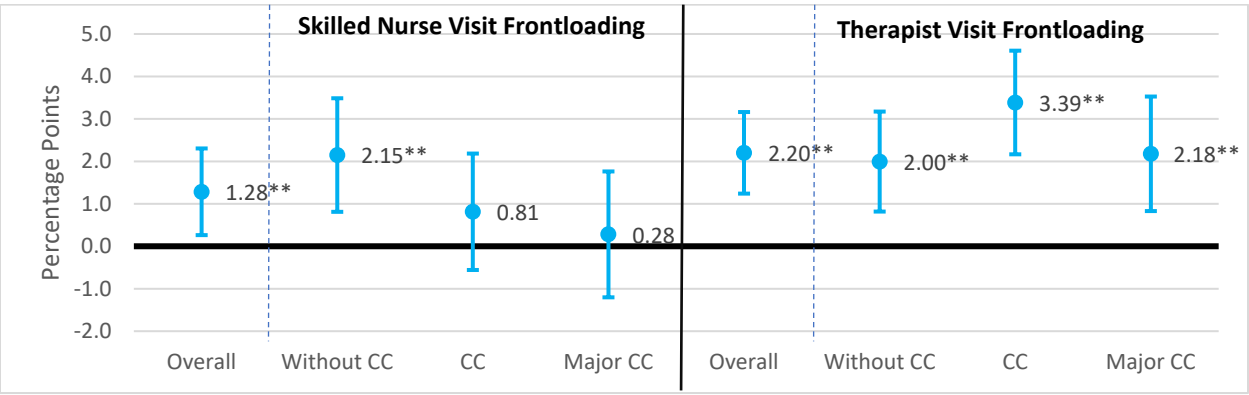
Agencies subject to HHVBP incentives also increased use of frontloaded therapist visits for episodes with greater clinical severity measured at the start of care. In particular, HHVBP contributed to 2.54 and 2.58 percentage point increases in the proportion of episodes with frontloaded therapist visits for medium and high HCC score episodes (Exhibit 43, right panel) and impacts ranging from a 2 to 3.39 percentage point increase for episodes based on complications and comorbidities during the preceding hospitalization (Exhibit 44, right panel).

Exhibit 43. HHVBP Increased Frontloading of Skilled Nurse Visits for Low HCC Score and Frontloading of Therapist Visits for Medium and High HCC Score Post-Institutional Episodes



*Graph shows 90% confidence intervals | **p < 0.05 | Each plotted point estimate comes from a regression model estimated on a subgroup of episodes defined based on ranges of hierarchical condition category (HCC) score from the year prior to start of home health care | Low designates HCC score below the 20th percentile HCC score of all first episodes, Medium is HCC score between 20th and 80th percentile, High is HCC score greater than 80th percentile. Analysis was performed on a subset of first home health FFS episodes in sequences, only including post-institutional home health episodes that lasted at least 14 days without a hospitalization occurring during that time, and that belong to the claims-based analytic sample (see Sections A.2.1.2 [Page 56] and A.5.1.2 [Page 102] of the Technical Appendix).*

Exhibit 44. HHVBP Increased Frontloading of Skilled Nurse Visits when Preceding Hospitalization was Without Complications and Comorbidities and Frontloading of Therapist Visits for All Three Levels of Complications and Comorbidity Status



*Graph shows 90% confidence intervals | ** p < 0.05 | Each plotted point estimate comes from a regression model on a group of episodes that belong to a subgroup defined by the identified complication and comorbidity status of the prior acute care hospitalization | CC = complications and comorbidities. Analysis was performed on a subset of first home health FFS episodes in sequences, only including post-institutional home health episodes that lasted at least 14 days without a hospitalization occurring during that time, and that belong to the claims-based analytic sample (see Sections A.2.1.2 [Page 56] and A.5.1.2 [Page 102] of the Technical Appendix).*

4.4 Discussion

The results in this section provide evidence of one potentially important mechanism by which the quality incentives in HHVBP may have prompted improvements in the delivery of care and outcomes for home health patients. Our analysis of HHA frontloading practices and changes in agency use of these

practices in response to HHVBP is consistent with the hypothesis that HHAs respond to performance-based financial incentives by adjusting the number, timing, and types of visits to achieve better outcomes. In particular, our analysis of the association between frontloading and key quality outcomes showed that shifting the distribution of skilled nurse or therapist visits more heavily to the first week was associated with better outcomes for unplanned hospitalizations. Moreover, the analysis of subgroups defined by clinical severity demonstrated that frontloading was associated with greater reductions in the risk of unplanned hospitalizations for patients with indication of greater clinical risk observed before the start of home health care. This evidence is consistent with the hypothesis that frontloading (as we have defined it) indicates high quality care.

Through our D-in-D analysis, we found statistically significant evidence that HHAs increased their use of frontloading in response to HHVBP by moderately increasing the share of both skilled nursing and therapy visits occurring during the first week relative to the second week of home health episodes. Considered collectively, the findings of these related analyses suggest that HHAs view frontloading as conducive to improving quality. Furthermore, the pattern of increasing magnitudes in the impacts of HHVBP for all five model years (2016-2020) suggests possible agency responsiveness to increasing maximum payment adjustments over this period.

The analysis of HHVBP impacts on frontloaded visits across subgroups, through which we only found a statistically significant effect of HHVBP on use of frontloaded skilled nurse visits for post-acute episodes with the lowest clinical risk, suggests that increases in the use of frontloaded skilled nurse visits may have been more easily achieved by agencies for patients with relatively lower clinical risk. The reason that such increases may be more achievable for these lower risk episodes is because they have lower pre-existing use of frontloaded skilled nurse visits in both HHVBP and comparison states. Similarly, increases in frontloaded therapist visits are more readily achievable for higher risk episodes because as defined, these episodes have a lower proportion frontloaded with therapist visits in general.

4.5 Case Study of Potential Chain-Driven Spillover

Evaluation interviews conducted in 2019 with staff from chain-affiliated HHAs and leadership from home health chains documented that performance improvement strategies across HHAs are often formulated at the corporate level and implemented in a centralized manner, regardless of location in an HHVBP or non-HHVBP state (Arbor Research, 2020). As well, interviews with some of the larger home health chains revealed that performance assessments and improvement activities were not necessarily implemented or refined in response to HHVBP incentives, but rather reflected ongoing efforts as part of established organizational performance goals. While the HHVBP Model frequently served as an additional incentive to undertake performance improvement initiatives, chain organizations may not have differentiated implementation between affiliated HHAs in HHVBP and non-HHVBP states. Thus, if chain-affiliated HHAs are following corporate-level directives, both in response to HHVBP and other incentives, they represent a potential source of spillover that would be important to consider when measuring and interpreting HHVBP model impacts. More specifically, if change has spread to the non-intervention states, then the impact of HHVBP could be under-estimated; that is, the difference between the change in HHVBP states and the change in non-HHVBP states will be smaller than if there were no spillover. Moreover, this would suggest that there may be a more limited additional impact on performance from the expansion of the model beyond the current nine states since some of the benefits may have already accrued in the non-HHVBP states.

Using listings of HHA data from annual SEC 10-K filings required of public companies and other publicly available data (see Section A.5.1.9 [Pages 110-111] in the Technical Appendix for additional detail), we provide an initial look at the extent of spillover between chain-affiliated agencies operating in both HHVBP and non-HHVBP states by focusing on a subset of HHVBP performance measures in 2019 within a large, national home health chain: Louisiana Health Care (LHC) Group. Results from our case study are summarized below.

4.5.1 Background on LHC Group

Based in Lafayette, Louisiana, LHC Group is one of the largest national providers of in-home health care services, serving patients in 37 states and the District of Columbia (LHC Group, 2021). Since its founding in 1994 as a single home health agency, LHC Group has expanded its service base to include hospice care, home and community-based services, facility-based care, advance care planning, and palliative care. The company has grown immensely in a short amount of time through a number of major acquisitions and mergers and had 150 affiliated agencies in 2019 (Exhibit 45). These agencies accounted for 2.5% and 2.3% of agencies in HHVBP and non-HHVBP states, respectively, and provided a disproportionate share of episodes (5.3% and 4.6%, respectively). LHC Group's comparable position in both HHVBP and non-HHVBP states helps to underscore the role that chains play overall in the HHA landscape – in HHVBP states, chain-affiliated agencies represent nearly 40% of all agencies and 60% of episodes, and in non-HHVBP states represent approximately 24% of all agencies and 43% of episodes (Exhibit 45).

Exhibit 45. Number and Episode Volume of LHC Group HHAs, Other Chain-Affiliated HHAs, and Independent HHAs in HHVBP and non-HHVBP States, 2019

	HHVBP States			Non-HHVBP States		
	Chain Affiliation			Chain Affiliation		
	LHC Group	Other	None	LHC Group	Other	None
Number of Agencies	53	797	1,290	197	1,893	6,620
% Agencies	2.5%	37.2%	60.3%	2.3%	21.7%	76.0%
Agency Characteristics						
Total OASIS Episodes (N)	64,778	665,963	498,596	191,045	1,616,219	2,380,646
% OASIS Episodes	5.3%	54.2%	40.6%	4.6%	38.6%	56.8%
HHA Size Distribution by HHA Annual Volume (%)						
1-249 OASIS episodes	0.6%	0.8%	12.2%	1.0%	2.2%	22.9%
250-999 OASIS episodes	21.4%	17.3%	30.7%	32.8%	21.6%	34.3%
1,000+ OASIS episodes	78.0%	81.9%	57.1%	66.3%	76.2%	42.8%

4.5.2 Patterns across Chain and non-Chain Agencies in HHVBP and non-HHVBP States

To explore potential spillover, we characterize agencies across HHVBP and non-HHVBP states according to a number of HHVBP measures representing different dimensions of agency performance, beneficiary health (to observe potential selection effects), and the structure of care delivery (Exhibit 46). For the two claims-based HHVBP measures, we see similar patterns across the three agency types (i.e., LHC Group-affiliated, Other chain-affiliated, and non-affiliated) in both HHVBP and non-HHVBP states. For

example, for both claims-based measures and in HHVBP and non-HHVBP states, LHC Group-affiliated agencies have the highest values, followed by other chain-affiliated agencies and then non-affiliated HHAs. Interviews with agencies and chain leadership suggest that the OASIS- and HHCAHPS-based measures are more responsive to agency behavior changes (e.g., through coding practices, more focused communications) than the claims-based measures (Arbor Research, 2020). For these measures as well, we see general consistency across the LHC Group-affiliated HHAs in HHVBP and non-HHVBP states, and similar orderings across LHC Group-affiliated, other chain-affiliated, and non-affiliated agencies regardless of geography. Two minor exceptions are the OASIS discharge to community and HHCAHPS Overall Care measures, where the measure values in HHVBP states are fairly uniform across agency affiliation type, compared to non-HHVBP states where the pattern of declining measure values from LHC Group-affiliated, other-chain, and non-affiliated is similar to what we have seen for other measures. A possible explanation is that these two measures are less easily influenced by agency behavior and chain protocols or policies.

Exhibit 46. Selected HHVBP Measures, Case-mix, and Episode Characteristics, by LHC Group, Other Chain-Affiliated HHAs, and Independent HHAs in HHVBP and non-HHVBP States, 2019

	HHVBP States			Non-HHVBP States		
	Chain Affiliation			Chain Affiliation		
	LHC Group	Other	None	LHC Group	Other	None
HHVBP Measures (Agency-level*)						
Claims-based measures						
Unplanned Acute Care Hospitalization/First FFS HH Episodes	15.4%	15.3%	15.0%	15.9%	15.7%	15.2%
Outpatient ED Use (No Hospitalization)/First FFS HH Episodes	13.7%	13.1%	12.5%	14.1%	13.6%	12.6%
Selected OASIS-based measures						
Discharged to Community	73.4%	73.7%	72.9%	72.1%	71.5%	70.3%
Improvement in Dyspnea	89.3%	85.6%	82.0%	89.7%	84.3%	77.3%
Improvement in Management of Oral Medications	83.4%	78.3%	75.5%	83.5%	77.6%	70.9%
Improvement in Pain Interfering with Activity	90.4%	85.6%	84.2%	92.5%	85.3%	79.7%
Selected Patient Experience HHCAHPS-based measures						
How well did the home health team communicate with patients (Communication)	86.9%	86.2%	85.6%	88.5%	86.5%	85.2%
Did the home health team discuss medicines, pain, and home safety with patients (Discussion of Care)	84.8%	83.0%	82.0%	86.7%	84.1%	82.6%
How do patients rate the overall care from the home health agency (Overall Care)	84.7%	84.9%	84.7%	86.7%	85.1%	83.9%
Beneficiary Characteristics						

	HHVBP States			Non-HHVBP States		
	Chain Affiliation			Chain Affiliation		
	LHC Group	Other	None	LHC Group	Other	None
Episode-level Average HCC Score (Relative Health Severity)	3.3	3.3	3.2	3.2	3.3	3.1
Episode Characteristics						
Average Visits Per Episode (Total)	18.2	16.9	18.8	17.4	16.1	16.5
Avg Visits per Episode by Discipline						
Occupational Therapy (OT)	2.5	2.3	1.7	2.3	2.0	1.4
Physical Therapy (PT)	7.1	6.3	6.4	6.0	5.5	5.1
Speech Therapy (ST)	0.4	0.5	0.3	0.5	0.5	0.2
All therapies (PT, OT, ST)	10.0	9.1	8.3	8.8	8.0	6.7
Skilled Nurse	7.5	7.0	8.8	7.8	7.1	8.2
Medical Social Services	0.2	0.1	0.1	0.1	0.1	0.1
HH Aide	0.6	0.6	1.5	0.6	0.9	1.5

**The claims-based and OASIS measures are risk-adjusted and weighted by the number of episodes. | HCC = Hierarchical Condition Category*

Beneficiary health status across the different groups of agencies and HHVBP and non-HHVBP states is similar (i.e., average HCC score of 3.1-3.3; Exhibit 46), suggesting that variation in performance across the groups captures differences in how care is provided across agencies rather than differences in underlying beneficiary characteristics. Finally, we also examined care delivery through the distribution of visits by discipline, which was motivated by previous findings from interviews that found agencies have adjusted their approach to the types of visits within an episode (Arbor Research, 2020). Again, we see similar patterns in the distribution of visit types across the different agency groupings in HHVBP compared to non-HHVBP states. In both HHVBP and non-HHVBP states, LHC Group-affiliated agencies have the largest number of occupational Therapy, physical Therapy, and all therapy visits combined, followed by other chain-affiliated chain agencies and then independent agencies. The reverse is true for skilled nursing and home health aide visits, with non-chain affiliated agencies providing more of these visits per episode than chain-affiliated agencies in both HHVBP and non-HHVBP states. The comparable patterns in performance among LHC Group chain-affiliated HHAs in both HHVBP states and non-HHVBP states provides some initial evidence that agencies affiliated with the same chain may behave similarly regardless of geography.

4.6 HHVBP Self-Reported Measures

As part of our quantitative analyses through the fifth year of the original HHVBP Model, we examined the reporting rates of the three HHVBP measures among HHAs in the HHVBP states via the Secure Web Portal:

- Influenza Vaccination Coverage for Home Health Care Personnel;
- Herpes Zoster (Shingles) Vaccination for Patient; and
- Advance Care Plan.[20]

In 2020, 89.2 percent of all agencies in HHVBP states reported herpes zoster vaccination status of patients, and the same percent of agencies reported whether an advance care plan was present (not shown). Only two-thirds of agencies (66.2 percent) reported the influenza vaccination status of their personnel. Among agencies that reported influenza vaccination status, all but one also reported the other two measures. As such, the agency reporting rate for all three measures (66.2 percent) was nearly the same as the rate at which agencies reported influenza vaccination. The 2020 reporting rate for all three measures was lower than what we found in 2019 (80.8 percent) or 2018 (79.6 percent). This reduction in the reporting rate for 2020 may partially be explained by CMS's reporting exemption for these self-reported measures for the first two quarters of 2020 due to the COVID-19 PHE (HHS, 2020). We found a slightly higher share of agencies that did not report any of the three measures in 2020 (10.6 percent) compared to previous years (e.g., 9.0 percent and 9.7 percent in 2019 and 2018, respectively). As in previous years, reporting rates were lower among small, freestanding, for-profit, newer, and non-chain agencies (see Exhibit B-23 [Page 148] in the Technical Appendix).

4.7 HHVBP Connect

We also examined the use of HHVBP Connect by HHAs in HHVBP states during the fifth year of the model. HHVBP Connect is an interactive web-based platform for HHAs in HHVBP states designed to facilitate learning and collaboration on topics related to the HHVBP Model. With the exception of average webinar attendance, agencies' use of HHVBP Connect in 2020 declined from the first four years of the model, including a lower number of unique logins and fewer downloads and online posts.

Content related to quality improvement activities and updates to the model (e.g., downloads, webinar participation) continued to be the most frequently accessed resources. Similar to prior years, the most frequently used HHVBP Connect resource type in 2020 was downloading resources, with 669 downloads of the 58 resources created in 2020, a substantial decrease from the nearly 4,500 downloads of the 105 resources in 2019. Model participants also continued to download materials that were created in earlier years of the model, with 1,115 downloads of 314 resources that were posted prior to 2020.

The second most frequently used HHVBP Connect resource in 2020 was attending live webinars. There were only three webinars offered in 2020 with 541 cumulative attendees, a marked decrease compared to the 13-15 annual webinars offered in previous years. The webinar on reporting during the COVID-19 PHE generated the most interest with 309 HHAs in attendance.

There are several factors that may have influenced this lower utilization in 2020, including the much smaller number of webinars offered in 2020 compared to previous years as well as a large share of users

[20] The "Advance Care Plan" measure reflects the "Percentage of patients aged 65 years and older who have an advance care plan or surrogate decision maker documented in the medical record or documentation in the medical record that an advance care plan was discussed but the patient did not wish or was not able to name a surrogate decision maker or provide an advance care plan." (HHVBP Connect, 2016).

being deactivated by the system in early 2020 (presumably due to different login credentials required by the new website).[21] The COVID-19 PHE may have also contributed to lower utilization as HHAs faced competing priorities, and agency staff may also have increased familiarity with the HHVBP Model, translating to less need for technical assistance. We provide further details of our analyses of HHVBP Connect in Section B.4.2 (Page 149) in the Technical Appendix.

[21] In 2020, HHVBP Connect was replaced by "CMMI Connect" which had a new user interface and required different login credentials. However, we still refer to the website as "HHVBP Connect" for continuity.

5. Results: Higher Agency Total Performance Scores in HHVBP States than Comparison States in Each of the First Five Years of the Original HHVBP Model

5.1 Introduction

This section presents our analyses of the impact of the HHVBP Model on the overall quality measure performance of home health agencies in the nine model states. As discussed above, the performance of eligible agencies under the HHVBP Model is measured using Total Performance Scores (TPS), which are the basis for adjusting Medicare payments to agencies under the home health PPS. For example, CMS used the 2018 TPS to determine the payment adjustments applied to eligible HHAs in the nine HHVBP states for CY 2020. The TPS is of interest as an overall performance indicator for comparing agencies in model states with those in non-model states where this metric does not affect Medicare payments to HHAs. Under the HHVBP Model, the agency TPS has also had growing financial implications for agencies in the nine HHVBP states. While the 2016 TPS determined payment adjustments of up to ±3 percent in CY 2018, the 2019 TPS determined payment adjustments of up to ±7 percent in CY 2021 (see Exhibit 1).

As discussed in Section 1, the performance of agencies in the nine original model states during performance year 2020 would have determined payment adjustments of up to ±8 percent in CY 2022 in the original design of the HHVBP Model (CMS, 2016). However, in the CY 2022 final rule, CMS expanded the HHVBP Model nationally and identified CY 2022 as a pre-implementation year with no HHVBP payment adjustments (HHS 2021). An agency's performance in CY 2023 – the first performance year of the expanded HHVBP Model – will be used to adjust its payment of up to ±5 percent in CY 2025.

In our analyses for this report, we examined agency performance data through 2020 which at the time were expected to result in payment adjustments to agencies in 2022. Using multivariate linear regression of agency-level data for 2016-2020, we found ***higher TPS values in each of the first five years of the model*** for agencies in the nine model states compared to those in the non-model states. Sustained impacts of HHVBP starting in the first year of implementation may reflect effects of the model's performance incentives as agencies were aware that starting in 2016, their performance would affect their future Medicare payments. Our analyses of agency TPS values for 2020, which were originally designed to result in larger payment adjustments in 2022 and were the second year that used larger weights for the claims-based measures, do not show a strong pattern of HHVBP agencies with a lower TPS being more likely than other agencies to care for beneficiaries with social risk factors. Finally, based on an analysis of freestanding HHAs using cost report data for the first two payment years of the model (i.e., 2018-2020), we did not find a strong relationship between the profitability of agencies and their payment adjustments under HHVBP.

5.2 Higher TPS among Agencies in HHVBP States Compared to Non-HHVBP States in the First Five Years

In 2020, we calculated a TPS for 78.2 percent of HHAs in HHVBP states[22] and 71.1 percent of HHAs in non-model states (Exhibit 47). For agencies in both HHVBP states and non-model states, those without a

[22] Among HHAs in HHVBP states, our calculated TPS aligns closely with the TPS calculated by the HHVBP Implementation Contractor (See Section A.2.7 [Page 84] in the Technical Appendix), as does the percentage of

TPS tended to be small and were in operation for a relatively shorter period (see Exhibit B-31 [Page 155] in the Technical Appendix). Based on their smaller size, agencies that were ineligible to receive a TPS account for relatively few home health episodes in the U.S. Our analyses of TPS values for the most recent year (2020) demonstrate HHAs eligible to receive a TPS accounted for 99.2 percent of OASIS episodes in HHVBP states and 98.3 percent of OASIS episodes in non-model states (Exhibit 47). We observed similar rates in 2019 (see Exhibit B-31 [Page 155] in the Technical Appendix). The TPS analyses in this report therefore reflects the quality performance of a very large proportion of the home health episodes for Medicare and Medicaid patients in the U.S.

Exhibit 47. HHAs that are Ineligible to Receive a TPS Account for Relatively Few Home Health Episodes, 2020

	Agencies in HHVBP States			Agencies in Non-HHVBP States		
	Eligible for TPS		Total	Eligible for TPS		Total
	Yes	No		Yes	No	
Total number of HHAs	1,491	416	1,907	5,947	2,421	8,368
% of HHAs	78.2%	21.8%	100.0%	71.1%	28.9%	100.0%
Number of OASIS episodes	1,587,381	13,298	1,600,679	5,175,403	88,337	5,263,740
% of OASIS episodes	99.2%	0.8%	100.0%	98.3%	1.7%	100.0%
Number of Medicare claims episodes	2,056,202	21,026	2,077,228	6,704,105	223,593	6,927,698
% of Medicare claims episodes	99.0%	1.0%	100.0%	96.8%	3.2%	100.0%

Agencies eligible to receive a TPS under the HHVBP Model include those having at least five HHVBP measures with sufficient data and a Medicare participation date prior to the CY used as a baseline period for measuring improvement.

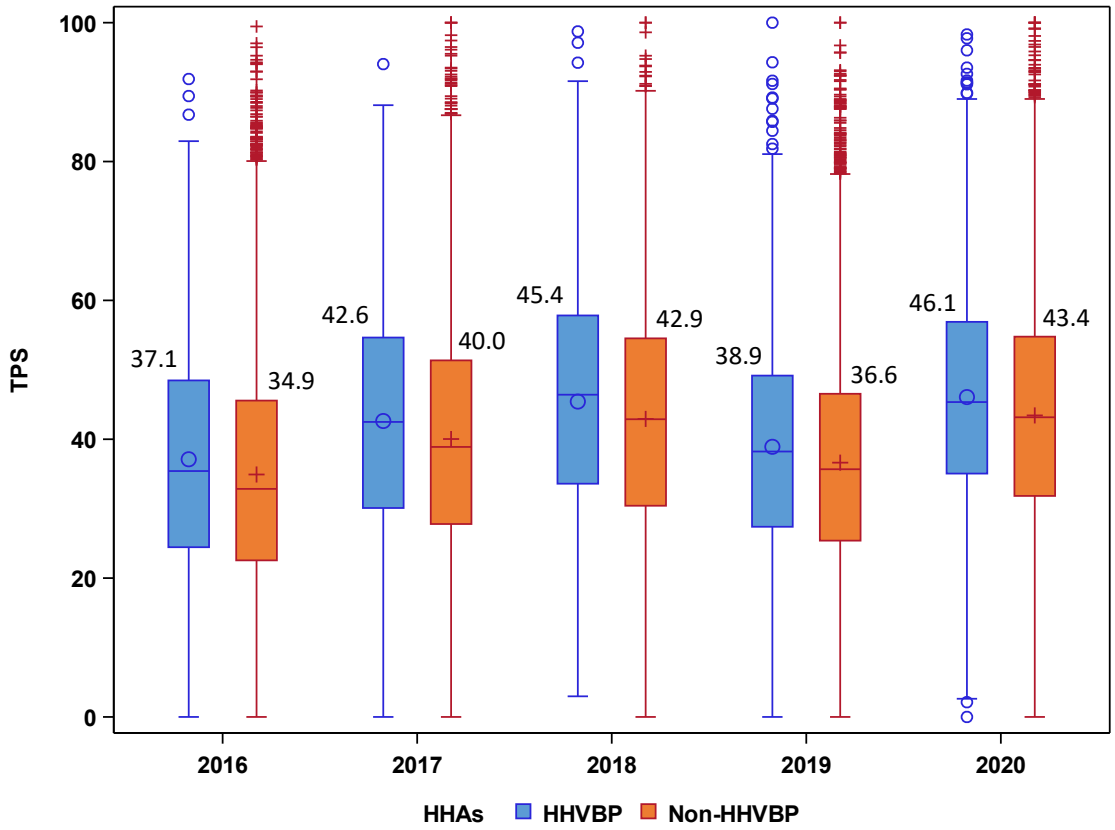
In each of the first five years of the original model, TPS values were slightly higher among HHAs in HHVBP states relative to those in non-model states (Exhibit 48). We note that agency TPS values in the two groups of states are compared while accounting for the risk adjustment method being used for each of the individual HHVBP performance measures that comprise the TPS. Between 2016 and 2018, there was a shift upward in the agency TPS distribution each year for both groups of agencies. Since there were minimal changes in the TPS methodology during this period,[23] we can interpret these shifts as indicating ongoing improvement in agency performance in 2018 over 2017 (and in 2017 over 2016). Between 2018 and 2019, there was a shift downward in the TPS distributions for both groups of agencies. However, given the change in TPS methodology starting in 2019—which included the increased weighting of the two claims-based measures—these downward shifts for both groups of agencies should not be interpreted to reflect decreases in overall agency performance based on the measures included in the TPS. Instead, the lower TPS values in 2019 for agencies in both HHVBP states

HHAs in HHVBP states that received a TPS in 2020 from the HHVBP Implementation Contractor (See Exhibit B-1 [Page 119] in the Technical Appendix).

[23] The same methodology was used to calculate each agency's TPS for 2016 and 2017, while one process measure was dropped from the TPS calculation for 2018 (Drug Education on Medications Provided to Patient/Caregiver).

and non-HHVBP states likely reflect the larger contribution of the unplanned ACH and outpatient ED utilization measures to the TPS, since agencies had lower scores on these measures compared to most other measures included in the TPS (see Exhibit B-33 [Page 156] in the Technical Appendix).

Exhibit 48. Higher Agency TPS Values in HHVBP versus Non-HHVBP States, 2016 – 2020



*The box shows the interquartile range, with the median represented by the horizontal line and the mean represented by the circle or the "plus" sign for HHVBP and non-HHVBP groups, respectively. The lower line or "whisker" reflects the minimum observation, and the upper whisker reflects the maximum TPS that occurs within the 75th percentile and 1.5*IQR (the "fence"). The circles above the upper whisker reflect outliers (i.e., observations that are higher than the "fence").*

Between 2019 and 2020, there was again a shift upward in the TPS distributions for both groups of agencies. Among the trends in agency performance on individual measures included in the TPS, we observed the largest increases in average measure scores during 2019-2020 for the two claims-based utilization measures and the two TNC change in functioning measures (see Exhibit B-33 [Page 156] in the Technical Appendix). These trends may have been influenced by the COVID-19 PHE, which likely contributed to the observed declines in unplanned hospitalization and ED measures in 2020 (see Exhibit B-6 [Page 130] in the Technical Appendix). However, as shown in Exhibit 48, TPS values continued to be higher among agencies in HHVBP states compared to those in non-model states during 2020. As in the first four years of HHVBP, we found that the relatively higher TPS values among agencies in HHVBP states during 2020 continue to be almost entirely the result of higher scores for the OASIS-based outcome measures (see Exhibit B-33 [Page 156] in the Technical Appendix).

We also examined agency TPS values while accounting for the observed differences in agency characteristics and patient sociodemographic factors between the HHVBP and non-HHVBP groups.[24] For each of the initial five years of the model, we found agency TPS values to be relatively higher in HHVBP states based on multivariate linear regression. Model estimates indicated TPS values that were 3.2 percentage points higher among agencies in HHVBP states in 2020 after ranging between 1.6 and 2.9 percentage points higher between 2016 and 2019 (Exhibit 49). This effect size indicates TPS values for HHVBP agencies that were 7.4 percent higher than those for non-HHVBP agencies in 2020 after ranging between 3.7 percent and 7.9 percent higher between 2016 and 2019.

Exhibit 49. Higher Agency TPS Values in HHVBP versus Non-HHVBP States When Also Adjusting for Patient Sociodemographic Factors and Agency Characteristics, 2016 – 2020

Year	Agencies in HHVBP States		Average TPS, Agencies in Non-HHVBP States	Percent Difference
	Coefficient	p-value		
2016	1.6	<0.001	34.9	4.6%
2017	2.0	<0.001	40.0	5.0%
2018	1.6	<0.001	42.9	3.7%
2019	2.9	<0.001	36.6	7.9%
2020	3.2	<0.001	43.4	7.4%

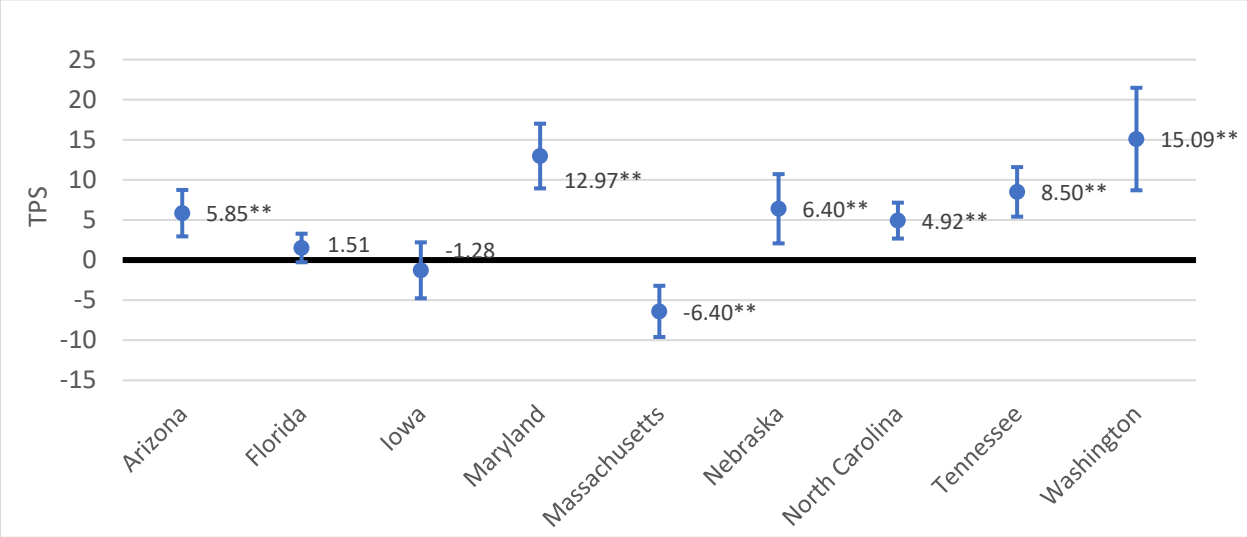
We considered the results of these analyses of TPS through the first five years of the model in the context of pre-existing levels of agency performance on the same measures. Using a similar methodology for calculating a TPS for each agency during 2013 – 2015,[25] we found that the agency scores were similar in HHVBP and non-HHVBP states in each year from 2013 – 2015 (see Exhibit B-34 [Page 158] in the Technical Appendix). These results suggest initial balance in the overall performance of agencies in these two groups prior to the implementation of the model.[26]

We also examined the impact of the model in each of the HHVBP states since the effect of the model on the overall quality measure performance of agencies may vary across the individual states. In 2020, agency TPS values were higher for six HHVBP states relative to their respective regional comparison groups based on linear regression analyses: Arizona, Maryland, Nebraska, North Carolina, Tennessee, and Washington (Exhibit 50). For all of these six states except Nebraska and North Carolina, agency TPS values were also higher relative to their regional comparison groups in each of the first four years of the model (see Exhibits B-35 through B-38 [Pages 158-160] in the Technical Appendix). For North Carolina, agency TPS values were also higher relative to its regional comparison group in 2016, 2018, and 2019 (also shown in the Technical Appendix). In 2020, Massachusetts was the only HHVBP state with lower

[24] As discussed above, we did not use a D-in-D approach for these analyses since the TPS already captures changes over time in performance. See Section A.1.7 (Page 44) in the Technical Appendix for additional detail.
[25] These simulated TPS values reflect agency performance in each year relative to the previous year, which is treated as the baseline period. For example, the simulated 2015 TPS reflects a combination of agency levels of quality achievement in 2015 relative to 2014 achievement thresholds and benchmarks and agency levels of quality improvement between 2014 and 2015.
[26] We do not compare TPS values during 2013-2015 with those observed during 2016 – 2020, since the TPS calculated for each year under the model will reflect the use of 2015 as a fixed baseline period and are therefore not directly comparable starting in 2017 (since the baseline period is no longer the previous year).

agency TPS values than its regional comparison group (Exhibit 50). The lower scores for agencies in Massachusetts relative to its regional comparison group continued a pattern also seen in 2018 and 2019 (see Exhibits B-36 and B-37 [Page 159] in the Technical Appendix).

Exhibit 50. Higher Agency TPS in Six HHVBP States Relative to their Regional Comparison Groups, 2020



*Graph shows 90% Confidence Intervals. ** p < 0.05*

5.2.1 Comparison of 2020 Agency TPS by Social Risk Factors

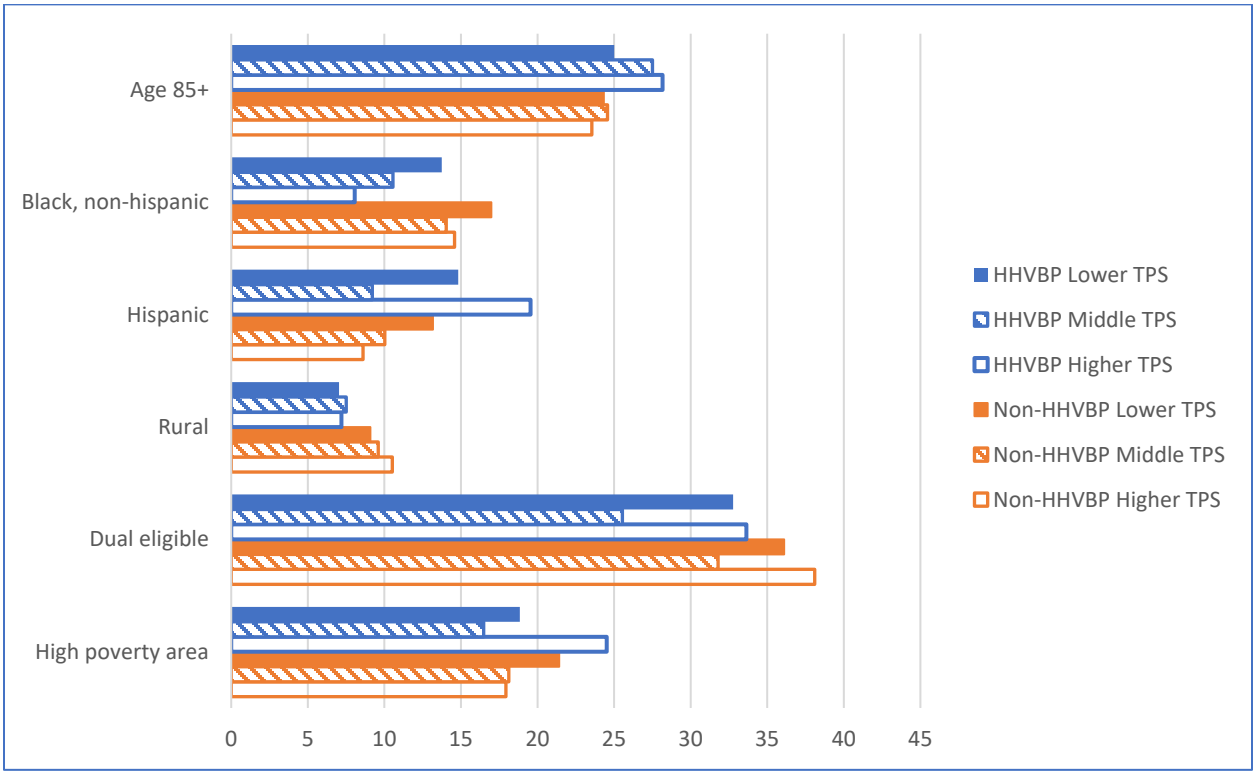
As with other value-based purchasing programs, there is potential under HHVBP for some providers to face greater challenges in responding to quality performance incentives. This may include providers caring for beneficiary populations with greater social risk factors. For example, if HHAs that care for disproportionately large populations of patients with social risk factors consistently have lower levels of performance and negative payment adjustments, and they perceive their poorer results as being influenced by factors beyond their control, the model may discourage agencies from caring for certain patient populations. In this way, there is a risk that the model could adversely affect access to care for some beneficiaries.

We explored this risk during the fifth year of the model, which reflected the continued use of the larger weights for the claims-based measures in the TPS calculation and the anticipated larger payment adjustments that were planned for 2022 prior to the national expansion of the model. We considered the extent to which HHVBP agencies with a larger proportion of beneficiaries in certain demographic or social risk factor groups were more likely to have a lower TPS during 2020. For these analyses, we defined three groups of agencies: (1) Lower TPS, based on the lowest quartile of TPS values among agencies in the same state cohort in 2020; (2) Higher TPS, based on being in the highest quartile of TPS values among agencies in the same state cohort in 2020; and (3) Middle TPS, which includes all other agencies (i.e., the middle two quartiles in 2020).

Overall, we did not find that agencies in HHVBP states with a lower TPS in 2020 were systematically more likely than other agencies in HHVBP states to care for beneficiaries with certain demographic characteristics or for those with social risk factors (Exhibit 51). For example, in HHVBP states, there were higher percentages of beneficiaries who were dual eligible or living in a high poverty area among

agencies with a higher 2020 TPS (Exhibit 51). While agencies in HHVBP states with a lower TPS in 2020 cared for a higher percentage of black non-Hispanic beneficiaries than other agencies in HHVBP states (Exhibit 51), we also found a similar pattern among agencies in non-HHVBP states. Broadly, these patterns based on demographic and social risk factors are similar to those we observed based on our analyses of agency TPS data for 2017 through 2019 that were presented in previous annual reports (Arbor Research, 2020).

Exhibit 51. Agencies in HHVBP States with a Lower 2020 TPS Do Not Care Disproportionately for Patients with Social Risk Factors Compared to Other 2020 TPS Groups



5.3 No Strong Relationship between HHVBP Payment Adjustments and Agency Profitability

Given the magnitude of the potential payment adjustments under the HHVBP Model which are large relative to other VBP programs, there is potential for the model to have implications for the overall profitability of agencies. In this section we examine agency profitability and assess whether it varies with agency payment adjustments under the HHVBP Model.

In the previous Annual Report, we found there was no strong pattern between agency profitability and their overall performance under the model, as reflected in their *future* HHVBP payment adjustments (Arbor Research, 2021). Due to the lag in the availability of cost report data (which we use to measure agency profitability), limited data were available to explore the extent to which HHVBP payment adjustments may have been an important factor in determining the profitability of agencies during the initial years in which the payment adjustments were applied. However, with 2019 cost report data now accessible, we can examine agency profit margins during the first two years in which eligible agencies

received a payment adjustment. This includes both the first year of payment adjustments (2018), during which agencies could receive up to a ±3 percent adjustment, and the second year of payment adjustments (2019), during which agencies could receive up to a ±5 percent adjustment.

To conduct this analysis, we obtained the most current Medicare cost reports available for home health agencies for fiscal years (FYs) 2018 and 2019, and we linked these data with the payment adjustments HHAs received in FYs 2018 and 2019, to observe the relationship between these two factors contemporaneously. Similar to the methodology we used for previous Annual Reports, we applied a methodology that is also used by CMS to exclude agencies that are missing requisite variables or that reported aberrant and implausible information (see Section A.2.1 [Page 47] in the Technical Appendix). Also, consistent with previous reports, we limit our analysis to freestanding agencies, which represent a very high percentage of agencies (92 percent in 2018 and 93 percent in 2019) and have much different cost and revenue structures than hospital-based agencies. Using the cost report data to calculate agency profit margins for FYs 2018 and 2019, we then compared the average payment adjustments among agencies in different profit margin categories.

An examination of the profit margins of freestanding agencies in HHVBP states and non-HHVBP states shows a strong pattern of positive profit margins for both groups of agencies, in both 2018 and 2019 (Exhibit 52). In 2018, 61.2 percent of HHVBP agencies and 62.8 percent of non-HHVBP agencies reported profit margins exceeding 10 percent, while an additional 13.6 percent of HHVBP agencies and 16.0 percent of non-HHVBP agencies had profit margins of between 0-10 percent. Levels of profitability increased somewhat in 2019 across both the HHVBP and non-HHVBP groups. Given the disproportionate share of Florida agencies in the overall HHVBP population (see Exhibit B-7 [Page 134] in the Technical Appendix), we also examined separate distributions for agencies in Florida and those in the other eight HHVBP states and found relatively similar patterns (Exhibit 52).

Exhibit 52. Over 60 percent of Freestanding Agencies Continue to Report Profit Margins of at Least 10 percent in FYs 2018 and 2019

	2018 Florida only	2019 Florida only	2018 Excluding Florida	2019 Excluding Florida	2018 All HHVBP	2019 All HHVBP	2018 Non-HHVBP	2019 Non-HHVBP
Total HHAs (n)	606	618	658	605	1,264	1,223	5,533	5,509
Profit Margin								
≥ 50%	1.3%	1.6%	4.9%	6.3%	3.2%	3.9%	3.3%	3.6%
49% to 25%	26.6%	28.6%	30.5%	31.2%	28.6%	29.9%	26.2%	27.9%
24% to 20%	13.4%	14.4%	8.5%	11.2%	10.8%	12.8%	10.8%	11.5%
19% to 15%	12.7%	9.4%	9.6%	10.2%	11.1%	9.8%	11.8%	11.5%
14% to 10%	8.4%	10.5%	6.7%	9.6%	7.5%	10.1%	10.6%	10.9%
Subtotal	**62.4%**	**64.6%**	**60.2%**	**68.6%**	**61.2%**	**66.6%**	**62.8%**	**65.4%**
9% to 5%	8.4%	7.1%	7.6%	9.1%	8.0%	8.1%	9.1%	8.4%
4% to 0%	5.4%	6.5%	5.8%	4.6%	5.6%	5.6%	6.9%	6.1%
Subtotal	**13.8%**	**13.6%**	**13.4%**	**13.7%**	**13.6%**	**13.7%**	**16.0%**	**14.5%**
-1% to -5%	4.8%	4.4%	4.3%	3.1%	4.5%	3.8%	4.6%	4.4%

	2018 Florida only	2019 Florida only	2018 Excluding Florida	2019 Excluding Florida	2018 All HHVBP	2019 All HHVBP	2018 Non-HHVBP	2019 Non-HHVBP
-6% to -10%	3.6%	3.7%	2.9%	1.5%	3.0%	2.6%	3.6%	3.1%
-11% to -15%	2.3%	1.6%	3.0%	1.7%	3.3%	1.6%	2.3%	2.3%
-16% to -20%	1.7%	1.6%	1.7%	2.0%	2.0%	1.8%	1.6%	1.7%
-21% to -25%	4.6%	1.1%	2.0%	1.2%	1.8%	1.1%	1.2%	1.3%
-26% to -50%	3.6%	5.8%	4.0%	3.0%	4.3%	4.4%	3.7%	3.5%
< -50%	3.1%	3.6%	8.7%	5.3%	6.3%	4.4%	4.3%	3.8%
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

When comparing the average payment adjustment for agencies based on their profit margins, we do not find evidence of a strong relationship (Exhibit 53). For example, there is no tendency for agencies with larger positive profit margins to have larger positive payment adjustments under the HHVBP Model, or agencies with larger negative profit margins to have larger negative payment adjustments. Additional analyses that we conducted were also consistent with this finding. Based on overall correlations between agency payment adjustments and agency profit margins, we found no statistically significant correlation for 2018 and only a weak correlation for 2019 ($r = 0.106$, $p<0.01$). As a sensitivity analysis, we also examined the correlation between an agency's prior year payment adjustment and their profit margin the following year, to assess any lagged effects, and also found no statistically significant correlation (not shown). These results suggest that agency profitability continues to depend largely on factors other than the payment adjustments being made under the model, both overall and among agencies with different levels of profitability.

Exhibit 53. No Strong Relationship between Agency HHVBP Payment Adjustments and Agency Profit Margins in FY 2018 and 2019

	2018 (max ±3%) Florida only	2019 (max ±5%) Florida only	2018 (max ±3%) Excluding Florida	2019 (max ±5%) Excluding Florida	2018 (max ±3%) All states	2019 (max ±5%) All states
Profit Margin						
≥ 50%	0.29%	1.39%	-0.65%	-0.34%	0.15%	1.14%
49% to 25%	0.04%	-0.09%	-0.06%	0.12%	-0.01%	0.01%
24% to 20%	0.25%	0.13%	0.08%	0.05%	0.15%	0.09%
19% to 15%	0.02%	-0.11%	-0.12%	0.18%	-0.06%	0.03%
14% to 10%	0.24%	0.13%	-0.16%	-0.02%	0.02%	0.05%
9% to 5%	0.13%	0.02%	-0.02%	-0.11%	0.05%	-0.03%
4% to 0%	0.34%	-0.38%	-0.15%	-0.45%	0.11%	-0.42%
-1% to -5%	0.11%	-0.23%	-0.28%	-0.67%	-0.08%	-0.48%
-6% to -10%	0.00%	-0.07%	0.24%	-0.46%	0.10%	-0.34%
-11% to -15%	0.40%	0.84%	0.04%	-0.18%	0.21%	0.30%
-16% to -20%	-0.11%	-0.90%	0.22%	0.01%	0.07%	-0.47%

	2018 (max ±3%)	2019 (max ±5%)	2018 (max ±3%)	2019 (max ±5%)	2018 (max ±3%)	2019 (max ±5%)
	Florida only	Florida only	Excluding Florida	Excluding Florida	All states	All states
-21% to -25%	0.76%	0.43%	-0.33%	-1.11%	0.25%	-0.42%
-26% to -50%	0.10%	0.03%	0.32%	-0.13%	0.20%	-0.07%
< -50%	0.27%	-0.05%	-0.20%	-0.41%	0.12%	-0.19%

5.4 HHVBP Payment Adjustments for 2021 Differ by Agency Type

In August 2020, eligible agencies in HHVBP states received notifications of their preliminary payment adjustments for 2021, the fourth year in which CMS adjusted Medicare payments to HHAs based on quality performance measures (Exhibit 1). These HHVBP agency-specific payment adjustments were based on agency TPS values for 2019 and could range between -7 percent and +7 percent. CMS finalized the payment adjustments in November 2020 and applied them to all Medicare FFS home health claims beginning January 1, 2021.

Among the 1,941 HHVBP agencies with at least one Medicare claims-based or OASIS-based home health episode in performance year 2019, 1,529 (79 percent) were eligible to receive a payment adjustment to their FFS claims in CY 2021 (Exhibit 54). The average and median payment adjustment across agencies was 0.203 percent and 0.047 percent, respectively, and ranged from -7 percent to 7 percent (not shown).

Whereas 29 percent of agencies received payment adjustments either lower than -2 percent or higher than 2 percent in CY 2020, this increased to 38 percent of agencies in CY 2021 (Exhibit 55). This includes 17 percent of agencies that received a payment adjustment lower than -2 percent, and 22 percent of agencies that received a payment adjustment greater than 2 percent. Relative to other agencies in CY 2021, both the highest performing agencies that received a 3 to 7 percent payment adjustment and the lowest performing agencies that received a -3 to -7 percent adjustment were smaller and less likely to be affiliated with a chain (Exhibit 54). Overall, non-profit agencies had slightly more favorable payment adjustments during CY 2021, which is a pattern we also observed in the first three years in which HHVBP payment adjustments were applied (Arbor Research, 2019; 2020; 2021). In addition to being overrepresented among agencies receiving positive payment adjustments (Exhibit 54), non-profit agencies had an average payment adjustment of 0.5 percent, which compares to 0.1 percent for for-profit agencies (see Exhibit B-39 [Page 160] in Technical Appendix).

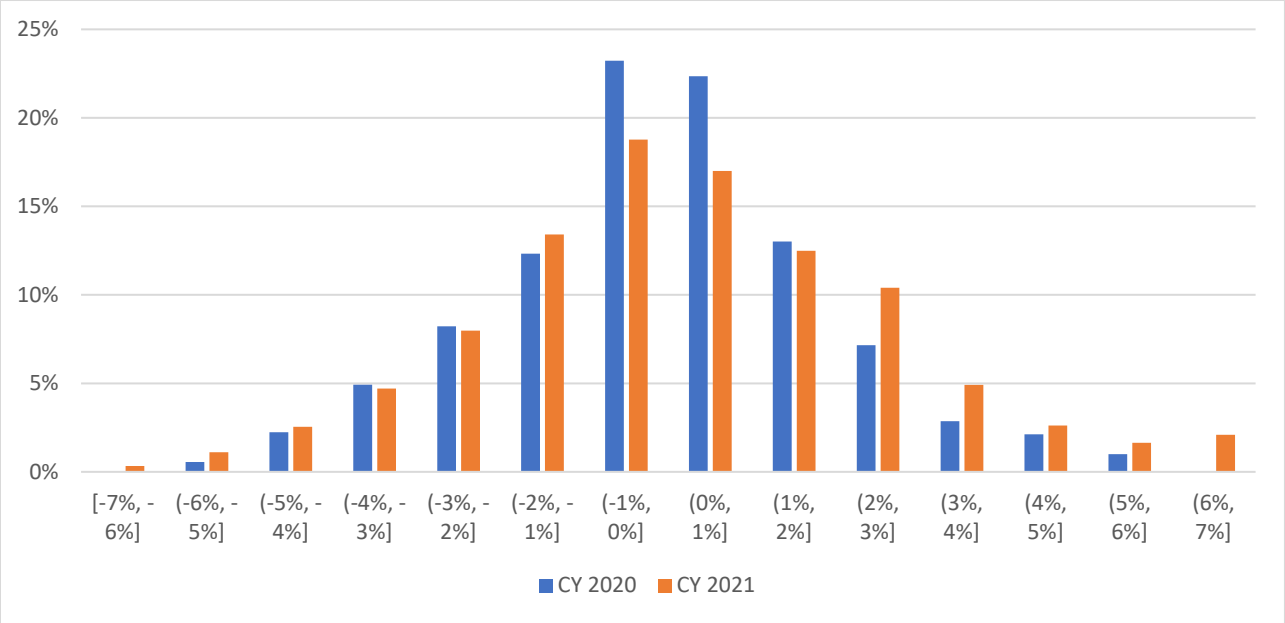
Exhibit 54. Slightly More Favorable HHVBP Payment Adjustments for Non-Profit Agencies, CY 2021

Characteristics*	CY 2021 HHA Payment Adjustment Categories						Overall	p-value
	[-7%, -3%]	(-3%, -1%]	(-1%, 0%]	(0%, 1%]	(1%, 3%]	(3%, 7%]		
Number of HHAs with a TPS	133	327	287	260	350	172	1,529	--
% of HHAs in each payment adjustment category	8.7%	21.4%	18.8%	17.0%	22.9%	11.3%	100.0%	--
Type								
Hospital-based	4.4%	4.3%	4.1%	7.8%	13.0%	5.2%	6.9%	<0.001
Freestanding	95.6%	95.7%	95.9%	92.2%	87.0%	94.8%	93.1%	
Ownership								
For profit	86.8%	77.1%	76.7%	65.1%	66.4%	65.3%	71.9%	
Nonprofit	12.9%	21.3%	21.6%	32.9%	27.5%	34.0%	25.5%	<0.001
Government owned	0.4%	1.6%	1.8%	2.0%	6.1%	0.6%	2.6%	
Chain affiliation								
Yes	28.8%	56.8%	59.7%	55.1%	52.4%	35.4%	54.0%	
No	66.5%	30.8%	30.6%	33.2%	37.4%	57.2%	35.5%	<0.001
Unknown	4.7%	12.4%	9.7%	11.6%	10.2%	7.5%	10.6%	
Size: Number of OASIS episodes								
1-59	0.9%	0.3%	0.2%	0.1%	0.3%	1.2%	0.3%	
60-249	12.0%	2.7%	2.3%	2.3%	4.8%	16.7%	4.1%	
250-499	17.3%	7.4%	6.0%	6.2%	7.9%	20.6%	8.0%	<0.001
500-999	21.0%	12.9%	9.7%	10.3%	18.8%	19.7%	13.5%	
≥1,000	48.7%	76.7%	81.8%	81.0%	68.2%	41.7%	74.2%	
HHA Age								
<4 years	1.3%	1.0%	0.4%	0.7%	1.7%	3.2%	1.1%	
4-10 years	39.4%	19.0%	17.5%	12.5%	17.5%	28.8%	18.2%	<0.001
>10 years	59.2%	80.0%	82.1%	86.8%	80.8%	68.0%	80.7%	

**HHA characteristics from performance year 2019.*

With the HHVBP Model design leading to an increase in the maximum potential payment adjustments from ±6 percent in CY 2020 to ±7 percent in CY 2021, we continue to observe a widening in the range of agency payment adjustments in CY 2021 (Exhibit 55). For example, while 45.6 percent of agencies received payment adjustments within ±1 percent in CY 2020, this declined to 35.8 percent in CY 2021. In contrast, the percentage of agencies receiving a payment adjustment of either more than 3 percent or less than -3 percent increased from 13.7 percent in CY 2020 to 20 percent in CY 2021. For CY 2021, this includes 5.2 percent of agencies with a payment adjustment of either more than 5 percent or less than -5 percent. This trend illustrates the growing financial implications of the model for agencies.

Exhibit 55. Widening Distribution of Agency Payment Adjustments between CY 2020 and CY 2021



5.5 Discussion

Through the first five years of HHVBP, we observed evidence of a continued positive impact of the model on the overall performance of agencies on the quality measures included in the TPS. Evidence of sustained impacts of HHVBP that began in the first year of implementation (2016) suggests the importance of the model's performance incentives, which preceded the initial adjustments to agency payments under the Medicare home health PPS by two years (2018). With the initial TPS methodology published in the proposed rule for the HHVBP Model in July 2015 (HHS, 2015b), it was possible for agencies to anticipate that their performance starting in 2016 would affect their future Medicare payments, and plausibly may have influenced their response to the model well before the payment adjustments began.

In this report, we showed that the pattern in continued positive impacts of HHVBP now extends to 2020, the third year in which the model methodology adjusted Medicare home health PPS payments in HHVBP states. While the potential payment adjustments under the model have grown larger over time, the actual adjusted amounts remain small relative to the profit margins of many agencies. Nevertheless, we have continued to see higher TPS values among agencies in HHVBP states, unlike the relatively comparable overall performance on quality measures that was observed prior to model implementation. While TPS values for 2019 and 2020 are not comparable to those for earlier years because of changes in the scoring methodology, our analysis of 2019-2020 data suggests a continued positive impact of HHVBP on overall agency performance. This change in scoring strengthened financial incentives for HHVBP agencies to improve their performance on the unplanned hospitalization measure in particular, as the weighting of this measure in the TPS calculation increased from 6.25 percent in 2018 to 26.25 percent starting in 2019 (HHS, 2018). In the two years since this scoring change was adopted, we have not observed a large increase in average scores for this measure among HHVBP agencies relative to non-HHVBP agencies in either 2019 or 2020. Rather, as we observed prior to 2020, the higher TPS values among agencies in HHVBP states in 2020 continue to largely reflect higher levels of performance on the OASIS-based outcome measures, which include measures of both discharge to community and functioning. This may be because at least so far, the OASIS measures capture aspects of care that agencies have felt they can more readily influence. Our previous interviews with agencies suggested an ongoing emphasis on their performance on the OASIS-based measures in particular (Arbor Research, 2019; 2021).

We are unable to rule out the possibility that agency TPS values for 2020 were affected by the COVID-19 PHE. During 2019-2020, we observed an increase in agency TPS values as well as in average scores for certain HHVBP measures which may have been relatively more sensitive to effects of the PHE, such as measures of unplanned hospitalization and ED use. However, these trends during 2019-2020 were observed among agencies in both HHVBP and comparison states. Moreover, in other analyses we conducted for this report, we did not find evidence suggesting a materially different effect of the PHE on agency performance in HHVBP states (see Section 2.3). This includes relatively similar overall COVID-19 rates in HHVBP and comparison states during 2020 and our overall finding that analyses of individual HHVBP performance measures were not highly sensitive to the inclusion of COVID-19 indicators in D-in-D analyses. Instead, the difference in TPS values among HHVBP and non-HHVBP agencies in 2020 is not markedly different from what we observed in earlier years of the model.

With the payment adjustments under the model growing larger over time, we continued to explore whether there were patterns in agency performance based on the presence of patient social risk factors that might indicate emerging risks for some beneficiaries under the model. As we previously found based on data through 2019, this was also not the case in 2020. We did not find a pattern in 2020 of beneficiary social risk factors being more common among HHVBP agencies with a lower TPS compared to higher performing agencies.

Despite the growing magnitude of the payment adjustments, agency profit margins remain large overall relative to the payment changes under HHVBP. Using available cost report data through the second payment year of the model, we are able to confirm that the model qualitatively does not affect profitability for most agencies. As financial data become available for agencies for later payment years which reflect a wider range of payment adjustments (e.g., 2020), it will be valuable to reassess the impact of the model on agency profitability and whether agency profitability is associated with the performance of agencies under the model.

6. Results: HHVBP Continues to Have Modest Impacts on Medicare Utilization in the First Five Model Years

6.1 Introduction

This section examines the impact of HHVBP on measures of health care utilization during the first five years of the model. We found that HHVBP continued to produce ***intended impacts on claims-based ACH, ED use followed by inpatient admission, and SNF use measures among FFS beneficiaries receiving home health services; it also had an offsetting unintended impact on ED utilization without hospitalization*** among FFS beneficiaries receiving home health services. Furthermore, in a supporting analysis, we examined four of the most common categories of diagnoses found as causes of ED utilization to determine if some of these common causes of ED visits drive a pattern of increasing outpatient ED use attributable to HHVBP that we have reported in previous annual reports. However, from this analysis we found that a collection of less common diagnoses may be more significant drivers of this pattern.

More specifically, the cumulative D-in-D results indicate relative declines under HHVBP in unplanned hospitalizations, among first and all home health episodes in a sequence, and use of SNFs, of approximately 0.15 to 0.34 percentage points (1 to 7 percent relative to baseline averages in HHVBP states). These findings provide evidence of the HHVBP Model's continued achievement of intended impacts, since hospitalization is an important indicator of health status and the largest driver of health care expenditures among FFS beneficiaries receiving home health services. While we also observe a relative increase in outpatient ED use among HHVBP states of 0.29 percentage points, there is also a relative decline in ED use followed by an inpatient admission of 0.16 percentage points, such that we do not observe a statistically significant increase in overall ED use. We note these findings reflect behavior of HHAs that occurs during the first two years of the model prior to application of the initial payment adjustments (2016 – 2017) as well as the first three years of HHVBP payment adjustments (2018 –2020). These changes in utilization are consistent with our findings for Medicare spending measures presented in the following section.

There were two exogenous factors in 2020 that affected all home health episodes– implementation of PDGM and onset of the COVID-19 PHE. First, we present detailed findings about the impact of HHVBP on the six utilization measures followed by results of sensitivity analyses conducted to examine the potential implications of PDGM and COVID-19 PHE for the utilization measures. We also present descriptive trends of COVID-19-related hospitalizations between HHVBP and non-HHVBP states. Subsequently, we explore nuances related to these D-in-D findings by examining: (1) the potential effect of a substantial increase in the weight applied to claims-based quality measures in the TPS for 2019 and 2020 performance relative to 2018 performance; and (2) differences in the impact of HHVBP on ED use during home health episodes as a function of primary diagnoses associated with the ED admissions.

6.2 FFS Claims-Based Utilization Measure Rates, Pre- and Post-HHVBP Implementation

Before presenting our D-in-D findings, we present descriptive information on the FFS claims-based utilization measures that allow comparisons between HHVBP and non-HHVBP states to provide context for interpreting model estimates of the relative changes occurring under HHVBP. The unadjusted pre-HHVBP (2013-2015) values were relatively similar between the HHVBP states and non-HHVBP states for most of the utilization measures, particularly for the HHVBP measures (listed in italics in Exhibit 56). The

15.7 percent rate of unplanned ACHs for first FFS episodes was slightly lower in HHVBP states relative to the 16.3 percent rate for non-HHVBP states during the pre-intervention years, and the two rates converged to closer average levels of 15.5 percent and 15.6 percent, respectively, during 2016-2020. In contrast, the baseline period measure of unplanned ACHs for all FFS episodes (17.0 percent) was somewhat greater in HHVBP states relative to non-HHVBP states (15.9 percent), maintaining a nearly constant difference on average during the post-HHVBP period when both HHVBP and non-HHVBP states decreased by 1.6 and 1.5 percentage points to rates of 15.4 percent and 14.4 percent, respectively.

During the three years preceding the start of HHVBP, outpatient ED utilization among HHVBP states was slightly lower at 11.7 percent of first home health episodes compared with non-HHVBP states (12.3 percent). The HHVBP average increased by 0.8 percentage points to a 12.5 percent rate similar to the 12.6 percent rate of non-HHVBP states post HHVBP (2016-2020). ED utilization followed by an inpatient admission, in contrast, was equal between HHVBP states and non-HHVBP states in the baseline period at a rate of 14.2 percent, and increased to a 14.5 percent rate in HHVBP states in the post-implementation period, while the rate in non-HHVBP states marginally decreased to 14.1 percent. Total ED use among first home health episodes was slightly lower in HHVBP states compared with non-HHVBP states from 2013 to 2015 (26.6 percent and 27.6 percent respectively); this rate increased post HHVBP to a rate of 27.6 percent in HHVBP states, while it remained unchanged in non-HHVBP states. SNF use was somewhat higher among HHVBP states (4.9 percent) relative to non-HHVBP states (4.0 percent) during the baseline period, and though it declined for both groups, it still remained higher at an average of 4.4 percent for HHVBP relative to a 3.7 percent average for non-HHVBP states during the first five years of the model.

Unadjusted rates of all the utilization measures declined from 2019 to 2020 (Exhibit B-6 [Page 130] in the Technical Appendix) with the steepest decline being in SNF use with nearly half the rate in 2020 as in 2019 for both HHVBP (i.e., 4.9 to 2.8 percent) and non-HHVBP states (i.e., 4.2 to 2.4 percent). From 2019 to 2020, unplanned ACHs for all FFS episodes decreased by about a third in both groups (e.g., 16.9 to 11.2 percent for HHVBP states) and outpatient ED use for first FFS episodes decreased by about 15 percent (e.g., 13.0 to 11.0 percent in HHVBP states; see Exhibit B-6 [Page 130] in the Technical Appendix). Similar declining trends for both groups in 2020 may be due to the COVID-19 PHE or implementation of PDGM or a combination of both factors.

Exhibit 56. Baseline and Post-HHVBP Period Means for Unadjusted FFS Claims-Based Health Care Utilization Measures Show Small Changes in Rates of Acute Hospitalizations and SNF Use with Greater Increases in ED Use in HHVBP States versus Non-HHVBP States

Measure	HHVBP States		Non-HHVBP States		Change in Mean	
	Baseline (2013-2015)	Post-HHVBP (2016-2020)	Baseline (2013-2015)	Post-HHVBP (2016-2020)	HHVBP States	Non-HHVBP States
Unplanned Acute Care Hospitalization/First FFS HH Episodes	15.7%	15.5%	16.3%	15.6%	-0.2	-0.7
Outpatient ED Use (no Hospitalization)/First FFS HH Episodes	11.7%	12.5%	12.3%	12.6%	0.8	0.3
ED Use followed by Inpatient Admission/First FFS HH Episodes	14.2%	14.5%	14.2%	14.1%	0.3	-0.1
Total ED Use (Outpatient or Inpatient Claims)/First FFS HH Episodes	26.6%	27.6%	27.6%	27.6%	1.0	0.0
Unplanned Acute Care Hospitalization/All FFS HH Episodes	17.0%	15.4%	15.9%	14.4%	-1.6	-1.5
SNF Use /All FFS HH Episodes	4.9%	4.4%	4.0%	3.7%	-0.5	-0.3

HHVBP Measures indicated by italic text.

In the context of our D-in-D approach, we also examined baseline trends in these claims-based measures to assess the validity of our assumption of parallel trends in HHVBP and non-HHVBP states. The results of these analyses suggest that trends in these claims-based measures for the two groups were parallel prior to the implementation of HHVBP, such that the non-HHVBP population is a plausibly valid representation of what would have happened in HHVBP states if the model had not been implemented. Details are shown in Section A.1.5.2 (Page 25) in the Technical Appendix.

6.3 HHVBP Continues to Reduce Acute Hospitalizations and SNF Use While Increasing Outpatient Emergency Department Use

We examined effects of HHVBP on several claims-based measures of utilization associated with or following home health episodes. Because home health care also entails monitoring patient status, facilitating early interventions, and promoting more rapid recovery of health and functional status, most of these measures can be interpreted as indicators of the quality of home health care in that higher quality care may result in fewer unplanned hospitalizations, ED visits, or subsequent admissions to SNFs. Given their importance as claims-based measures used in the calculation of the TPS, we focus first on the analysis of unplanned ACH use and ED use without hospitalization among first home health episodes. We also report on our examination of SNF use and other measures of hospitalization and ED use.

Overall, we found the average annual impact of the HHVBP Model over 2016-2020 to involve relative decreases in utilization in HHVBP states compared with non-HHVBP states for most of these measures, but we also found relative increases in ED use not followed by hospitalization (Exhibit 57). HHVBP produced an average annual 0.15 percentage point decrease in unplanned ACH use in first episodes among FFS home health beneficiaries in HHVBP states relative to non-HHVBP states during the first five years of the model and an average annual impact of a 0.29 percentage point increase in outpatient ED utilization during first episodes (Exhibit 57). These effects translate to a 1.0 percent decrease per HHVBP Model year relative to the 15.7 percent average unplanned hospitalization rate for first home health episodes in HHVBP states during the baseline period and a 2.5 percent increase relative to the baseline average outpatient ED use of 11.7 percent. The D-in-D estimate for outpatient ED utilization reflects the HHVBP states' lower ED utilization rates in the baseline period converging to those of non-HHVBP states post-HHVBP, a trend that we will continue to monitor.

In contrast to the outpatient ED utilization measure, we observed a 0.16 percentage point *decrease* in ED utilization followed by inpatient admission among first episodes in HHVBP states relative to non-HHVBP states from 2016 to 2020. This corresponds to a 1.1 percent decrease relative to the baseline average of 14.2 percent and is consistent with the findings for impact on ACH utilization. The total ED use measure, which combines outpatient ED utilization with ED visits that result in an inpatient admission, showed no cumulative impact of HHVBP states compared with non-HHVBP states from 2016 to 2020 (Exhibit 57). This null finding for total ED use is consistent with the opposite directions of the estimated HHVBP impacts for the two constituent measures that make up the total ED use measure.

Because observation stays may in some circumstances serve as substitutes for an ED visit or inpatient stay, we examined the rate of combined ED visits and observation stays during first FFS home health episodes that did not result in hospitalizations for comparison with that of the HHVBP measure of outpatient ED use only. As expected, we found that the unadjusted rate of the combined ED visit/observation stay measure was slightly larger than for outpatient ED visits alone and followed a similar pattern of slightly increasing prevalence over time, followed by a decline in 2020. For HHVBP states, the rate of outpatient ED use or observation stay without hospitalization rose from 13.8 percent in 2013 to 14.5 percent at the end of the baseline period in 2015 and rose further to 15.5 percent by 2019 before decreasing to 13.4 percent in 2020 (see Exhibit B-6 [Page 130] in the Technical Appendix). Non-HHVBP states had very similar rates of use, rising from 13.7 percent in 2013 to 14.5 percent in 2015, 15.2 percent in 2019, and then declining to 13.3 percent in 2020 (see Exhibit B-6 [Page 130] in the Technical Appendix). That is, the pattern of observation stays that do not result in an inpatient stay align closely with the ED visits that do not result in an inpatient stay.

We also report results for the broader measure of unplanned hospitalizations among all FFS home health episodes to provide a more comprehensive view of the impacts of HHVBP on hospitalization. This approach allows us to analyze possible unintended consequences of the design of the HHVBP hospitalization measure (for example, if agencies are able to avoid certain hospitalizations in the near-term that instead occur later in a sequence of episodes, at which point they are not directly penalized by the model). As with the HHVBP measure that includes hospitalization only during first episodes, we estimated a similar reduction for unplanned hospitalizations among all home health episodes: cumulative estimate of -0.27 percentage points, corresponding to an average annual decrease of 1.6 percent in HHVBP states relative to the baseline period rate of 17.0 percent. We found a relative decline of 0.34 percentage points per year in SNF use among home health FFS beneficiaries in HHVBP states

compared with those in non-HHVBP states, reflecting a 6.9 percent decline relative to the 4.9 percent baseline rate of SNF use.

For these claims-based utilization measures, the separate yearly D-in-D estimates for 2016-2020 showed some fluctuations from year to year. For unplanned hospitalization among first home health episodes, the yearly D-in-D estimates indicated reductions due to HHVBP in 2016 (-0.23 percentage points) and 2019 (-0.27 percentage points) but no statistically significant impact in 2017, 2018, or 2020. Two of the six utilization measures (unplanned hospitalizations among all home health FFS beneficiaries and SNF use among all home health FFS beneficiaries) had a statistically significant change in the average magnitude of impact estimates during the three years of payment adjustments (2018-2020) relative to the first two years (2016-2017) of the HHVBP Model (See Exhibit B-41 [Page 162] in the Technical Appendix). Both measures had a pattern of steadily increasing and statistically significant impacts in the intended direction of decreased use since 2017 (Exhibit 57). Furthermore, we observed a sharp decline from 2019 to 2020 in the impact of unplanned hospitalizations among all episodes by 0.19 percentage points (-0.30 to -0.49 [63 percent]) and in SNF use by 0.31 percentage points (-0.29 to -0.60 [107 percent]). On the other hand, Outpatient ED Use had significantly greater impacts in an unintended (i.e. positive) direction since 2017, but then declined from 0.36 in 2019 to 0.22 in 2020, a change of 0.14 percentage points (39 percent) (Exhibit 57). The impact estimate in 2020 for ED use followed by a hospitalization among first home health episodes was negative but marginally statistically insignificant (-0.17, p = 0.10).

As explained in Section 2.2.2, we conducted a sensitivity analysis to understand the impact of PDGM on the two utilization measures that include all (vs. only first) episodes. The 2020 impact estimates from the sensitivity analysis for both measures were smaller in magnitude than the 2020 estimates from the primary analysis: for unplanned hospitalizations among all home health episodes, -0.31 percentage points (Exhibit B-42 [Page 163] in Technical Appendix) versus -0.49 percentage points (Exhibit 57), and for SNF utilization, -0.45 percentage points (Exhibit B-42 [Page 163] in Technical Appendix) versus -0.60 percentage points (Exhibit 57). This analysis shows that the elevated declines in 2020 attributed to the HHVBP Model (as noted above) for both of these all-episode measures could partially be due to differential impact of PDGM in HHVBP states, in addition to the Model impact.

Exhibit 57. HHVBP Leads to Continued Reduction in Unplanned hospitalization, SNF Use, and ED Use Followed by an Inpatient Admission, but Increasing Outpatient ED Use

	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	% Relative Change
	D-in-D[a]	p-value	Lower 90% CI[a]	Upper 90% CI[a]		
Unplanned Acute Care Hospitalization/First FFS HH Episodes						
2016	-0.23	<0.01	-0.37	-0.10	15.7%	-1.5%
2017	-0.04	0.68	-0.18	0.11		-0.3%
2018	-0.14	0.12	-0.29	0.01		-0.9%
2019	-0.27	<0.01	-0.43	-0.11		-1.7%
2020	-0.08	0.45	-0.26	0.10		-0.5%
Cumulative	-0.15	0.04	-0.28	-0.03		-1.0%

	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	% Relative Change
	D-in-D[a]	p-value	Lower 90% CI[a]	Upper 90% CI[a]		
Outpatient ED Use (No Hospitalization)/First FFS HH Episodes						
2016	0.26	<0.001	0.14	0.37	11.7%	2.2%
2017	0.23	<0.01	0.10	0.36		2.0%
2018	0.37	<0.001	0.24	0.50		3.2%
2019	0.36	<0.001	0.21	0.50		3.1%
2020	0.22	0.02	0.07	0.37		1.9%
Cumulative	0.29	<0.001	0.18	0.39		2.5%
ED Use Followed by Inpatient Admission/First FFS HH Episodes						
2016	-0.19	0.01	-0.32	-0.06	14.2%	-1.3%
2017	-0.04	0.62	-0.18	0.10		-0.3%
2018	-0.12	0.21	-0.27	0.04		-0.8%
2019	-0.28	<0.01	-0.43	-0.12		-2.0%
2020	-0.17	0.10	-0.35	0.002		-1.2%
Cumulative	-0.16	0.03	-0.28	-0.04		-1.1%
Total ED Use (Outpatient or Inpatient Claims)/First FFS HH Episodes						
2016	0.03	0.76	-0.13	0.19	26.6%	0.1%
2017	0.17	0.13	-0.02	0.35		0.6%
2018	0.25	0.03	0.06	0.44		0.9%
2019	0.12	0.34	-0.08	0.31		0.5%
2020	0.06	0.68	-0.17	0.28		0.2%
Cumulative	0.13	0.18	-0.03	0.28		0.5%
Unplanned Acute Care Hospitalization/All FFS HH Episodes						
2016	-0.16	0.02	-0.28	-0.05	17.0%	-0.9%
2017	-0.11	0.18	-0.24	0.02		-0.6%
2018	-0.22	<0.01	-0.36	-0.08		-1.3%
2019	-0.30	<0.01	-0.45	-0.14		-1.8%
2020	-0.49	<0.001	-0.65	-0.32		-2.9%
Cumulative	-0.27	<0.001	-0.39	-0.16		-1.6%
SNF Use/All FFS HH Episodes						
2016	-0.19	<0.001	-0.25	-0.14	4.9%	-3.9%
2017	-0.20	<0.001	-0.26	-0.14		-4.1%
2018	-0.28	<0.001	-0.34	-0.21		-5.7%
2019	-0.29	<0.001	-0.36	-0.22		-5.9%
2020	-0.60	<0.001	-0.68	-0.52		-12.2%
Cumulative	-0.34	<0.001	-0.39	-0.28		-6.9%

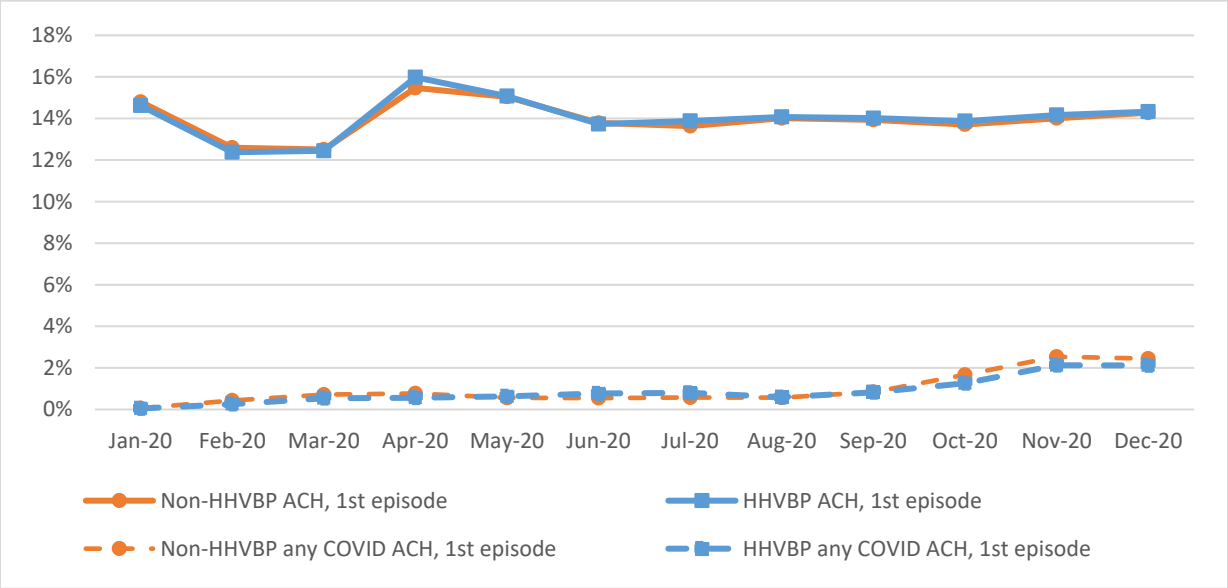
HHVBP Measures indicated by italic text. CI= Confidence Interval. See Exhibit 57n for each measure's sample size. [a] Values represent percentage point changes.

6.3.1 Similar trends observed in acute care hospitalizations in HHVBP and non-HHVBP States during COVID-19 PHE

We also examined trends in COVID-19-specific ACHs among first FFS home health episodes in 2020, in relation to all unplanned ACHs among first FFS home health episodes (Exhibit A-49 [Page 74] in the Technical Appendix). This allowed us to explore if there were differential rates of COVID-19

hospitalizations between HHVBP and non-HHVBP states among all the acute care unplanned hospitalizations that contributed to the HHVBP measure, ACH use among first home health episodes. We observed that the trends in COVID-19 hospitalizations in HHVBP and non-HHVBP states were similar with rates between 0.5 and 1 percent from March through September 2020 (Exhibit 58). The COVID-19 hospitalization rates increased in the last three months of 2020 and the rates for the HHVBP states were slightly lower over this time period compared to non-HHVBP states (1.3 percent vs 1.7 percent in October and 2.1 percent vs 2.4 percent in December, respectively). The overall unplanned hospitalization rates among first home health episodes for both HHVBP and non-HHVBP states were stable from October to December at about 14 percent (Exhibit 58). We also found monthly trends in COVID-19-related hospitalizations corresponding to the all-episode unplanned hospitalization measure to be similar between HHVBP and non-HHVBP states (Exhibit B-40 [Page 162] in the Technical Appendix).

Exhibit 58. Similar Trends in Unplanned Acute Care Hospitalizations (ACHs) Among First FFS Home Health Episodes between HHVBP and non-HHVBP States, Overall and COVID-19 Specific, by Month, 2020



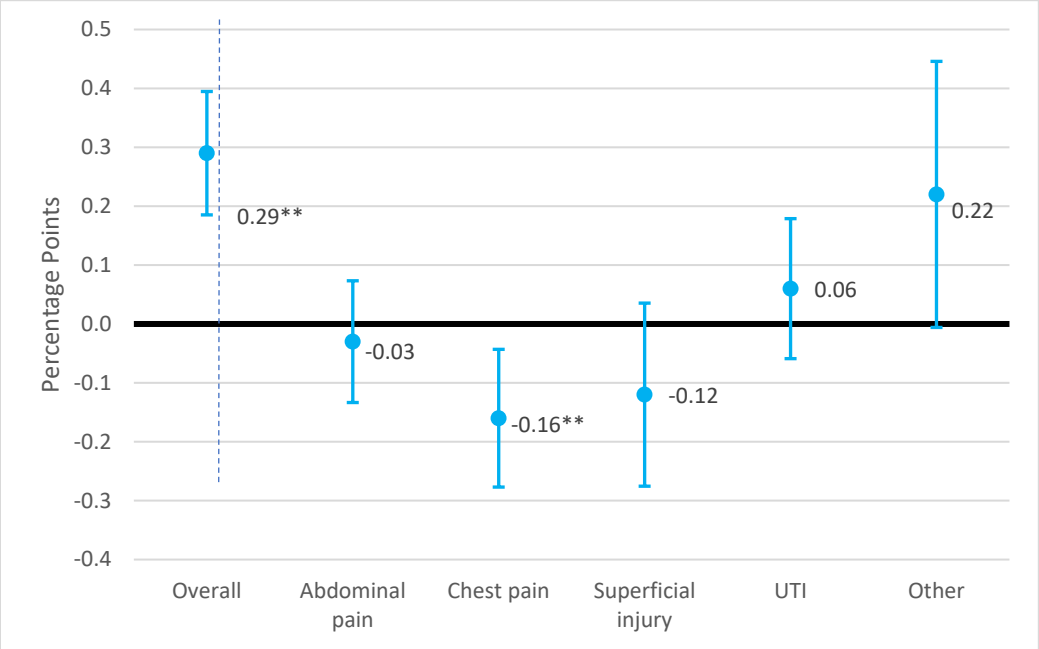
For more details, please refer to Exhibit A-49 of the Technical Appendix.

6.3.2 HHVBP Impacts Increasing Outpatient ED Visits Are Not Driven by the Four Most Common Causes of ED Visits

In previous annual reports, we have found evidence of offsetting increases to outpatient ED use and decreases in unplanned acute hospital use, both attributable to HHVBP, indicating possible substitution of outpatient ED use for acute inpatient care even though agencies have incentives under HHVBP to reduce both types of service use (Arbor Research, 2021). To better understand factors contributing to higher outpatient ED utilization during first episodes in HHVBP states, we examined four groups of the most common causes for ED visits (abdominal pain, chest pain, superficial injury, and urinary tract infections [UTI]) alongside episodes with ED visits only from all other causes pooled together as a separate group. Among impacts on cause-specific outpatient ED visits, we only found statistically significant HHVBP impacts on the probability of episodes with visits related to chest pain (-0.16 percentage points; Exhibit 59). We found positive but not statistically significant impacts of HHVBP on outpatient ED use during first episodes for UTI and non-specific "other" conditions, with the latter having a higher magnitude than the four conditions we examined (Exhibit 59). Among impacts on cause-

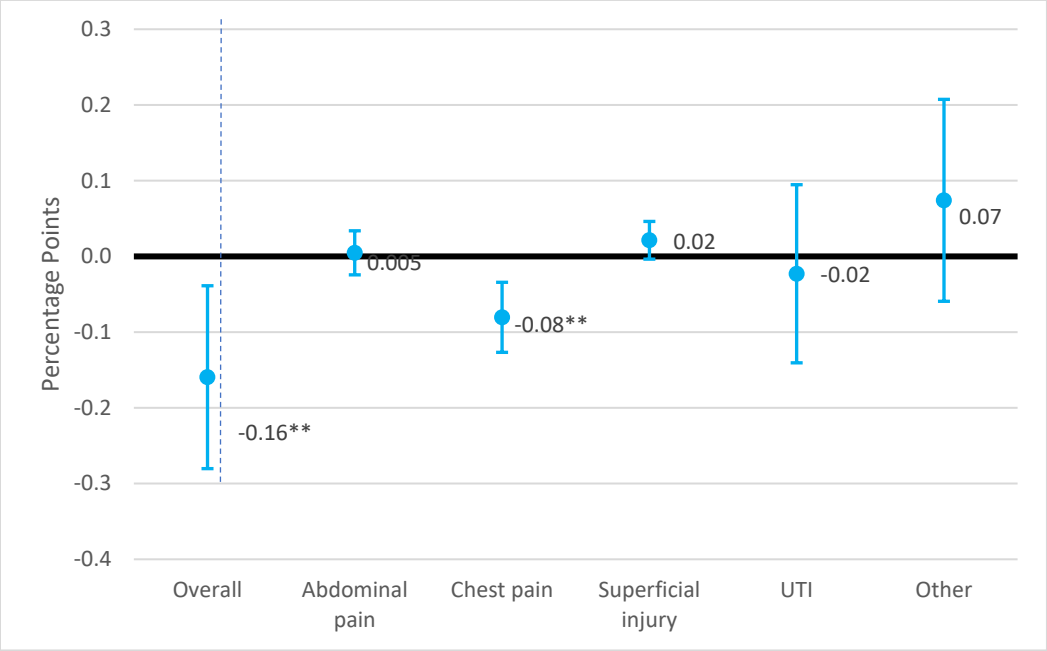
specific ED visits that resulted in inpatient stays, we again only found statistically significant HHVBP impacts on the probability of episodes with visits related to chest pain (-0.08 percentage points; Exhibit 60). Details about how we identified condition-specific ED and inpatient use are provided in Section A.3.3 (Page 92) in the Technical Appendix.

Exhibit 59. Cumulative D-in-D Estimates Indicate Higher Outpatient ED /First FFS HH Episodes is Not Driven by any Particular Conditions



*Graph shows 90% Confidence Intervals; ** p < 0.05; All regression models adjust for beneficiary and agency characteristics and other covariates that are included in the D-in-D analyses of claims-based measures in this report; (see Section A.1.4.2 [Page 9] in the Technical Appendix).*

Exhibit 60. Cumulative D-in-D Estimates Indicate Reductions in ED use followed by an Inpatient Admission/First FFS HH Episodes is Partly Driven by Chest Pain



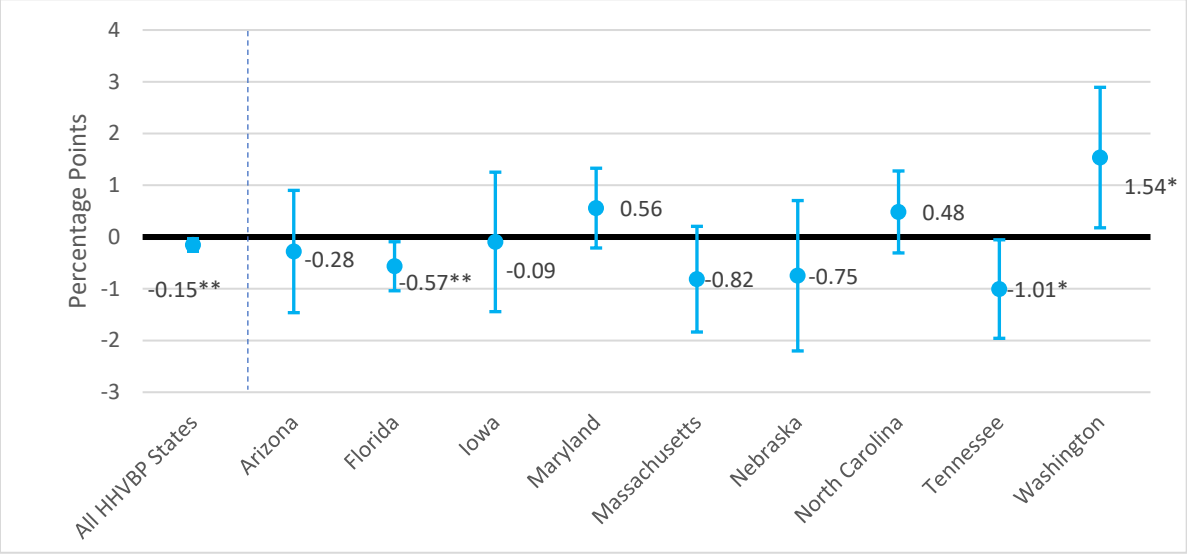
*Graph shows 90% Confidence Intervals; ** p < 0.05; All regression models adjust for beneficiary and agency characteristics and other covariates that are included in the D-in-D analyses of claims-based measures in this report; (see Section A.1.4.2 [Page 9] in the Technical Appendix).*

6.3.3 HHVBP Impacts on Acute Care Hospitalizations and Unintended Impacts on Outpatient ED Use Are Driven Primarily by Florida

In our analysis of state-specific impacts among HHVBP states, we found strong evidence of intended impacts in at least two HHVBP states relative to their regional comparison groups for four of the six claims-based utilization impact measures: unplanned hospitalizations among first home health episodes and all home health episodes, ED utilization followed by an inpatient admission, and SNF use. For Florida, we found consistently strong evidence of intended impacts on unplanned hospitalizations among first and all home health episodes, ED use followed by an inpatient admission, and SNF use, with offsetting unintended impacts on ED use without hospitalization during first episodes.

Florida had average annual impact estimates of -0.6 percentage points (-4.1 percent relative to Florida's baseline level) for unplanned hospitalizations among first home health episodes (Exhibit 61), -1.4 percentage points (-8.8 percent relative to Florida's baseline level) for unplanned hospitalizations among all home health episodes, -1.05 percentage points (-7.9 percent relative to Florida's baseline level) for ED use followed by an inpatient admission among first home health episodes, and -0.22 percentage points (-5.3 percent relative to Florida's baseline level) for SNF utilization among all home health episodes (see Exhibit B-44 [Page 164] in the Technical Appendix).

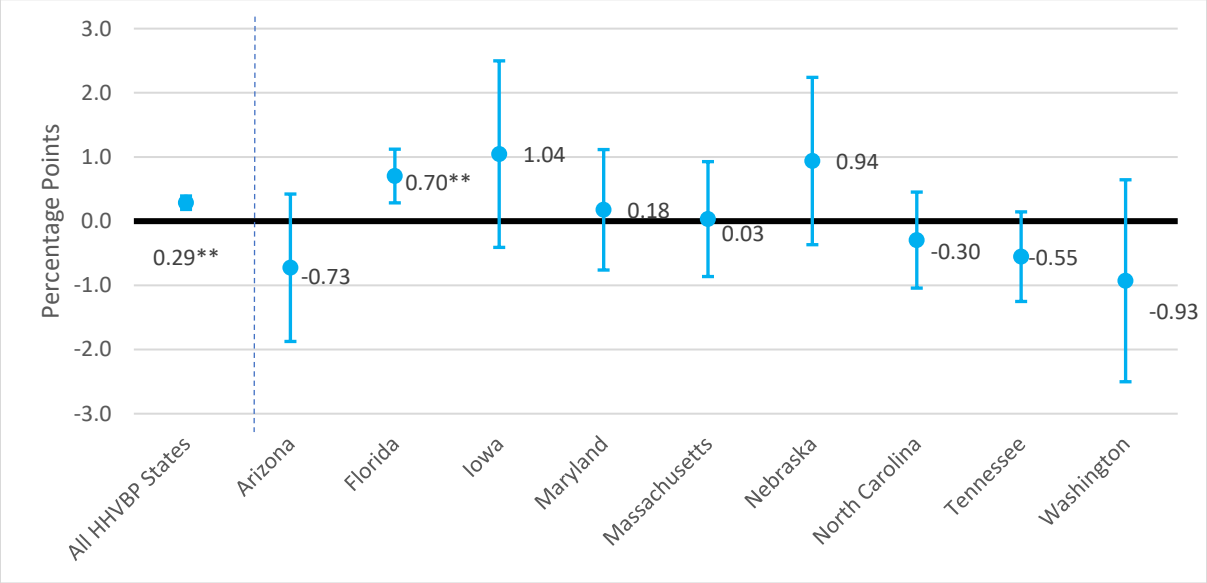
Exhibit 61. Cumulative D-in-D Estimates Indicate Reductions in Unplanned Acute Care Hospitalization/First FFS HH Episodes Overall are Driven Primarily by Florida



*Graph shows 90% Confidence Intervals; * p < .10; ** p < 0.05; State-level models include state-specific linear time trends. "All HHVBP States" model does not include state-specific linear time trends.*

We also found strong evidence that the HHVBP incentives contributed to intended impacts in Tennessee on unplanned hospitalizations among first home health episodes (-1.01 percentage points; -5.8 percent relative to Tennessee's baseline level; Exhibit 61), unplanned hospitalizations among all home health episodes (-1.11 percentage points; -6.5 percent relative to Tennessee's baseline level), SNF use (-0.76 percentage points; -15.3 percent relative to Tennessee's baseline level), and also for total ED utilization (-1.22 percentage points; -4.1 percent relative to Tennessee's baseline level) (see Exhibit B-44 [Page 164 in the Technical Appendix). We observed a large decline in SNF use in Iowa with the average annual impact estimate of -1.66 percentage points (-25 percent relative to Iowa's baseline level). We found some evidence of unintended impacts in Washington, with increasing unplanned hospitalizations among first home health episodes by 1.5 percentage points (+10.0 percent relative to the state baseline level; Exhibit 61) and increasing ED use followed by an inpatient admission by 1.4 percentage points (+10.5 percent relative to the state baseline level) (see Exhibit B-44 [Page 164] in the Technical Appendix). For Florida only, we found strong evidence of unintended cumulative impacts increasing ED use during first episodes by 0.7 percentage points (+7.1 percent relative to the state baseline level; see Exhibit 62).

Exhibit 62. Cumulative D-in-D Estimates Indicate Increases in Emergency Department Use (no Hospitalization)/First Home Health Episodes are Driven by Florida



*Graph shows 90% Confidence Intervals; ** p < 0.05; State-level models include state-specific linear time trends. "All HHVBP States" model does not include state-specific linear time trends.*

6.4 No Observed Impact of Larger TPS Weight for the Unplanned Hospitalization Measure in 2019 and 2020

As discussed in Section 1, CMS designed the HHVBP Model to evolve over time, with successively larger payment adjustments applied with each year. In the fourth performance year (2019), CMS also made several changes to the HHVBP measure set and to the weights of the HHVBP measures when calculating each agency's TPS. These changes affected the payment adjustments to agencies starting in 2021.

In addition to changes involving the HHVBP OASIS-based measures (discussed in detail in Section 8), larger TPS weights were applied starting in 2019 to both of the HHVBP claims-based measures. From 2018 to subsequent years, the weight used for the unplanned ACH measure increased from 6.25 percent to 26.25 percent, while the weight for the ED use (without hospitalization) measure increased from 6.25 percent to 8.75 percent. Together, the total weight for these two measures combined increased from 12.5 percent to 35 percent, such that performance on the claims-based measures had notably greater financial implications for agencies starting in 2019 (HHS, 2018).

Given the relatively large increase in the weight applied for the unplanned ACH measure, we evaluated whether the change in TPS weighting may have prompted a response from agencies in HHVBP states to improve their performance on this measure in particular. If so, such an effect would be incremental to impacts already observed through the first three years of the model.

We first classified agencies based on their previous performance on the unplanned ACH measure. Using quartiles of agency performance on this measure within each state during 2018, we defined three groups of agencies: (1) agencies in the low quartile for the percentage of adjusted unplanned ACH among first home health episodes in eligible agencies in the same state (i.e., having higher performance on this measure among agencies in their state); (2) agencies in the middle two quartiles for the

measure; and (3) agencies in the high quartile for the measure (i.e., having lower performance on this measure among agencies in their state). For each of these three groups, we compared the change in hospitalizations from 2018 to 2019 and from 2019 to 2020 between HHVBP states and the comparison states. This analysis includes adjustments for the same set of beneficiary and agency characteristics included in other analyses of claims-based impact measures in this report.

During 2018, the adjusted percentage of unplanned ACH ranged from an average of 18.7 percent and 19.6 percent of episodes in agencies in the high quartile in HHVBP and non-HHVBP states, respectively, to an average of 13.1 percent and 11.9 percent of episodes in agencies in the low quartile in the two groups of states, respectively (Exhibit 63). Between 2018 and 2019, there was a decline in hospitalizations in agencies that were in the high quartile during 2018, in both groups of states. However, the decline for HHVBP states (-1.7 percent) was smaller than the decline for non-HHVBP states (-2.3 percent; Exhibit 63), where no additional financial incentive was introduced in 2019 for agencies to reduce hospitalizations. Similarly, between 2019 and 2020, there was also a decline in hospitalizations in agencies that were in the high quartile during 2018, in both groups of states. However, the change in hospitalization between 2019 and 2020 did not differ between the two groups of states.

Exhibit 63. Patterns in Unplanned Acute Care Hospitalization (ACH) during 2018-2020 Do Not Provide Evidence of an Impact of the Increased TPS Weight Assigned to the ACH Measure in 2019 and 2020

Agency Quartile for HHVBP Unplanned Acute Care Hospitalization Measure, 2018^	Adjusted Unplanned Acute Care Hospitalization/First HH Episode, 2018	Estimated Change in Adjusted Unplanned Acute Care Hospitalization/First HH Episode, 2018 to 2019	Estimated Change in Adjusted Unplanned Acute Care Hospitalization/First HH Episode, 2019 to 2020
Low Quartile			
HHVBP States	13.1%	1.5%**	-1.9%
Non-HHVBP States	11.9%	2.2%**	-2.0%
Middle Quartiles			
HHVBP States	15.9%	-0.1%**	-2.4%**
Non-HHVBP States	15.9%	0.1%**	-2.7%**
High Quartile			
HHVBP States	18.7%	-1.7%**	-2.8%
Non-HHVBP States	19.6%	-2.3%**	-3.0%

^Defined based on agency quartiles within each state for the risk-adjusted measure of unplanned acute care hospitalization that is used in calculating each agency's TPS.
***p<0.05 comparing estimated change in unplanned acute care hospitalization/first HH episode for HHVBP states relative to non-HHVBP states, with adjustments for beneficiary and agency characteristics and other covariates that are included in the D-in-D analyses of claims-based measures in this report; *p<0.1.*

Among agencies that were in the low quartile for hospitalizations in 2018, hospitalizations increased during 2019, in HHVBP and non-HHVBP states. However, the increase in hospitalization was smaller in HHVBP states (1.5 percent) than in non-HHVBP states (2.2 percent; Exhibit 63). Hospitalizations decreased between 2019 and 2020 for both groups in the low quartile, although the change in hospitalization over time did not differ between the two groups of states. For the middle quartiles of agencies, hospitalizations decreased slightly by 0.1 percent in HHVBP states and increased by a similar amount in non-HHVBP states during 2019. Also in the middle quartiles, hospitalizations decreased

between 2019 and 2020 for both groups, and the decrease was larger for non-HHVBP states (-2.7 percent) relative to HHVBP states (-2.4 percent; Exhibit 63).

The results in Exhibit 63 suggest year-to-year variation in agency performance on the HHVBP hospitalization measure, as agencies with lower performance in 2018 improved on average in 2019-2020 and agencies with higher performance in 2018 worsened on average in 2019 but improved on average in 2020. We therefore also considered whether agencies may have responded to the change in TPS weighting based on information that would have been available to them about their performance in an earlier year. As of the start of 2019, agencies may have been more aware of their performance on the measure for 2017 than their performance for 2018. We replicated the analysis presented in Exhibit 63, except that we used 2017 data to define quartiles of agency performance and examined changes in hospitalization between 2017 and 2019. The findings of this sensitivity analysis were similar to those presented above; in particular, there was no evidence that agencies in the high quartile in HHVBP states were more likely to improve than their counterparts in non-HHVBP states.

Overall, the results in Exhibit 63 are not consistent with the change in TPS weights incentivizing greater improvements in performance on this measure starting from 2019, beyond the gains that had already occurred under HHVBP. Given the patterns we observe across the three groups in Exhibit 63, one possible explanation is that yearly changes in the performance of individual agencies on this measure may in part reflect the effects of regression to the mean. For future analyses that includes the final year of the original HHVBP model (i.e., 2021), it may be informative to combine data over the three years following the change in TPS weights to yield a more stable measure of agency performance on a single measure for evaluating effects of the change in weighting in the original HHVBP model as well as provide additional insight about potential effects of the expanded model which uses the same weighting (HHS, 2021).

6.5 Discussion

Our findings that HHVBP has decreased unplanned hospitalizations, ED use resulting in inpatient admission, and SNF use aligns with the intentions of policymakers to incentivize HHA activities that reduce unnecessary acute care use. However, we found evidence of offsetting increases to outpatient ED use attributable to HHVBP, indicating possible substitution of outpatient ED services for acute inpatient care, even though agencies have incentives under HHVBP to reduce both outpatient ED visits and inpatient hospitalizations. Related to these incentives, findings from our previous interviews with HHAs suggest that they use similar strategies to decrease both types of utilization (Arbor Research, 2020).

One potential explanation for our findings is that HHVBP reduced the severity of conditions for which home health patients received emergency services while having little impact on the likelihood of an ED visit, thereby reducing the frequency of inpatient hospital admissions initiated in the ED but in turn also leading to an increase in the frequency of outpatient ED visits. We explored this hypothesis by testing the impact of HHVBP on outpatient ED visits and ED visits that result in inpatient stays identified separately by four of the most common groups of diagnoses listed as causes of ED use in the study population. We did not find any evidence among these four common causes of ED use that any one common condition drives the pattern of increasing outpatient ED use attributed to HHVBP. Rather, we found the largest positive HHVBP impact on ED use was among home health episodes with only other less common conditions grouped together. We did find evidence that a relative reduction in ED visits for

chest pain among HHVBP episodes was a significant driver of reductions in both ED visits that result in inpatient stays as well as outpatient ED use.

In an analysis of first episode unplanned hospitalizations associated with a COVID-19 diagnosis, we found relatively low proportions of COVID-19 related hospitalizations that peaked in the last quarter of 2020 and generally similar patterns across HHVBP and non-HHVBP states. In addition, we conducted sensitivity analyses of impacts on utilization that did not include adjustments for either COVID-19 diagnoses for individual home health patients or for county-level COVID-19 rates. The 2020 D-in-D estimates from these models (Exhibit B-54 [Page 178] in the Technical Appendix) were similar to those in Exhibit 57 for all utilization measures. These results collectively add further evidence that impacts of COVID-19 were generally similar in HHVBP and non-HHVBP states, suggesting the PHE had limited effect as a potential confounder of this evaluation's estimates of HHVBP Model impacts for 2020.

Our analysis of changes in unplanned ACH use from 2018 to 2019 and from 2019 to 2020 among agencies categorized according to the high, middle, and low quartiles of adjusted unplanned ACH in 2018 shows no evidence of a notable response among HHVBP agencies to the substantial increase in weighting of ACH in the TPS from 6.25 percent in 2018 to 26.25 percent in 2019 and 2020. Aside from this finding of little or no change in average performance of HHVBP agencies on the ACH during first episodes measured in later years of the model relative to early years, we do find some evidence of an increasing intended impact reducing unplanned ACH and SNF utilization among all episodes to a greater degree in 2018-2020 relative to 2016-2017. However, this finding seems driven to a large extent by the increase in the HHVBP impact on these measures in 2020 relative to all prior years of the model. Given exogenous events in 2020 that included implementation of the PDGM—a major revision of the HH PPS—and the onset of the COVID-19 PHE, and some uncertainty about potential confounding related to these events, we urge caution with the interpretation of the larger than previous HHVBP impacts on these outcomes in 2020. Although our sensitivity analyses exploring alternative approaches to controlling for PDGM and the COVID-19 PHE find similar impact estimates as those reported above, we find some fluctuation in the magnitudes of the 2020 impact estimates depending on how we account for the PDGM-related change in maximum episode lengths. As data become available for 2021, we will explore whether the increased estimates for 2020 continue into 2021 and examine whether there are perceptible changes in HHA activities contributing to these larger HHVBP Model impacts in HHVBP states compared to comparison states.

Consistent with our findings from previous years, Florida continued to drive the intended impacts on unplanned hospitalizations, ED use followed by an inpatient admission and SNF use. We also found evidence of declines in unplanned hospitalizations and SNF use - two of the main drivers of Medicare savings (as discussed in the next section) - in Tennessee and Iowa.

7. Results: HHVBP Continued to Slow the Rate of Growth in Medicare Spending Largely Due to Impacts on Inpatient and Skilled Nursing Facility Spending

7.1 Introduction

If the HHVBP Model is successful in promoting higher quality home health care and preventing unnecessary hospitalizations or other forms of health care utilization, it may in turn reduce Medicare spending. However, there may also be offsetting changes in utilization that lead to increased spending for other types of services, such as for outpatient ED use which we found in Section 6 to have increased due to HHVBP. In this section, we examine the effects of HHVBP on both overall Medicare Part A and Part B spending and on individual components of Medicare spending during 2016-2020.

We continued to find that HHVBP led to a ***decline in Medicare spending for FFS beneficiaries receiving home health services*** through the first five years of the model. This includes a reduction in Medicare spending due to HHVBP during 2020, which overlaps with the introduction of PDGM and the onset of the COVID-19 PHE. As discussed above in Section 2 and briefly in the following section, we modified our analytic approach for 2020 to help mitigate any bias in our impact estimates due to these exogenous factors.

Overall during 2016-2020, we find that HHVBP led to a 1.6 percent decline in average Medicare expenditures per day for FFS beneficiaries during and within 30 days following home health episodes. This impact reflects a reduced rate of growth in total Medicare spending among beneficiaries receiving home health services in HHVBP states compared to non-HHVBP states, and reflects an average annual reduction in total Medicare spending of $190 million during 2016 – 2020. We find that much of this overall decline reflects impacts on spending for inpatient and SNF services, and corresponds to estimated annual savings of $109 million and $40 million, respectively.

In contrast, there is evidence of a small, positive effect of HHVBP on Medicare spending for outpatient ED visits and observation stays. However, the observed increase in spending associated with these services in HHVBP states represents a small offset to the other savings due to the relatively small expenditures associated with ED visits and observation stays (approximately 2.3 percent of total spending in the baseline period).

In the remainder of this section, we first provide an overview of the measures of Medicare spending that are examined in this report, which includes a change in measure calculations for 2020 due to implementation of PDGM. We then describe trends in Medicare spending among beneficiaries receiving home health care in HHVBP and non-HHVBP states, present the results of D-in-D analyses of the impact of the model on total Medicare spending, and examine impacts for both key components of spending and for individual HHVBP states.

7.2 Overview of Medicare Spending Measures

To assess average effects of HHVBP on Medicare spending for all nine HHVBP states combined and for individual HHVBP states, we continued to focus on three measures of total Medicare spending for FFS beneficiaries receiving home health care. Our analyses of 2020 data indicated that it was necessary to revise our spending measure definitions to assess model impacts during 2020. We noted a differential change in the follow-up period for measuring spending during home health care between HHVBP and

non-HHVBP states in 2020 that appears to be a result of the introduction of PDGM. This change was motivated by concern that D-in-D analyses might falsely attribute a change in average spending in HHVBP states relative to non-HHVBP states to the HHVBP Model instead of attributing it to PDGM. To avoid this potential source of bias, we implemented alternative spending measure definitions for 2020 (refer to Section 2.2.2 for details) while keeping the spending measure definitions for the pre-PDGM years (2016-2019) unchanged from the Fourth Annual Report.

The **Average Medicare Spending per Day during FFS Home Health Episodes of Care** reflects Medicare Part A and Part B expenditures occurring during or shortly after the time period in which Medicare FFS patients are under the active care of an HHA. While analyses of pre-PDGM model years (2016-2019) are based on a measure of spending from the home health claim start date through seven days following the last home health visit date reported on the claim, analyses of the post-PDGM model year (2020) are based on a measure of spending during the 30 days after the home health claim start date.[27] For the 60 percent of pre-PDGM (2016-2019) home health episodes and 33 percent of post-PDGM (2020) episodes that had no subsequent home health episode, we examined a second measure, **Average Medicare Spending per Day following FFS Home Health Episodes of Care**. This measure reflects "*downstream*" Medicare Part A and Part B expenditures for up to 30 days following the time period in which Medicare FFS patients were considered to be under the active care of an HHA.[28] The former measure captures expenditures for inpatient hospitalizations and other services that occurred concurrently with a home health episode of care, while the latter measure captures expenditures associated with any hospitalizations or other services that occurred within 30 days after a home health episode ends.[28] We combine these two measures to calculate a measure of **Average Medicare Spending per Day during and following FFS Home Health Episodes of Care**. For home health episodes followed within seven days by a subsequent home health episode (for pre-PDGM years) or within 30 days of home health claim start date (for the post-PDGM year), the combined measure reflects spending only during the home health episode.

For each of the above three measures of total Medicare spending for FFS beneficiaries receiving home health care, we also defined measures for key components of Medicare spending. As explained further in the Technical Appendix (Section A.2.2 [Page 64]), we calculated measures of average Medicare spending per day for each of the following service categories: inpatient hospitalizations, home health care, Part B non-institutional services (i.e., carrier and durable medical equipment claims), outpatient institutional services (which include outpatient ED and observation stays), skilled nursing, and hospice

[27] We define "during home health episodes of care" as the time period from the home health claim start date through a) the last visit date reported on the FFS claim plus seven days for the pre-PDGM model years (2016-2019) and 30 days after home health claim start date for the post-PDGM year (2020), or b) the start of the next home heath episode. To draw accurate inferences about model impacts during 2016-2019, spending measures for the baseline years (2013-2015) are defined using the pre-PDGM method, whereas spending measures for the baseline years are defined using the post-PDGM method to assess model impacts in 2020. See Section A.2.2 (Page 64) in the Technical Appendix for more detail.

[28] We define "following home health episodes of care" as the time period between the day that the beneficiary is no longer under the active care of an HHA (after the 7th day following last visit date for pre-PDGM years and after the 29th day following home health claim start date for the post-PDGM year) and over the subsequent 30 days or until the start of the next home health episode, death, or loss of FFS Part A eligibility, whichever comes earlier. See Section A.2.2 (Page 64) in the Technical Appendix for more detail.

services. We note that by definition, the home health component is not relevant to the *downstream total spending measure* as it includes expenditures within 30 days after a home health episode ends.

7.3 FFS Claims-Based Medicare Spending, Pre- and Post- HHVBP Implementation

As shown in Exhibit 64, average Medicare spending per day during home health episodes of care increased at a slower rate between the baseline and the 2016-2019 post-implementation period in HHVBP states than in non-HHVBP states (increasing by $11/day and $15/day which corresponds to increases of 7.4 percent and 11.1 percent, respectively). Average spending continued to increase at a slower rate in HHVBP states than in non-HHVBP states between the baseline period (recalculated using the post-PDGM approach) and 2020 (increasing by $21/day and $27/day which corresponds to increases of 14.4 percent and 19.6 percent, respectively). This measure of spending also increased at a somewhat lower rate during the baseline period in HHVBP states relative to non-HHVBP states when adjusting for model covariates (see Exhibit A-11 [Page 28] in the Technical Appendix for a comparison of trends in spending between the two groups, and Exhibit B-6 [Page 130] in the Technical Appendix for unadjusted annual means during 2013 – 2020 for the two groups).

Exhibit 64. Average Spending for FFS Home Health Beneficiaries Increased at a Slower Rate between Baseline and Post-Implementation Period in HHVBP States versus Non-HHVBP States

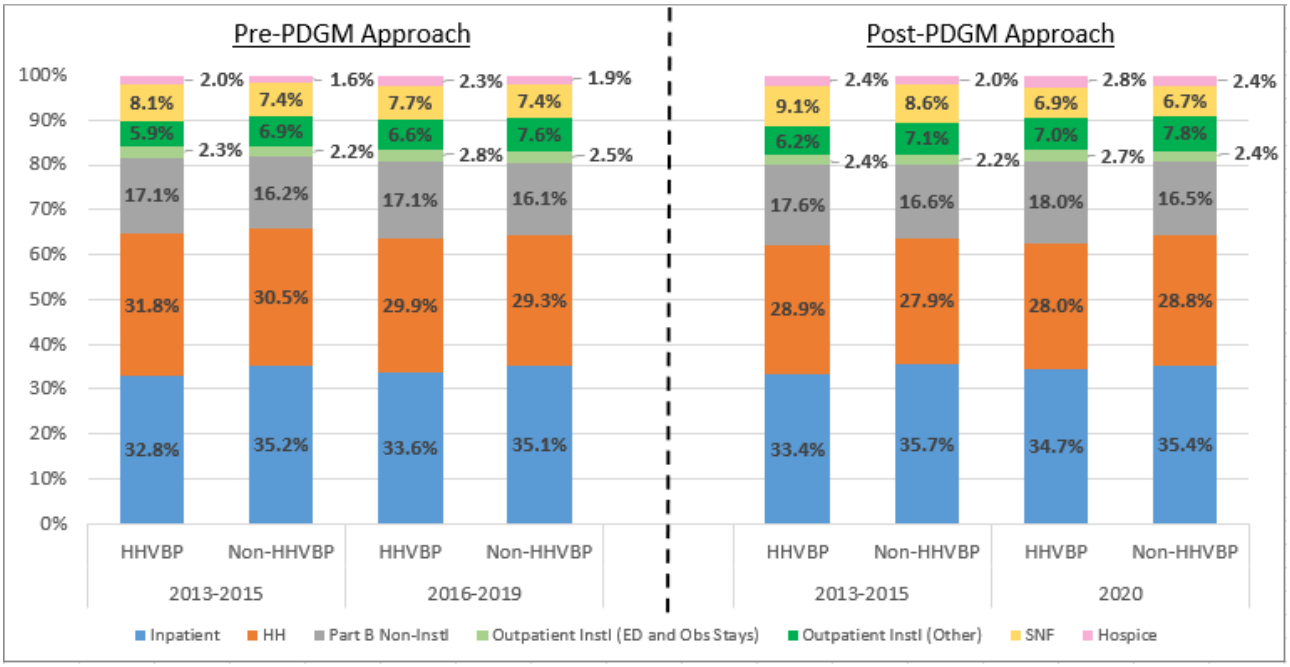
Measures (Pre-PDGM Approach)	HHVBP States		Non-HHVBP States		Change in Mean	
	Baseline (2013-2015)	Intervention (2016-2019)	Baseline (2013-2015)	Intervention (2016-2019)	HHVBP States	Non-HHVBP States
Average Medicare Spending per Day during and following FFS HH Episodes of Care	$138.33	$148.86	$131.61	$144.41	$10.53	$12.80
Average Medicare Spending per Day during FFS HH Episodes of Care	$150.60	$161.70	$135.34	$150.38	$11.09	$15.04
Average Medicare Spending per Day following FFS HH Episodes of Care	$105.97	$114.93	$116.54	$123.51	$8.96	$6.97
Measures (Post-PDGM Approach)	**HHVBP States**		**Non-HHVBP States**		**Change in Mean**	
	Baseline (2013-2015)	**Post-PDGM Intervention (2020)**	**Baseline (2013-2015)**	**Post-PDGM Intervention (2020)**	**HHVBP States**	**Non-HHVBP States**
Average Medicare Spending per Day during and following FFS HH Episodes of Care	$130.85	$152.80	$127.69	$153.84	$21.96	$26.15
Average Medicare Spending per Day during FFS HH Episodes of Care	$144.25	$165.09	$135.79	$162.43	$20.84	$26.64
Average Medicare Spending per Day following FFS HH Episodes of Care	$82.25	$113.31	$89.38	$120.26	$31.06	$30.87

Average is based on capped expenditure measures. For more details on post-PDGM approach, please refer to Section A.1.4.2 (Page 9) in the Technical Appendix.

Since we examined measures of average spending per day, we also compared the average number of days over which spending was measured in HHVBP and non-HHVBP states. The average number of days corresponding to the measures of spending during and following home health episodes of care used in our analyses is similar between the two groups for both the baseline period and post-implementation periods, including both the pre-PDGM and post-PDGM periods (see Exhibit B-45 [Page 167] in the Technical Appendix).

The major components of total Medicare FFS spending during the baseline period were similar among beneficiaries receiving home health care in HHVBP and non-HHVBP states (Exhibit 65). For the two groups, approximately one-third of total Medicare expenditures during and following home health episodes of care in the baseline period were associated with inpatient services, followed by 31-32 percent for home health services, 16-17 percent for Part B non-institutional services, 8-9 percent for outpatient institutional services, 7-8 percent for skilled nursing facility services, and 2 percent for hospice services. Medicare expenditures for outpatient ED visits and observation stays combined represent approximately one-fourth of total outpatient institutional expenditures and slightly more than two percent of total expenditures for both groups during the baseline period. Observation stays (not shown separately in Exhibit 65) account for slightly less than one-third of the combined outpatient ED and observation stay expenditures (32.0 percent for HHVBP; 28.2 percent for non-HHVBP). The distribution of spending among these major components during the baseline period was relatively similar when using the post-PDGM approach to defining spending measures (Exhibit 65).

Exhibit 65. Components of Total Medicare Spending for FFS Beneficiaries Were Similar Between Beneficiaries in HHVBP States and Non-HHVBP States During Baseline (2013 – 2015) and Pre-PDGM (2016-2019) and Post-PDGM Implementation (2020) Periods



Percentages are based on uncapped total Medicare spending during and following FFS home health episodes of care. For more details on post-PDGM approach, please refer to Section A.1.4.2 (Page 9) in the Technical Appendix.

There were similar changes over time in the major components of total spending in HHVBP and non-HHVBP states. For both groups, outpatient institutional services accounted for an increasing share of

total spending over time while home health and Part B non-institutional services accounted for a decreasing share of total spending. We observe these trends using both the pre-PDGM approach for model years 2016-2019 and the post-PDGM approach for 2020. For both HHVBP and comparison states, there is also a decline in the share of total spending for SNF services in 2020 that was not observed in earlier years of HHVBP (Exhibit 65).

These trends were also reflected in the average expenditure per day amounts for each period (as shown in Exhibit B-48 and Exhibit B-49 [Page 169] of the Technical Appendix). While the average dollar amounts for all components increased over time in both HHVBP and non-HHVBP states, we observed the largest increases for the inpatient and outpatient institutional categories for both the pre-PDGM and post-PDGM periods. Unadjusted means for other spending components, corresponding to spending during home health episodes of care and up to 30 days following home health episodes of care, are also included in the Technical Appendix (Exhibit B-48 and Exhibit B-49).

7.4 HHVBP Continues to Result in Overall Reductions in Medicare Spending

Based on data through the fifth year of the model, we continued to find HHVBP to be associated with a decline in two of the three measures of total Medicare spending per day for Part A & Part B services (Exhibit 66). The cumulative D-in-D estimate[29] of -$2.17 suggests that HHVBP led to a reduction in average daily Medicare spending during and following home health episodes among FFS beneficiaries, which corresponded to a 1.6 percent decrease compared to average HHVBP levels observed for 2013 – 2015. This D-in-D estimate translated to an estimated average annual savings among FFS beneficiaries receiving home health services of $190 million during 2016 – 2020. This estimate corresponded to savings to the Medicare program occurring from the beginning of the home health episode through up to 30 days after home health episodes of care.[27]

These overall savings reflect the measured impact of HHVBP on Medicare spending during, rather than in the 30 days following, home health episodes of care. The cumulative D-in-D results for average daily Medicare spending during FFS home health episodes were relatively similar in magnitude to those of the combined spending measure (e.g., -$2.07 vs. -$2.17, respectively), and corresponded to a 1.4 percent decline relative to pre-HHVBP levels (Exhibit 66). Based on the cumulative D-in-D estimate of -$2.07 for the measure of total Medicare spending per day during home health care, the estimated average annual savings among FFS beneficiaries receiving home health services were $129 million during 2016 – 2020. This estimate corresponded to savings occurring from the beginning of the home health episode through up to seven days after the last home health visit, or starting in 2020, 29 days following the start of home health care.

Using data for the most recent year of the model and applying a modified approach for calculating spending measures in the post-PDGM period, we continue to find evidence of an impact of HHVBP in reducing Medicare spending. The 2020 D-in-D estimate was slightly larger in magnitude compared to that of prior years (-$3.98). D-in-D estimates for the third spending measure, average daily Medicare spending *following* home health episodes, were smaller and not statistically significant for each of the first five years of the model.

[29] The cumulative estimate is a weighted average of the yearly D-in-D estimates with 2016-2019 HHVBP impacts estimated from one regression model and 2020 impact estimated from another regression model that incorporates the post-PDGM approach.

Overall, the D-in-D estimates for the total spending measures suggest relatively slower growth in average spending per day in HHVBP states compared to non-HHVBP states. Since financial incentives under HHVBP have become stronger with every year of the model, we tested whether the impact of the Model on the Medicare spending measures differed between the first two years of the model before payment adjustments were applied (2016 – 2017) and the subsequent three years of the model (2018 – 2020). This test indicated a larger impact of HHVBP in 2018-2020 compared to 2016-2017 for the overall measure of spending during and following home health episodes of care (see Exhibit B-47 [Page 168] in the Technical Appendix) which appears to be strongly influenced by the larger D-in-D estimate for 2020 (Exhibit 66). As with our findings for agency TPS and forms of utilization, impacts of HHVBP on Medicare spending starting in the first year of model implementation may reflect effects of the model's performance incentives starting in 2016, when agencies may have been anticipating that their performance would affect their future Medicare payments.

Exhibit 66. HHVBP Leads to Reductions in Overall Medicare Part A and Part B Spending for FFS Home Health Beneficiaries in Each of the First Five Years of the Model

Measure	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	% Relative Change*
	D-in-D	p-value	Lower 90% CI	Upper 90% CI		
Average Medicare Spending per Day during and following FFS HH Episodes of Care						
2016	-$1.12	<0.01	-$1.79	-$0.45	$138.33	-0.8%
2017	-$2.00	<0.01	-$3.05	-$0.94		-1.4%
2018	-$1.99	0.02	-$3.37	-$0.62		-1.4%
2019	-$2.68	<0.01	-$4.40	-$0.97		-1.9%
2020	-$3.26	<0.01	-$5.30	-$1.22		-2.5%
Cumulative	-$2.17	<0.01	-$3.43	-$0.92		-1.6%
Average Medicare Spending per Day during FFS HH Episodes of Care						
2016	-$0.90	0.05	-$1.67	-$0.14	$150.60	-0.6%
2017	-$1.77	0.02	-$3.01	-$0.53		-1.2%
2018	-$1.81	0.07	-$3.47	-$0.15		-1.2%
2019	-$2.13	0.09	-$4.23	-$0.04		-1.4%
2020	-$3.98	<0.01	-$6.29	-$1.67		-2.8%
Cumulative	-$2.07	0.02	-$3.52	-$0.62		-1.4%
Average Medicare Spending per Day following FFS HH Episodes of Care						
2016	-$0.41	0.56	-$1.56	$0.75	$105.97	-0.4%
2017	-$0.35	0.72	-$1.97	$1.27		-0.3%
2018	$0.74	0.54	-$1.26	$2.74		0.7%
2019	$0.20	0.90	-$2.26	$2.66		0.2%
2020	$0.22	0.88	-$2.18	$2.61		0.3%
Cumulative	$0.08	0.94	-$1.64	$1.79		0.1%

*CI= Confidence Interval. These models include state-specific linear time trends (See Section A.1.5.3 [Page 38] in the Technical Appendix for more details). See Exhibit 66n (Page 198) in the Technical Appendix for each measure's sample size. *Relative changes for 2016 – 2019 express the impact estimate as a percentage of the average spending per day during the baseline period in HHVBP states as reported in the table. Estimates of the relative change for 2020 and the cumulative 2016-2020 period incorporate the post-PDGM approach to measuring average spending per day and were calculated using a slightly different average baseline value. For more details, please refer to Section A.1.4.2 (Page 9) and A.2.9 (Page 87) in the Technical Appendix.*

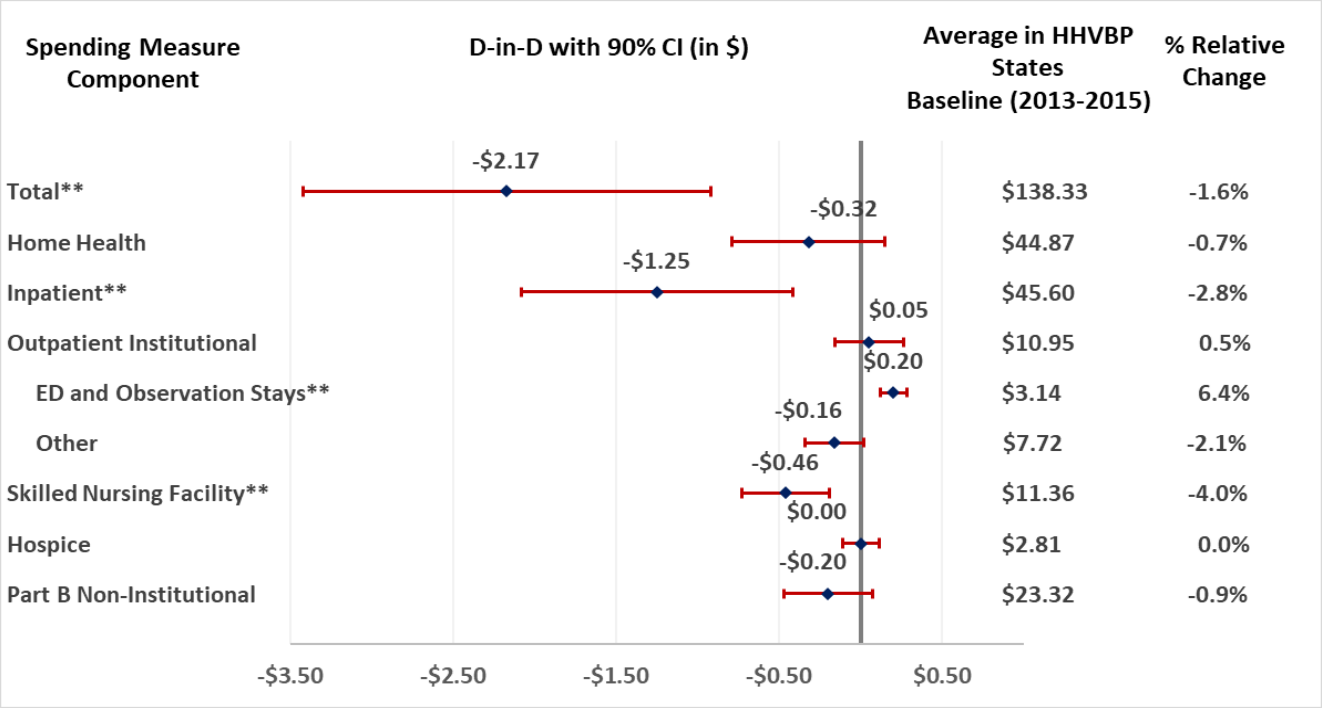
7.5 HHVBP Impact on Total Medicare Spending Driven by Decreases for Inpatient and Skilled Nursing Facility Services

Consistent with what we reported in the Fourth Annual Report, (Arbor Research, 2020) inpatient and SNF services remain the largest contributors to the overall reduction in average Medicare spending *during and following* home health episodes of care due to HHVBP (Exhibit 67). The cumulative D-in-D estimates indicate that HHVBP led to a $1.25 and $0.46 reduction in average daily spending for inpatient and SNF services, respectively, which corresponds to a 2.8 and 4.0 percent decline relative to pre-HHVBP implementation average measure values, respectively. These reductions in inpatient and SNF expenditures per day correspond to estimated annual savings to Medicare of $109 million and $40 million, respectively.

In contrast, there was a small positive impact of the model on outpatient ED and observation stay expenditures ($0.20/day) during and following home health episodes of care, which corresponds to a 6.4 percent increase compared to pre-HHVBP levels and an estimated annual cost to Medicare of $17 million. The yearly D-in-D estimates for the spending components (see Exhibit B-51 [Page 174] in the Technical Appendix) were largely consistent with the cumulative results. In each year from 2016 – 2019, there were declines in spending due to HHVBP for both inpatient services and SNF services. While we continued to find an impact of HHVBP in reducing Medicare spending for inpatient services in 2020, the impact estimate for SNF services was not statistically significant for 2020 (-$0.35, p =0.21).

Unlike each of the first four years of the model, we observed a decline in spending for home health services due to HHVBP in 2020, with a 4.8 percent decline in 2020 relative to baseline averages (see Exhibit B-42 [Page 163] in the Technical Appendix). However, we continued to find no cumulative impact of HHVBP on spending for home health services (D-in-D estimate of -$0.32, p=0.26). In contrast, we continued to find no impact of HHVBP on spending for all outpatient institutional services combined in 2020, as well as cumulatively through the first five years of the model (Exhibit 67). Yearly D-in-D estimates for outpatient ED and observation stay expenditures per day, which account for approximately 25 to 30 percent of all outpatient institutional expenditures (Exhibit 65), remained consistently positive and increased over time relative to pre-HHVBP levels (from $0.13 in 2016 to $0.24 in 2020; see Exhibit B-51 [Page 174] in the Technical Appendix). However, the cumulative impact estimate for other outpatient institutional services is negative and not statistically significant (-$0.16, p=0.14, Exhibit B-52 [Page 176] in the Technical Appendix).

Exhibit 67. Reduction in Average Medicare Spending per Day during and following FFS HH Episodes of Care in HHVBP States versus Non-HHVBP States during 2016-2020 Driven by Declines in Inpatient and SNF Components

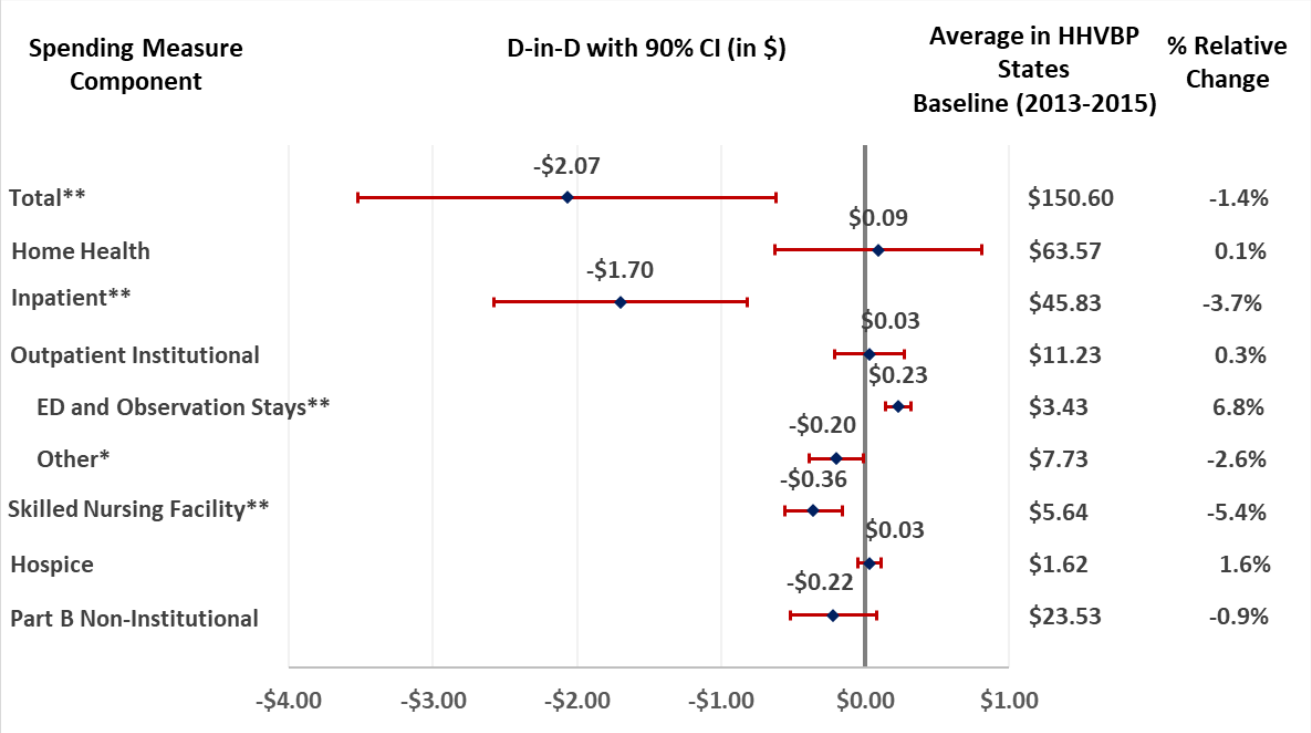


*Average is calculated based on the capped expenditure components. Estimates of the relative change for cumulative 2016-2020 period incorporate the post-PDGM approach to measuring average spending per day and were calculated using a slightly different average baseline value. For more details, please refer to Section A.1.4.2 and A.2.9 of the Technical Appendix |**Indicates significance at the p<0.05 level.*

We noted similar cumulative impacts of HHVBP in reducing inpatient and SNF expenditures and increasing outpatient ED and observation stay expenditures *during* home health episodes (Exhibit 68). The total estimated savings due to HHVBP for this measure (cumulative D-in-D estimate of -$2.07; Exhibit 66) largely reflected the impact on spending for inpatient services (cumulative D-in-D estimate of -$1.70) and SNF use (cumulative D-in-D estimate of -$0.36). We found no overall effect of HHVBP on expenditures for home health services *during* home health episodes. The cumulative D-in-D estimate for home health services was positive ($0.09) but not statistically significant (Exhibit 68).

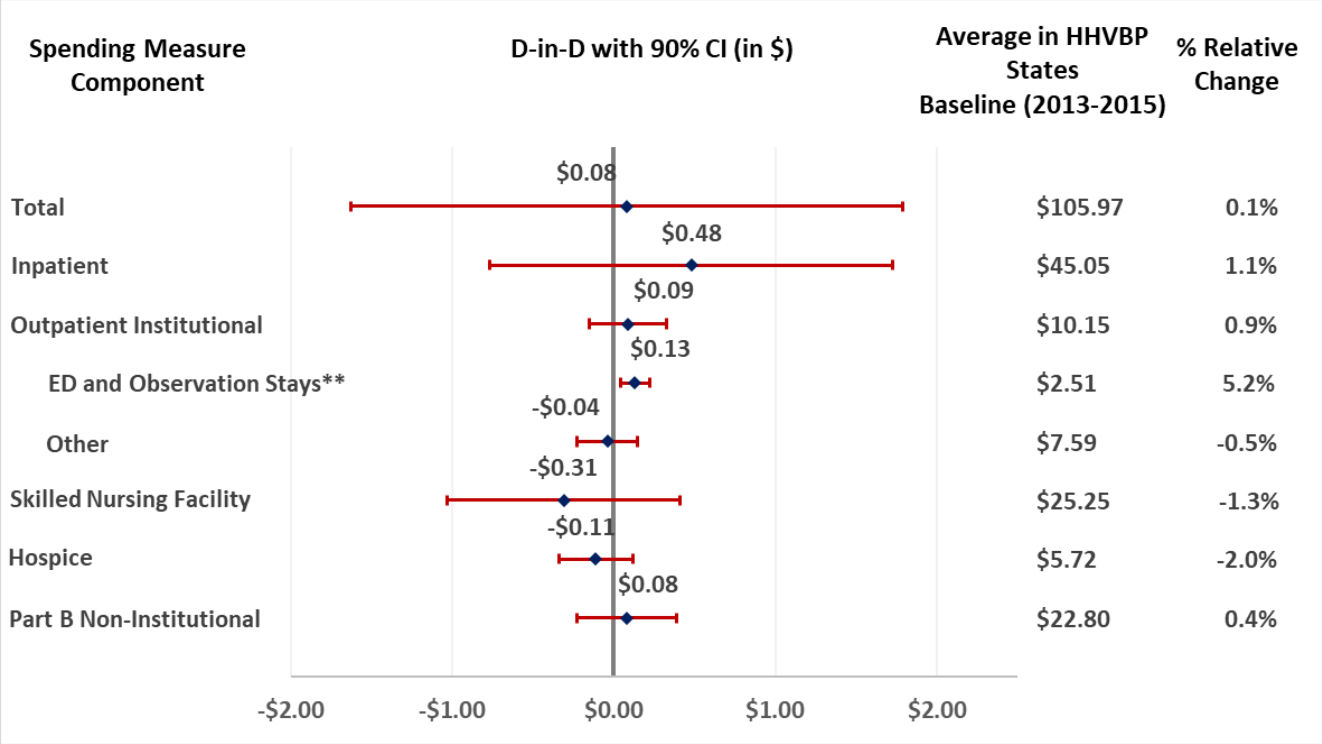
As with our findings for total Medicare spending *following* home health episodes, there was also generally no impact of HHVBP on the components of Medicare spending following home health episodes (Exhibit 69) with the exception of a small positive impact of the model on spending for outpatient ED visits and observation stays (cumulative D-in-D estimate of $0.13).

Exhibit 68. Reduction in Average Medicare Spending per Day during FFS Home Health Episodes of Care in HHVBP States versus Non-HHVBP States Driven by Declines in Inpatient and SNF Components



*Average is calculated based on the capped expenditure components. Estimates of the relative change for cumulative 2016-2020 period incorporate the post-PDGM approach to measuring average spending per day and were calculated using a slightly different average baseline value. For more details, please refer to Section A.1.4.2 and A.2.9 of the Technical Appendix |*Indicates significance at the p<0.10 level. | **Indicates significance at the p<0.05 level.*

Exhibit 69. No Reduction in Average Medicare Spending per Day following FFS Home Health Episodes of Care in HHVBP States versus Non-HHVBP States



*Average is calculated based on the capped expenditure components. Estimates of the relative change for cumulative 2016-2020 period incorporate the post-PDGM approach to measuring average spending per day and were calculated using a slightly different average baseline value. For more details, please refer to Section A.1.4.2 and A.2.9 of the Technical Appendix | **Indicates significance at the p<0.05 level.*

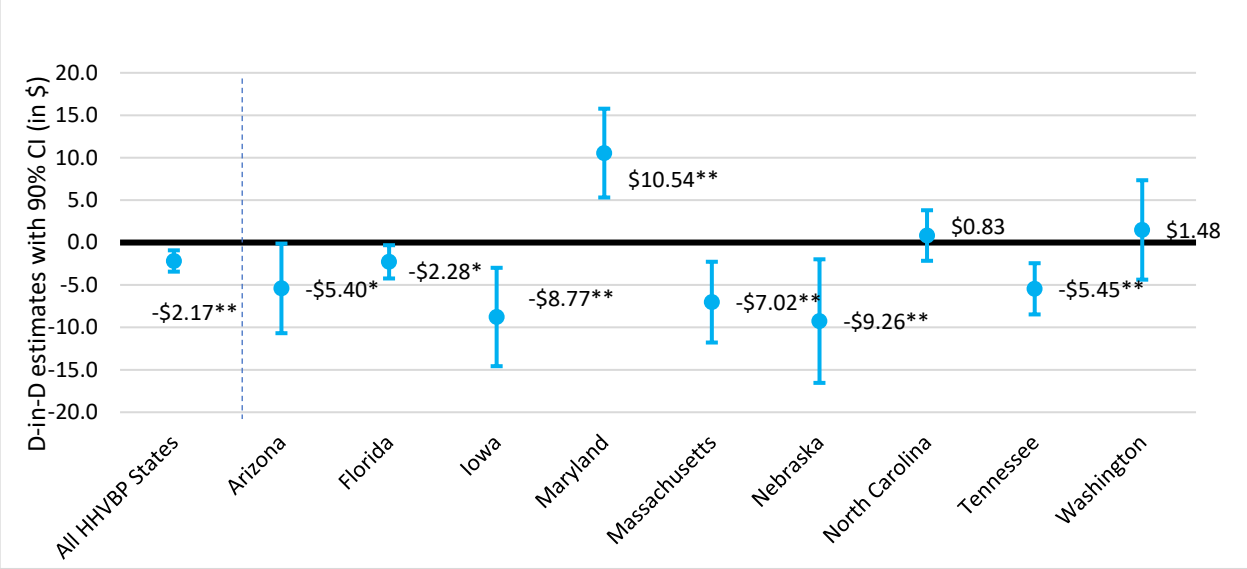
7.6 Cumulative Impact of HHVBP in Reducing Total Medicare Spending in Six HHVBP States

When examining impacts of HHVBP at the state level, we found evidence of overall savings due to HHVBP relative to regional comparison groups for six of the nine HHVBP states (Exhibit 70). Among these six states, the cumulative D-in-D estimates for average Medicare spending per day *during and following* home health episodes of care indicate reductions in spending for Arizona (-$5.40), Florida (-$2.28), Iowa (-$8.77), Massachusetts (-$7.02), Nebraska (-$9.26), and Tennessee (-$5.45). In contrast, there was a positive cumulative D-in-D estimate for Maryland, which suggests that the model led to an increase in average spending per day during and following FFS home health episodes of care of $10.54 (Exhibit 70).

Our analysis of two other spending measures sheds some light on the source of the overall spending impacts observed in the individual states. We found evidence of reductions in average Medicare spending per day *during h*ome health episodes of care in four of the six states mentioned above: Iowa, Massachusetts, Nebraska, and Tennessee (see Exhibit B-52 [Page 176] in the Technical Appendix). As we found above for all HHVBP states combined (Exhibit 66), there is no individual HHVBP state with an estimated reduction in average Medicare spending per day *following* home health episodes of care due to HHVBP. However, we found that the observed impact of HHVBP on total spending in Maryland appears to reflect a positive impact on spending both following home health episodes of care ($13.06,

p<0.01) and during home health episodes of care ($7.95, p=0.05; see Exhibit B-52 [Page 176] in the Technical Appendix).

Exhibit 70. Impact of HHVBP Model on Average Medicare Spending per Day during and following FFS Home Health Episodes of Care during 2016-2020 Varies by State



*Graph shows 90% confidence intervals. |*Indicates significance at the p<0.10 level. | **Indicates significance at the p<0.05 level. State-level models include state-specific linear time trends (See Section A.1.6 [Page 42] in the Technical Appendix for more details).*

Since the overall decline in Medicare spending due to HHVBP largely reflects impacts on spending for inpatient and SNF services, we examined these two components of spending for each of the nine HHVBP states (see Exhibit B-52 [Page 176] in the Technical Appendix). When examining average spending per day during and following home health episodes of care, we found evidence of cumulative declines in spending for inpatient services due to HHVBP in Arizona (-$4.46), Florida (-$1.39), Massachusetts (-$5.08), and Tennessee (-$2.08) and cumulative declines in spending for SNF services in Iowa (-$3.62) and Tennessee (-$1.56). Consistent with our findings of the impact of HHVBP on total spending in Maryland, there was a positive cumulative D-in-D estimate for spending on inpatient services in Maryland ($7.87). When examining average spending per day *during* home health episodes of care, we noted reductions in spending associated with inpatient hospitalizations in five states: Florida, Iowa, Massachusetts, Nebraska, and Tennessee. Iowa and Tennessee continued to be the drivers of savings associated with SNF services for this measure (see Exhibit B-53 [Page 176] in the Technical Appendix).

7.7 Discussion

With the addition of data for 2020, we find a sustained impact of HHVBP in reducing Medicare spending for FFS beneficiaries receiving home health care through the first five years of the model. There continues to be broad alignment between the overall findings of this evaluation regarding the impact of HHVBP on the utilization of services and the impact on Medicare spending. Similar to the sources of the overall reductions in spending due to HHVBP which appear to largely reflect savings related to inpatient hospital and SNF services, we also observe declines in utilization in each of these areas due to HHVBP (Section 6). These findings are consistent with intended effects of the HHVBP Model to reduce

unplanned ACH and may indicate that HHVBP has successfully incentivized quality improvements that have reduced the need for more resource-intensive forms of care.

Our findings of increased expenditures associated with outpatient ED visits and observation stays are again consistent with observed increases in outpatient ED use. Together, our findings for inpatient hospital services and outpatient ED visits and observation stays could imply that outpatient ED services were increasingly substituting for inpatient hospitalizations. While we show that the increase in spending for outpatient ED visits and observation stays has the effect of offsetting savings related to inpatient hospitalizations somewhat, this has a limited impact due to the relatively small share of overall spending that is related to outpatient ED visits and observation stays.

More so than in earlier years of the model, the analyses for this report which include data for 2020 suggest that the impact of HHVBP on spending may be growing larger over time. This is based on our findings of a slightly larger D-in-D estimate for 2020 compared to earlier years and evidence of larger impact estimates for the most recent three years of the model combined (2018-2020) compared to the initial two years (2016-2017). One possible alternative explanation is that there has been a differential impact of PDGM in HHVBP states which has contributed to a slightly larger impact estimate for 2020. However, our modification to the spending measure definitions for 2020 was designed to limit any such effects of PDGM as a source of confounding, and our analyses of the change in follow-up between the baseline and post-PDGM period based on these new measure definitions do not suggest a differential change in the duration of home health care between HHVBP and non-HHVBP states as a result of PDGM.

A potentially related finding for 2020 is that unlike in prior years of the model, we noted a decline in spending for home health services in HHVBP states compared to non-HHVBP states. Our state-level analyses indicated that this result was primarily driven by Arizona and Florida (results not shown). While PDGM was implemented nationally at the start of 2020, one possible explanation for this result is that there is variation across states in the initial impact of PDGM. Given the limited experience to date with the implementation of PDGM, additional information will be valuable in forming conclusions about any possible implications of this national payment reform for our evaluation of HHVBP. In particular, as data for 2021 become available, we will assess whether the larger overall model impacts observed in 2020 compared to earlier years of the model persist in 2021, and will explore whether there is evidence of sustained changes in agency practices in Arizona and Florida following the introduction of PDGM that help to explain the observed changes in home health spending in these states relative to their regional comparison groups.

While 2020 also marks the onset of the COVID-19 PHE, we did not find evidence that COVID-19 has had a markedly different impact on home health beneficiaries in HHVBP states and non-HHVBP states during the first year of the pandemic. As we showed in Section 2, trends in the incidence of COVID-19 were relatively similar overall between HHVBP states and non-HHVBP during 2020. In addition, we conducted sensitivity analyses of impacts on spending that did not include adjustments for either COVID-19 diagnoses for individual home health patients or for county-level COVID-19 rates. The 2020 D-in-D estimates from these models (Exhibit B-54 [Page 178] in the Technical Appendix) were similar to those in Exhibit 66 for all three total spending measures, which also does not suggest that the COVID-19 PHE represents a major source of confounding for the 2020 impact estimates.

As we have found in previous years of the model, our finding at the national level of overall cost savings to Medicare due to HHVBP is not uniform across the HHVBP states. Based on data through 2020, there is

evidence of a cumulative impact of HHVBP in reducing overall Medicare spending in six of the nine states. As we observed at the national level, declines in spending related to inpatient hospitalization and SNF services were also the main drivers of savings at the state level. In contrast to our findings for other HHVBP states, we also continued to find evidence of an increase in Medicare spending in one HHVBP state, Maryland. As we've previously discussed, a potential confounder for our analyses of the impact of HHVBP in Maryland is the implementation of the Maryland All-Payer Model, which began in 2014 and was found in a separate evaluation to result in cost savings for Medicare starting in 2016 (RTI International, 2019). Since this model is a statewide initiative that overlapped with the implementation of HHVBP and was not also adopted in other states, we are unable to formally control for any effects it may have had in the post-HHVBP period that would not also have occurred in its regional comparison states.

8. Results: HHVBP Continued to Produce Modest Improvements in OASIS-Based Outcome Quality Measures

8.1 Introduction

This section presents findings on the impact of HHVBP on the six OASIS-based measures used to calculate the TPS in 2020. Using D-in-D analyses, we continued to find a ***modest, positive impact of HHVBP for most of the OASIS-based outcome measures*** after the first five years of the model, including the two Total Normalized Composite (TNC) measures of changes in mobility and self-care that were introduced in 2019. The significant relative gains we observed occurred where average rates for the original, non-TNC measures tended to be high (e.g., 52 to 73 percent) prior to 2016 in both HHVBP and non-HHVBP states. At the state level, Arizona was a consistent driver of the overall HHVBP findings for most of the OASIS-based outcome measures.

8.2 OASIS-Based Quality Measures, Pre- and Post-HHVBP Implementation

Trends for the six OASIS-based measures that were used in the TPS calculation in 2020 showed a general trend toward improvements in outcomes over time in both HHVBP and non-HHVBP states (Exhibit 71); this trend began prior to HHVBP implementation (see Exhibit B-6 [Pages 130-133] in the Technical Appendix). For example, rates for Improvement in Management of Oral Medications increased by 20 percentage points for HHVBP states (51.5 percent to 71.5 percent) and by 16 percentage points for non-HHVBP states (53.9 percent to 69.5 percent). Similarly, the Improvement in Dyspnea and Improvement in Pain Interfering with Activities measures had increases of at least 12 percentage points between baseline and post-HHVBP periods for both HHVBP and non-HHVBP states.[30] We observed smaller increases in the percent of patients discharged to community, with 1.70 percentage points in non-HHVBP states and only 0.30 percentage points in HHVBP states.[31]

Performance scores also increased for the two normalized composite measures introduced in 2019.[32] In HHVBP states, the average score for the TNC Change in Self-Care measure increased from 1.37 in the baseline period to 1.88 post-intervention, while average scores in non-HHVBP states increased from 1.28 to 1.75. For the TNC Change in Mobility measure, average scores in HHVBP states increased by 0.24 between baseline and post-intervention (i.e., 0.43 to 0.67) and by 0.21 (0.41 to 0.62) in non-HHVBP states (Exhibit 71).

[30] Note that HHAs were required to submit data for the Improvement in Pain Interfering with Activities measure through CY 2020, but it was dropped from public reporting in April 2020 (HHS, 2019).

[31] In January 2020, CMS began publicly reporting a discharge to community measure derived from FFS claims data only (whereas the OASIS-based measure includes patients with Medicare and Medicaid). Compared to the OASIS-based HHVBP measure, the unadjusted annual values for the claims-based measure during 2018-2020 are approximately two to four percentage points higher in HHVBP states and approximately one to two percentage points lower in non-HHVBP states (see Exhibit B-60 [Page 181] in the Technical Appendix).

[32] For each TNC measure, the change in a patient's status between start/resumption and end of care in each of the underlying areas of functioning is standardized to be worth up to ±1 point towards the total composite change score. As such, the range for each of the episode-level composite measures reflects the number of underlying OASIS items: the TNC Change in Mobility score ranges from -3 to +3 points, and the TNC Change in Self-Care score ranges from -6 to + 6 points. See Exhibits A-55 and A-56 (Pages 78-79) of the Technical Appendix.

Exhibit 71. Improvements in Unadjusted OASIS-based Outcomes in Both HHVBP and Non-HHVBP States from Baseline to Post-HHVBP Period

Measure (Percentage or Mean Score)	HHVBP States		Non-HHVBP States		Change in Percentage or Mean Score	
	Baseline (2013-2015)	Post-HHVBP (2016-2020)	Baseline (2013-2015)	Post-HHVBP (2016-2020)	HHVBP States	Non-HHVBP States
Discharged to Community (%)	72.8%	73.1%	70.1%	71.8%	0.30	1.70
TNC Change in Self-Care (score)	1.37	1.88	1.28	1.75	0.51	0.47
TNC Change in Mobility (score)	0.43	0.67	0.41	0.62	0.24	0.21
Improvement in Dyspnea (%)	66.7%	81.4%	66.1%	78.9%	14.7	12.8
Improvement in Management of Oral Medications (%)	51.5%	71.5%	53.9%	69.9%	20.0	16.0
Improvement in Pain Interfering with Activity (%)	70.7%	82.4%	67.7%	79.6%	11.7	11.9

HHVBP Measures indicated by italic text.

8.3 Modest Improvements for Most OASIS-Based Outcome Impact Measures

We found a positive cumulative HHVBP effect for four of the six OASIS-based measures during the first five years of the HHVBP Model. For patients discharged to the community, we observed relative gains of 0.91 percentage points in HHVBP states relative to non-HHVBP states over the first five years of the HHVBP Model, translating to 1.3 percent change relative to its 72.8 percent baseline value (Exhibit 72). In each of the first two years of HHVBP, our D-in-D analysis indicated an increase in HHVBP states relative to non-HHVBP states of approximately 0.5 percentage points, followed by larger relative increases in the most recent three years of the model when agencies started receiving payment adjustments: 0.97 percentage points in 2018, 1.19 percentage points in 2019 and 1.39 percentage points in 2020. This difference in impact between the early years of the HHVBP Model (i.e., 2016-2017) and the most recent three years (i.e., 2018-2020) was statistically significant, suggesting a larger effect when HHAs received a payment adjustment (see Exhibit B-61 [Page 181] in the Technical Appendix).

The cumulative D-in-D estimates were also statistically significant and positive for the two TNC measures. HHVBP states had a relative increase of 0.04 in the TNC Change in Self-Care measure score from pre- to post-HHVBP implementation over non-HHVBP states, translating to a 2.9 percent increase from an average score of 1.37 in the baseline period (Exhibit 72). Although the cumulative D-in-D estimate for the TNC Change in Mobility measure was slightly smaller (0.01), it translated to a similar increase from its baseline (i.e., 2.3 percent increase from a baseline average score of 0.43), which is reflective of the different range in normalized change values for the two TNC measures (i.e., -3 to +3 for Mobility compared to -6 to +6 for Self-Care).[33] The relative change from baseline values in HHVBP states

[33] See Section A.2.3 (Page 78) of the Technical Appendix for additional information on the specific OASIS items that comprise the TNC measures.

Exhibit 72. HHVBP Model Results in Greater Improvement for Five OASIS-Based Outcome Measures

Measure	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	Percent Relative Change
	D-in-D[a]	p-value	Lower 90% CI[a]	Upper 90% CI[a]		
Discharged to Community						
2016	0.42	0.01	0.15	0.69	72.8%	0.6%
2017	0.55	0.04	0.12	0.98		0.8%
2018	0.97	0.01	0.40	1.55		1.3%
2019	1.19	0.01	0.46	1.91		1.6%
2020	1.39	0.01	0.49	2.29		1.9%
Cumulative	0.90	0.01	0.35	1.46		1.3%
TNC Change in Self Care						
2016	0.02	0.01	0.01	0.04	1.37	1.5%
2017	0.04	0.01	0.01	0.06		2.9%
2018	0.05	0.01	0.02	0.08		3.6%
2019	0.05	0.03	0.01	0.09		3.6%
2020	0.04	0.14	-0.005	0.09		2.9%
Cumulative	0.04	0.03	0.01	0.07		2.9%
TNC Change in Mobility						
2016	0.01	<0.01	0.004	0.02	0.43	2.3%
2017	0.01	0.01	0.005	0.02		2.3%
2018	0.02	0.01	0.01	0.03		4.7%
2019	0.02	0.06	0.002	0.03		4.7%
2020	0.01	0.18	-0.003	0.03		2.3%
Cumulative	0.01	0.03	0.004	0.02		2.3%
Improvement in Dyspnea						
2016	0.80	0.05	0.13	1.48	66.7%	1.2%
2017	0.75	0.25	-0.32	1.82		1.1%
2018	0.06	0.94	-1.35	1.48		0.1%
2019	-0.40	0.71	-2.17	1.36		-0.6%
2020	-1.49	0.25	-3.61	0.63		-2.2%
Cumulative	-0.09	0.91	-1.47	1.28		-0.1%
Improvement in Management of Oral Medications						
2016	1.91	<0.001	1.03	2.79	51.5%	3.7%
2017	3.06	<0.001	1.72	4.39		5.9%
2018	3.19	<0.01	1.51	4.87		6.2%
2019	2.61	0.05	0.44	4.79		5.1%
2020	1.58	0.32	-1.02	4.19		3.1%
Cumulative	2.49	0.02	0.80	4.17		4.8%
Improvement in Pain Interfering with Activity						
2016	1.24	<0.001	0.63	1.85	70.7%	1.8%
2017	1.75	<0.01	0.83	2.68		2.5%
2018	1.97	0.01	0.79	3.14		2.8%
2019	2.48	<0.01	1.05	3.90		3.5%
2020	2.58	0.01	0.91	4.25		3.6%
Cumulative	2.02	<0.01	0.92	3.12		2.9%

[a] Values represent percentage point changes with the exception of the TNC measures. | HHVBP Measures indicated by italic text. | CI= Confidence Interval.| These models include state-specific linear time trends (See Section A.1.5.3 [Page 38] in the Technical Appendix for more details). See 72n (Page 198) in the Technical Appendix for each measure's sample size.

for 2019—the year they were introduced into the HHVBP Model—were higher than the cumulative results: 3.6 percent for TNC Change in Self-Care and 4.7 percent for TNC Change in Mobility measure (see last column of Exhibit 72). For 2020, impact estimates for both TNC measures were equivalent to the cumulative estimates (i.e., slightly lower than 2019), but were not statistically significant.

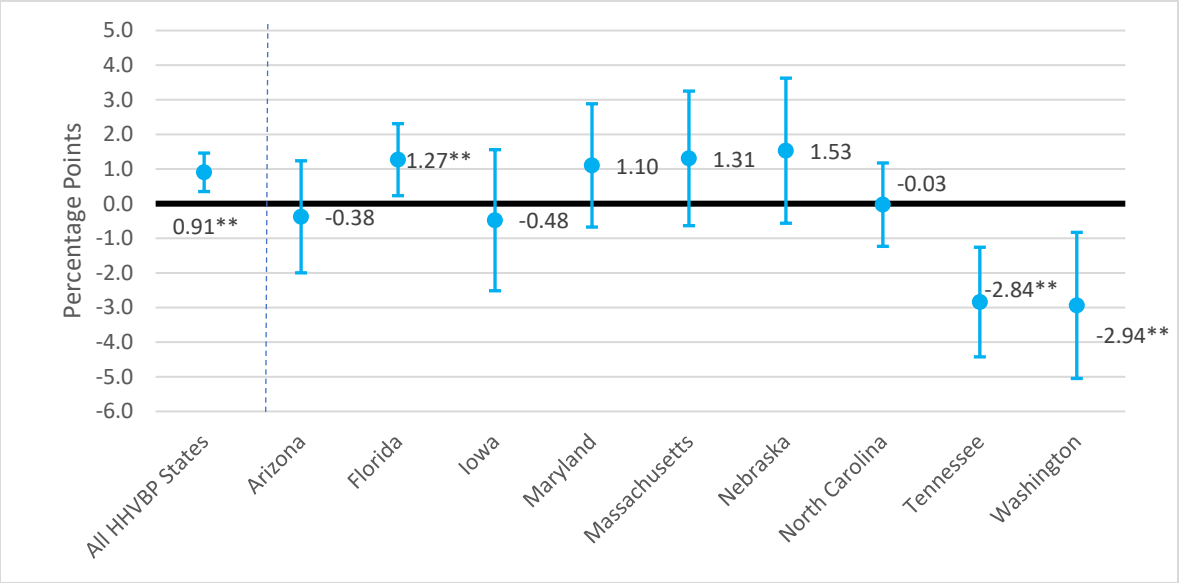
We also found cumulative D-in-D effects to be statistically significant and positive for two of the three measures of improvement in functional status, with Improvement in Dyspnea continuing to be the exception (Exhibit 72). Relative to the comparison group, the magnitude of the increase in the percentage of patients showing improvement in HHVBP states ranged from 2.02 percentage points for Pain Interfering with Activity to 2.49 percentage points for Management of Oral Medications. Similar to previous years, these relative changes led to a larger gap between the two groups for both measures, with higher levels of improvement observed among patients in HHVBP states post HHVBP implementation. In addition, the relative increases observed in HHVBP states based on the D-in-D estimates occurred in a context where there continued to be relatively large increases in measure rates over time for both groups. For example, the percentage of patients reported to be improving in Management of Oral Medications in HHVBP states increased by 20 percentage points between the baseline period and post-HHVBP implementation (i.e., from 51.5 percent to 71.5 percent of patients; (Exhibit 71). We did not find a significant difference between the early years (2016-2017) vs. later years of HHVBP (2018-2020) for either of these OASIS-based measures (see Exhibit B-61 [Page 181] in the Technical Appendix). However, the impact estimate for Improvement in Management of Oral Medications decreased significantly from 2019 (2.61 percentage points) to 2020 (1.58 percentage points). Similar to the two TNC measures, the impact estimate for Improvement in Management of Oral Medications for 2020 was not statistically significant.

In our analysis of state-specific impacts among HHVBP states relative to their respective regional comparison groups, we continued to find positive, statistically significant D-in-D cumulative results for Florida with regard to discharge to community (Exhibit 73). This implies that there was an increase in discharge of beneficiaries to the community in Florida relative to the other states in its regional grouping through the first five years of the HHVBP Model. Conversely, there were lower rates of beneficiaries being discharged to the community in Tennessee and Washington relative to the states in each of their respective regional groupings (Exhibit 73).

We found Arizona to be a consistent driver of the overall HHVBP findings for the other OASIS-based quality measures, with positive, significant D-in-D cumulative results for all but Improvement in Dyspnea, and Maryland and Washington also had positive significant results for some of the measures (see Exhibit B-62 [Page 182] in the Technical Appendix for the state-level D-in-D cumulative results for the OASIS-based measures). In contrast, Massachusetts' D-in-D estimates were mostly negative, and statistically significant for both the Improvement in Management of Oral Medications and Improvement in Pain Interfering with Activities measures. Across these five measures, the cumulative D-in-D estimate was considerably larger for Arizona than for all HHVBP states combined. For example, the cumulative estimate for the Improvement in Management of Oral Medications measure in Arizona was 10.94 percentage points compared to 2.49 for all HHVBP states (Exhibit 72). In turn, this translates to a much larger relative change from baseline (e.g., Arizona had a 21.8 percent increase from its baseline average of 50.2 percent; see Exhibit B-62 [Page 182] in the Technical Appendix). For the two TNC measures, Arizona as well as Maryland both saw larger improvements than their regional groupings. For example,

for the TNC Change in Mobility measure, Arizona had a 12.5 percent increase from its baseline average of 0.40, while Maryland increased 15.2 percent from its baseline average of 0.46.

Exhibit 73. Increase in Home Health Beneficiaries Discharged to Community in All HHVBP States Combined and Florida, but Decrease in Tennessee and Washington



*Graph shows 90% confidence intervals; * p,<0.10, ** p < 0.05.*

8.4 Slightly Steeper Declines in Mortality Rates among FFS Beneficiaries Receiving Home Health in HHVBP States

We also examined whether HHVBP may have had implications for rates of mortality among home health patients, which could have occurred as a result of changes in the quality or intensity of their care. While the previous analyses presented in this section utilize OASIS assessment data, we relied on Medicare FFS claims to examine mortality, since date of death is more reliably reported on these administrative data (especially for deaths occurring after the patient is discharged from home health). To align this measure with other claims-based impact measures (e.g., see Sections 6 and 7), we evaluated the percentage of home health episodes in which the Medicare FFS beneficiary died within 60 days of the start of the episode (see Exhibit A-51 [Page 76] in the Technical Appendix for additional detail).

The average unadjusted mortality rate during home health episodes remained constant over time in HHVBP states at 3.5 percent in both the baseline period (2013-2015) and in the first five years of the HHVBP Model (Exhibit 74). For non-HHVBP states, the average unadjusted mortality rate was slightly lower and decreased slightly from 3.3 percent in the baseline to 3.2 percent in the post-HHVBP period.

Exhibit 74. HHVBP States have Slightly Higher Unadjusted Patient Mortality Rates among FFS Beneficiaries than Non-HHVBP States

Measure	HHVBP States		Non-HHVBP States		Change in Mean	
	Baseline (2013-2015)	Post-HHVBP (2016-2020)	Baseline (2013-2015)	Post-HHVBP (2016-2020)	HHVBP States	Non-HHVBP States
Mortality Rate/All FFS Episodes	3.5%	3.5%	3.3%	3.2%	0.0%	-0.1%

After adjusting for the core set of beneficiary and agency covariates (see Exhibit A-3 [Page 14] in the Technical Appendix) including state fixed effects, our D-in-D model indicated that HHVBP led to a 0.13 percentage point decrease in the mortality rate among FFS home health beneficiaries in HHVBP states relative to non-HHVBP states during the first five years of the HHVBP Model (Exhibit 75). This cumulative effect translates to a 3.7 percent decrease relative to the 3.5 percent average mortality rate in HHVBP states during the baseline period.[34] The separate yearly D-in-D estimates are all negative and statistically significant.

Exhibit 75. Small Decrease in Patient Mortality Rates among FFS Beneficiaries in HHVBP States Relative to Non-HHVBP States

Measure	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	% Relative Change
	D-in-D[a]	p-value	Lower 90% CI[a]	Upper 90% CI[a]		
2016	-0.12	<0.001	-0.17	-0.08	3.5%	-3.4%
2017	-0.10	<0.001	-0.14	-0.05		-2.9%
2018	-0.09	<0.01	-0.13	-0.04		-2.6%
2019	-0.11	<0.001	-0.17	-0.06		-3.1%
2020	-0.20	<0.001	-0.25	-0.14		-5.7%
Cumulative	-0.13	<0.001	-0.17	-0.09		-3.7%

[a]Values represent percentage point changes| CI=Confidence Interval. | See Exhibit 72n (Page 198) in the Technical Appendix for measure's sample size.

8.5 Discussion

Our findings for most of the OASIS-based outcome measures show a modest, positive impact of HHVBP, reflecting a relative increase in discharge to the community and improvement in functional status measures in HHVBP states compared to non-HHVBP states. We observed similar results for the two composite measures added to the HHVBP measure set in 2019 that reflect improvement in patients' self-care and mobility. Cumulative impacts for the single item OASIS measures ranged from 0.9 to 2.9 percentage points. These relative gains occurred in a context where average measure achievement rates were already high (e.g., 52 to 73 percent) prior to implementation of HHVBP. In particular, for the three improvement measures examined (as well as the two composite measures), these relative gains occurred in the context of increases in measure rates that were already occurring in both HHVBP and non-HHVBP states prior to the launch of HHVBP and may in part reflect the response of agencies to

[34] We note that after accounting for the beneficiary characteristics, agency characteristics and other risk-factors that comprise our covariate list, the risk-adjusted mortality rate for HHVBP states is *lower* than that of the non-HHVBP states. See Exhibits B-61, B-62, and B-63 (Pages 181-183) in the Technical Appendix.

other public reporting initiatives. This aligns with findings from our qualitative work discussed in our previous annual reports that found quality improvement efforts for OASIS assessment to be a central focus of agencies (Arbor Research, 2018; 2019; 2020; 2021).

Although we continued to find statistically significant cumulative impacts of HHVBP when averaging effects over the five years of the model, a pattern emerged in 2020 where the impact estimates for three of the measures were not statistically significant, in contrast to what we found for each of the first four years of the model (i.e., 2016-2019). One possible explanation for this pattern in the results for 2020 is the COVID-19 PHE, especially given our inability to control for COVID-19 diagnoses among all home health patients with OASIS data (see Section 2 for additional detail on changes to our evaluation approach due to the COVID-19 PHE). To better understand the influence of COVID-19 as a potential confounder for the 2020 impact estimates, we conducted a sensitivity analysis of the TNC measures that was restricted to Medicare FFS beneficiaries only, for whom we could adjust for claims-based COVID-19 diagnoses in addition to county-level COVID-19 rates. Impact estimates for 2020 that were based on a model including both types of COVID-19 adjustments were similar in magnitude to 2019 estimates for both TNC measures and statistically significant for the TNC Change in Self-Care measure (not shown). In a related analysis, we did not find these results to be sensitive to the inclusion of adjustments for individual patient COVID-19 diagnoses. While these analyses which were limited to FFS beneficiaries did not yield impact estimates for the TNC measures that were substantially different from our primary analyses, we would not rule out the possibility that impact estimates for these measures could reflect a small degree of confounding related to the COVID-19 PHE. We will continue to explore how the COVID-19 PHE may affect OASIS-based outcome measures and our inferences regarding the effects of HHVBP.

At the state level, we continue to observe variation in the impacts of the model on the OASIS-based outcome measures. State-level D-in-D analyses show Arizona to be the only state that was a consistent driver of the overall HHVBP impact estimates for most of the OASIS-based measures. Similar to the state-level findings discussed above for other measures, we will continue to examine state-specific events that may be driving these differences observed across the HHVBP states.

9. Results: HHVBP Had Modest Unintended Impact on Three of Five Measures of Patient Experience with Care

9.1 Introduction

In this section, we examine the impact of HHVBP on the five measures of home health patients' experience with their care that are derived from the HHCAHPS survey and used to calculate an agency's TPS. These measures continue to remain relatively stable during the post-implementation period in both HHVBP and non-HHVBP states. Based on our D-in-D analyses, we found no impact of HHVBP on the two global HHCAHPS-based performance measures through the first five years of the model, including patients' ratings of overall care from the agency and likelihood of recommending the agency. For the remaining three measures, we found ***HHVBP was associated with a -0.2 to -0.4 percent relative decline in patient experience with care***. We provide more detail below.

9.2 Patient Experience Measures, Pre- and Post-HHVBP Implementation

Performance scores for the five HHCAHPS-based measures have remained stable over time in HHVBP states and non-HHVBP states (Exhibit 76). The unadjusted values for the two global measures of patient experience of care (Overall Care and Likely to Recommend) were similar between the HHVBP states and non-HHVBP states during the baseline period. The Likely to Recommend measure declined by 0.9 and 0.7 percentage points in HHVBP states and non-HHVBP states, respectively, whereas the Overall Care measure values for both groups remained similar post-implementation (Exhibit 76).

Exhibit 76. HHCAHPS-Based Patient Experience Measures Values Remained Stable Over Time in Both HHVBP and Non-HHVBP States

HHCAHPS-Based Patient Experience Impact Measures	HHVBP States		Non-HHVBP States		Change in Mean	
	Baseline (2013-2015)	Post-HHVBP (2016-2020)	Baseline (2013-2015)	Post-HHVBP (2016-2020)	HHVBP States	Non-HHVBP States
How often the home health team gave care in a professional way (Professional Care)	88.8%	88.4%	88.2%	88.0%	-0.4%	-0.2%
How well did the home health team communicate with patients (Communication)	85.9%	85.5%	85.3%	85.2%	-0.4%	-0.1%
Did the home health team discuss medicines, pain, and home safety with patients (Discussion of Care)	82.8%	82.0%	83.8%	83.3%	-0.8%	-0.5%
How do patients rate the overall care from the home health agency (Overall Care)	84.4%	84.2%	83.7%	83.7%	-0.2%	0.0%
Would patients recommend the home health agency to friends and family (Likely to Recommend)	79.6%	78.7%	78.4%	77.7%	-0.9%	-0.7%

HHVBP Measures indicated by italic text.

The unadjusted values for the Professional Care and Communication measures became more similar between the HHVBP states and non-HHVBP states post-implementation compared with baseline, with values for both groups trending downward. For example, for the Communication measure, the difference between groups decreased from 0.6 percentage points (85.9 percent for HHVBP compared to 85.3 percent for non-HHVBP) in the baseline period to just 0.3 percentage points (85.5 percent and 85.2 percent, respectively) post-HHVBP implementation. We observed an opposite trend for the Discussion of Care measure, where the difference between HHVBP states and non-HHVBP states increased from the baseline period (1.0 percentage point) to post-implementation (1.3 percentage points). Discussion of Care is also the only measure where unadjusted measure values in the HHVBP states were slightly lower than those of non-HHVBP states in both the baseline and post-HHVBP period.

9.3 Modest Negative or No Impact on Measures of Patient Experience with Care

Our cumulative D-in-D findings through the fifth year of the model found no cumulative impact of HHVBP on the two global HHCAHPS-based measures that are derived from single HHCAHPS questions: Overall Care and Likely to Recommend (Exhibit 77). However, our D-in-D results indicate a small negative effect of HHVBP in 2020 on the Likely to Recommend measure, with a 0.72 percentage point decrease translating to a 0.9 percent decrease relative to the baseline average of 79.6 percent.

For the three composite patient experience of care measures, we found a cumulative negative effect of the model. Relative to non-HHVBP states, HHVBP led to a cumulative impact of a 0.21 percentage point decrease in the Professional Care measure, a 0.24 percentage point decrease in the Communication measure, and a 0.33 percentage point decrease in the Discussion of Care measure in HHVBP states (Exhibit 77). These cumulative effects translate to a 0.2 percent, 0.3 percent, and 0.4 percent decrease relative to the baseline averages of 88.8 percent, 85.9 percent, and 82.8 percent, respectively, in HHVBP states. Results for the most recent year of the model also indicate a small negative HHVBP effect for two of these measures: Professional Care and Discussion of Care. For both measures, the impacts for 2020 were larger than the cumulative impacts (e.g., for Discussion of Care, we found an impact of -0.65 percentage points in 2020 vs. a cumulative impact of -0.33 percentage points; Exhibit 77). This translates to a larger but still modest decrease for 2020 relative to baseline values (e.g., a 0.8 percent decrease for Discussion of Care in 2020 relative to its baseline average of 82.8 percent).

Additionally, we found a statistically significant decline between the early years of the HHVBP Model (i.e., 2016 – 2017) and the three most recent years where HHAs received a payment adjustment (i.e., 2018 – 2020) for these two measures (see Exhibit B-67 [Page 186] in the Technical Appendix). Compared to non-HHVBP states, HHVBP states had a 0.27 percentage point decrease for the Professional Care measure and a 0.43 percentage point decrease for the Discussion of Care measure between the early years and later years of the model.

Exhibit 77. HHVBP Model Results in Modest Decrease in Three HHCAHPS-Based Measures

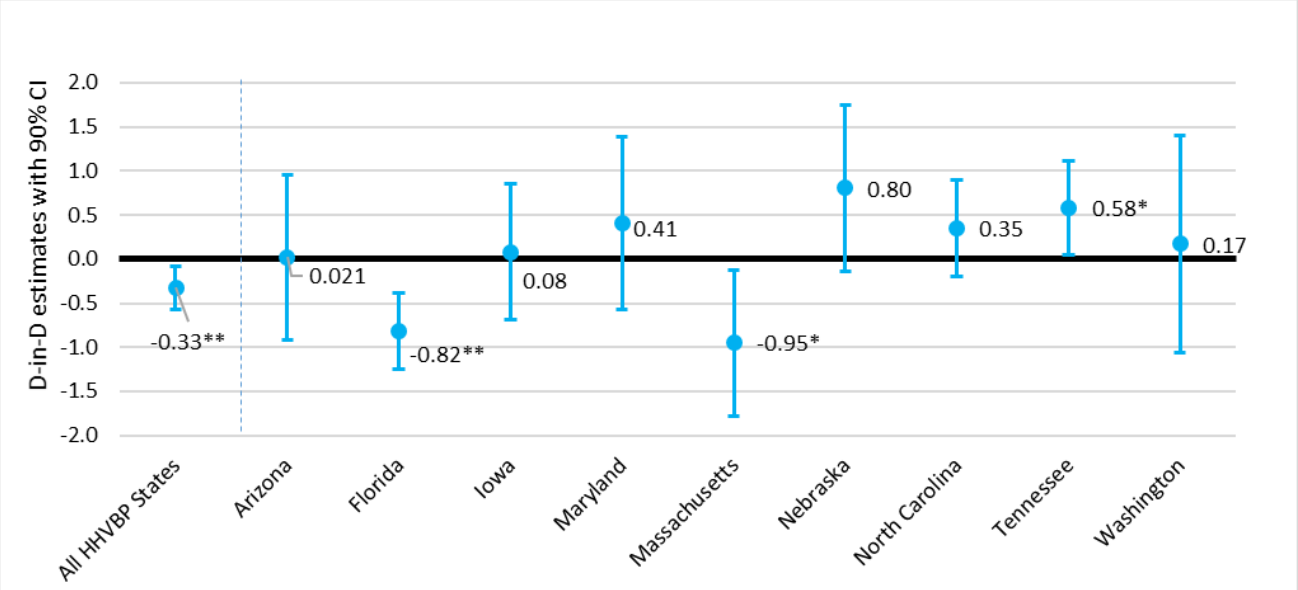
Measure	Model Estimates				Average in HHVBP States, Baseline (2013-2015)	Percent Relative Change
	D-in-D[a]	p-value	Lower 90% CI[a]	Upper 90% CI[a]		
How often the home health team gave care in a professional way (Professional Care)						
2016	-0.11	0.43	-0.34	0.12	88.8%	-0.1%
2017	0.02	0.91	-0.24	0.28		0.02%
2018	-0.08	0.61	-0.33	0.18		-0.1%
2019	-0.41	0.02	-0.68	-0.13		-0.5%
2020	-0.48	0.01	-0.78	-0.17		-0.5%
Cumulative	-0.21	0.06	-0.39	-0.03		-0.2%
How well did the home health team communicate with patients (Communication)						
2016	-0.22	0.16	-0.49	0.04	85.9%	-0.3%
2017	-0.05	0.77	-0.34	0.24		-0.1%
2018	-0.30	0.09	-0.60	-0.01		-0.3%
2019	-0.41	0.03	-0.72	-0.10		-0.5%
2020	-0.22	0.30	-0.56	0.12		-0.3%
Cumulative	-0.24	0.06	-0.45	-0.03		-0.3%
Did the home health team discuss medicines, pain, and home safety with patients (Discussion of Care)						
2016	-0.35	0.06	-0.66	-0.04	82.8%	-0.4%
2017	0.22	0.27	-0.10	0.54		0.3%
2018	-0.24	0.26	-0.58	0.11		-0.3%
2019	-0.62	<0.01	-0.99	-0.25		-0.7%
2020	-0.65	<0.01	-1.05	-0.25		-0.8%
Cumulative	-0.33	0.03	-0.57	-0.08		-0.4%
How do patients rate the overall care from the home health agency (Overall Care)						
2016	-0.10	0.67	-0.48	0.29	84.4%	-0.1%
2017	0.03	0.90	-0.36	0.42		0.04%
2018	0.25	0.31	-0.15	0.65		0.3%
2019	-0.18	0.50	-0.61	0.25		-0.2%
2020	-0.23	0.42	-0.69	0.24		-0.3%
Cumulative	-0.04	0.80	-0.33	0.24		-0.05%
Would patients recommend the home health agency to friends and family (Likely to Recommend)						
2016	0.01	0.97	-0.44	0.46	79.6%	0.01%
2017	0.29	0.30	-0.17	0.75		0.4%
2018	0.39	0.19	-0.10	0.89		0.5%
2019	-0.03	0.91	-0.54	0.47		-0.04%
2020	-0.72	0.04	-1.30	-0.15		-0.9%
Cumulative	-0.01	0.95	-0.36	0.33		-0.01%

[a] *Values represent percentage point changes. | HHVBP Measures indicated by italic text. | CI=Confidence Interval. See Exhibit 77n (Page 198) in the Technical Appendix for each measure's sample size.*

In our analysis of state-specific impacts, we found that Florida and Massachusetts drove the overall results for the Professional Care, Communication and Discussion of Care measures, with negative, statistically significant cumulative D-in-D estimates relative to their respective regional comparison groups for all three measures (see Exhibit B-68 [Page 186] in the Technical Appendix for the state-level D-in-D cumulative results for the HHCAHPS-based measures). Conversely, we found *positive,* statistically significant cumulative D-in-D estimates in Tennessee for all five measures of patient experience (see

Exhibit B-68 [Page 186] in the Technical Appendix). For all five measures, the magnitude of the D-in-D estimates was larger for these three states than the overall estimate for all HHVBP states combined (e.g., see Exhibit 78 for the Discussion of Care measure).

Exhibit 78. Decrease in HHCAHPS-based Discussion of Care Measure for All HHVBP States Combined, Florida, and Massachusetts, but Increase in Tennessee



*Graph shows 90% confidence intervals; * p < 0.10, ** p < 0.05.*

9.4 Discussion

As part of the ongoing development of quality measurement and quality incentive programs, there have been growing efforts to incorporate patient perspectives on their care. The design of the HHVBP Model reflects this initiative, as five of the original 17 performance measures (and 13 of the performance measures for 2020) included in the agency TPS calculation reflected measures of patient experience with care based on the HHCAHPS survey. As part of our evaluation of the HHVBP Model, we used these five HHCAHPS-based measures to examine the effect of the HHVBP Model on patient experience with care.

Measure rates were relatively high for all five measures during the baseline period, ranging from 78 percent to 89 percent, and have remained relatively stable over time. For all five measures, there was less than a one percentage point change in measure rates between the baseline period and the post-implementation period, in both HHVBP and non-HHVBP states.

While we continued to find no effect of HHVBP for the two global measures of patient experience with care (Overall Care and Likely to Recommend), our D-in-D analyses suggest a small negative impact of HHVBP on the Professional Care, Communication, and Discussion of Care measures after the first five years of HHVBP. These cumulative findings appear to be driven largely by results for 2019 and 2020, the two most recent years of the model in which there was up to a ±5 and ±6 percent payment adjustment, respectively, to HHAs. However, the cumulative impact estimates for these measures correspond to only a 0.2 to 0.4 percent relative decrease in the baseline measure rates, which does not suggest a meaningful impact of HHVBP on these aspects of patient experience with care. Furthermore, we would not expect a meaningful negative impact of HHVBP on patient experience with care based on our

previous interviews with representatives of HHAs in HHVBP states where we heard that many agencies were making changes to improve their performance on the HHCAHPS measures.

It is also important to view these findings within the broader context of the model as well as the HH PPS. For example, CMS made several changes to HHVBP in 2019, including adding new OASIS composite measures, dropping OASIS process measures, and weighting the two claims-based measures more heavily in the TPS calculation (HHS, 2018). These non-trivial changes to the HHVBP Model in 2019 may have prompted agencies to focus more of their efforts on the claims-based and new OASIS measures, which may have resulted in a small, unintended impact on certain aspects of patient experience.

More recently, the onset of the COVID-19 PHE may have had implications for measurement of patient experience. In particular, CMS did not require HHAs to report HHCAHPS survey for 2019 Q4, 2020 Q1, or 2020 Q2 (October 2019 through June 2020) (CMS, 2020a) so that providers could instead allocate resources to patient care during the COVID-19 PHE. Additionally, there was concern that the COVID-19 PHE would have a considerable impact such that these data should not be included in CMS' quality reporting program (CMS, 2020b). Since these HHCAHPS measures are used in the TPS calculation, their inclusion during the unprecedented times could have had a further unintended impact on the HHVBP payment adjustments for HHAs. As to be expected, we observed a decrease in the number of HHCAHPS surveys in 2020 compared to earlier years, from an average of 148 surveys per HHA in 2013-2019 to just 124 in 2020 (not shown). However, there was not a noticeable change in the unadjusted HHCAHPS-based measure values over time (see Exhibit B-6 [Page 130] in the Technical Appendix). Three of the five measures had negative significant D-in-D estimates for 2020, including Likely to Recommend, which showed a negative impact of HHVBP for the first time, though showing no impacts at the yearly or cumulative level (Exhibit 77). We will continue to examine how these measures of patient experience may change after the COVID-19 PHE subsides.

10. Results: Differential Impacts by Medicaid Status and Patient Race and Ethnicity

10.1 Introduction

As with other VBP programs, an important consideration for the HHVBP Model involves its potential implications for health equity. Are any gains in quality due to HHVBP incentives occurring widely among different beneficiary subgroups? Are these gains shared equally among beneficiary subgroups? If HHVBP does not uniformly affect all beneficiary subgroups, the model could adversely affect health equity. For example, any factors that constrained quality improvements and resulted in worse outcomes for some beneficiary subgroups prior to HHVBP could also constrain quality improvements under the model for those beneficiaries. Alternatively, if quality incentives encourage greater gains among beneficiary subgroups who have historically had worse outcomes on average, there is potential for the HHVBP Model to promote greater health equity. In this section, we explore whether effects of the HHVBP Model differ among home health patients based on (1) enrollment in Medicaid (i.e., whether dually eligible for Medicare and Medicaid, or Medicaid only), or (2) patient race and ethnicity.

Our findings indicate ***differential impacts of the HHVBP Model based on both Medicaid coverage and patient race and ethnicity***. The overall impacts of the model in leading to fewer unplanned hospitalizations and greater improvements in functioning were not observed among Medicaid patients. As a result, there was a pattern of modest growth in disparities for this population. There was no consistent pattern in the implications of the model for the racial and ethnic minority groups that we examined. While we found evidence of HHVBP leading to larger gains among Black non-Hispanic patients compared to white non-Hispanic patients, we also found evidence of HHVBP leading to smaller gains among Hispanic patients compared to white non-Hispanic patients early in the post-implementation period. As the use of VBP in the home health care setting continues to evolve, it will be important to understand its potential implications for health equity.

10.2 Motivation: Potential Unintended Consequences of Value-Based Purchasing

While VBP programs are designed to promote overall quality improvement, a potential unintended consequence is that they may systematically penalize providers who care for patients for whom it is more difficult to achieve quality performance levels that are tied to payment. Previous research involving other care settings indicates potential for unintended consequences of VBP programs for health disparities (Joynt, 2013; Ryan, 2013; Damberg, 2015; Gilman, 2015; Qi, 2020). One risk is that VBP programs may redistribute resources away from providers who care for historically underserved populations, which could limit investments in quality improvement and lead to worsening disparities in care and outcomes. This risk is important to evaluate in the context of HHVBP, as the payment adjustments have grown larger over time relative to other VBP programs.

As we describe in Section 5 of this report, we continued to find no evidence that HHVBP systematically penalizes agencies that care disproportionately for patients with social risk factors, even as the payment adjustments under the model have grown larger over time. This is consistent with our findings for earlier years of the model (Arbor Research, 2020; Arbor Research, 2021). However, these findings do not preclude the possibility that gains in quality under HHVBP are not shared equally among different patient populations. This would be the case if there are greater challenges in improving outcomes for some patients, such as those who face greater social or economic disadvantages that adversely affect

their health. If so, there is potential for a widening gap in outcomes over time among patient groups despite the overall quality performance incentives. Alternatively, we should not rule out the possibility that these incentives would motivate disproportionate gains among patient groups for whom there are greater opportunities for improvement.

In the remainder of this section, we first assess whether there were disparities in key home health patient outcomes prior to the implementation of HHVBP based on Medicaid enrollment and race or ethnicity. We then evaluate whether there is a widening gap in home health patient outcomes emerging under the model based on these patient characteristics, or whether there are disproportionate gains under the model for certain patient subgroups that have potentially reduced any existing disparities.

To assess whether the implications of the model are different for patients with Medicaid coverage or certain racial or ethnic minority groups, we examined four impact measures that together represent a range of outcomes that are highly relevant to the goals and the design of the model. These impact measures include measures of unplanned ACH and outpatient ED use (without hospitalization), which correspond to the two claims-based HHVBP utilization measures; and composite measures of improvement in mobility and improvement in self-care, which correspond to two of the OASIS-based HHVBP performance measures.

10.3 Modest Growth in Disparities for Patients with Medicaid Coverage

In the Fourth Annual Report, we found evidence of differential impacts of HHVBP on home health patients with Medicaid coverage (Arbor Research, 2021). In particular, the effects of HHVBP in reducing overall unplanned hospitalizations and improving levels of functioning among home health patients were not observed among those with Medicaid coverage and resulted in modest growth in disparities for this population. In this report, we extend these prior analyses to determine whether these patterns in the effects of the model continued through 2020.

FFS beneficiaries who are dually eligible for Medicare and Medicaid account for between 25 and 35 percent of all FFS home health episodes and have several distinguishing characteristics (Exhibit 79). Relative to other beneficiaries, dual eligible beneficiaries tend to be younger, are more likely to be Hispanic or Black, have a higher average HCC risk score (as an indicator of higher expected costs to Medicare), and were less likely to be discharged from an inpatient facility shortly before the start of home health care (Exhibit 79). Dual eligible beneficiaries are also predisposed to receive care from for-profit agencies and agencies that are not affiliated with a home health chain (Exhibit 79). These patterns remain similar between the baseline period and the post-HHVBP period. There are similar patterns by Medicaid status for the broader population of home health patients with OASIS data (see Exhibit B-69 [Page 188] in the Technical Appendix).

Exhibit 79. Dual Eligible Status is Associated with Many Differences in the Characteristics of FFS Home Health Beneficiaries, 2013-2020

	Baseline (2013-2015)		Post Period (2016-2020)	
	Duals	Non-Dual FFS	Duals	Non-Dual FFS
FFS Episodes (N)				
HHVBP	1,340,689	3,082,241	1,928,008	5,776,797
Non-HHVBP	5,322,666	10,094,882	8,522,955	17,831,036
Average Age (Years)				
HHVBP	70.9	79.7	70.8	79.9
Non-HHVBP	70.2	78.8	70.7	79.0
Female (%)				
HHVBP	66.4	60.2	64.9	58.9
Non-HHVBP	66.9	60.6	64.8	59.2
Race/Ethnicity (Mutually Exclusive) (%)				
Hispanic				
HHVBP	25.5	2.5	17.7	2.2
Non-HHVBP	17.4	3.8	15.8	3.6
Black Non-Hispanic				
HHVBP	17.8	6.7	18.9	7.0
Non-HHVBP	27.3	10.8	23.4	8.9
White Non-Hispanic				
HHVBP	54.4	89.8	60.7	89.7
Non-HHVBP	49.3	83.7	53.9	85.4
Non-Hispanic Other Race				
HHVBP	2.0	0.9	2.6	1.0
Non-HHVBP	5.8	1.6	6.8	1.9
Non-Hispanic Multiracial				
HHVBP	0.2	0.1	0.2	0.1
Non-HHVBP	0.2	0.2	0.2	0.2
Average HCC Score (1st Episode)				
HHVBP	2.8	2.6	3.3	2.9
Non-HHVBP	2.7	2.6	3.0	2.8
ESRD Flag				
HHVBP	4.4	2.2	5.9	2.5
Non-HHVBP	5.7	2.6	6.4	2.9
Discharge from Inpatient Facility within 14 Days (%)				
HHVBP	53.3	64.9	57.9	63.8
Non-HHVBP	54.1	65.8	53.0	65.5
Rural (%)				
HHVBP	6.0	4.5	6.4	4.5

	Baseline (2013-2015)		Post Period (2016-2020)	
	Duals	Non-Dual FFS	Duals	Non-Dual FFS
Non-HHVBP	10.4	8.9	10.0	8.9
HHA Ownership (%)				
For-Profit				
HHVBP	76.8	68.5	75.9	71.1
Non-HHVBP	77.2	65.5	78.9	69.0
Non-Profit				
HHVBP	20.4	28.3	21.8	26.4
Non-HHVBP	20.5	31.9	19.6	29.2
Government-Owned				
HHVBP	2.8	3.3	2.3	2.5
Non-HHVBP	2.2	2.6	1.5	1.8
HHA Chain Affiliation (%)				
Chain-Affiliated				
HHVBP	39.3	52.8	46.4	56.0
Non-HHVBP	28.1	37.7	31.4	43.0
No Chain Affiliation				
HHVBP	49.9	39.0	45.6	35.1
Non-HHVBP	65.7	53.6	63.5	49.4
Chain Affiliation Unknown/Missing (%)				
HHVBP	10.8	8.2	8.0	8.9
Non-HHVBP	6.1	8.7	5.1	7.6

When not adjusting for differences in patient case-mix, there were mixed patterns in key measures of utilization when comparing dual eligible beneficiaries to other beneficiaries. In both HHVBP and comparison states, there were higher rates of unplanned ACH among dual eligible beneficiaries than other beneficiaries, both in the baseline period and in the post-HHVBP period. Dual eligible beneficiaries were also more likely to have an outpatient ED visit in both groups of states and in both time periods. (Exhibit 80).

Exhibit 80. Higher Unadjusted Unplanned ACH and Outpatient ED Use among Dual Eligible FFS Beneficiaries in Both HHVBP and Non-HHVBP States, 2013-2020

Measure	Baseline (2013-2015)		Post Period (2016-2020)	
	Duals	Non-Dual FFS	Duals	Non-Dual FFS
Unplanned Acute Care Hospitalization/First HH Episodes (%)				
HHVBP	16.1	15.8	17.4	15.0
Non-HHVBP	16.9	16.0	16.1	15.4
ED Use (No Hospitalization)/First FFS HH Episodes (%)				
HHVBP	13.5	11.5	14.7	11.9

Measure	Baseline (2013-2015)		Post Period (2016-2020)	
	Duals	Non-Dual FFS	Duals	Non-Dual FFS
Non-HHVBP	14.6	11.7	14.3	12.0

For a broader population of home health patients with OASIS data, we examined changes over time in composite measures of both self-care and mobility that were not adjusted for patient case-mix. Medicaid patients were consistently less likely to improve functioning during home health episodes, in HHVBP and non-HHVBP states and in both time periods (Exhibit 81).

Exhibit 81. Smaller Unadjusted Total Normalized Composite Change in Self Care and Mobility among Medicaid Patients Compared to Non-Medicaid Patients in Both HHVBP and Non-HHVBP States, 2013-2020

Measure	Baseline (2013-2015)		Post Period (2016-2020)	
	Medicaid	Non-Medicaid	Medicaid	Non-Medicaid
Total Normalized Composite (TNC) Change in Self-Care				
HHVBP	1.3	1.5	1.7	2.0
Non-HHVBP	1.2	1.4	1.6	1.8
Total Normalized Composite (TNC) Change in Mobility				
HHVBP	0.4	0.5	0.6	0.7
Non-HHVBP	0.4	0.5	0.6	0.7

Multivariate analyses indicated a pattern of worse outcomes for patients with Medicaid before HHVBP was implemented. Medicaid coverage was associated with more frequent outpatient ED visits and with less improvement in self-care and mobility (Exhibit 82). These differences represent disparities in key outcomes for patients with Medicaid prior to implementation of the HHVBP Model, while accounting for demographic, clinical, socioeconomic, and geographic characteristics of beneficiaries, other Center for Medicare & Medicaid Innovation (CMMI) models, and agency characteristics (see Section A.5.1.6 [Page 105] in the Technical Appendix for details). Among FFS beneficiaries, dual eligible patients had lower unplanned ACH (Exhibit 82).

Exhibit 82. Medicaid Coverage Associated with Higher Adjusted Outpatient ED Use and Lower Adjusted Total Normalized Composite Change in Self-Care and Mobility Prior to HHVBP Implementation, 2013-2015

Measure	Subgroup Comparison	Difference Estimate	p-value
Unplanned Acute Care Hospitalization/First FFS HH Episodes** [a]	Dual vs. Non-Dual	-0.19	<0.001
ED Use (No Hospitalization)/First FFS HH Episodes** [a]	Dual vs. Non-Dual	2.02	<0.001
Total Normalized Composite (TNC) Change in Self-Care*	Medicaid vs. Non-Medicaid	-0.10	<0.001
Total Normalized Composite (TNC) Change in Mobility*	Medicaid vs. Non-Medicaid	-0.03	<0.001

*See Section A.5.1.7 (Page 106) in the Technical Appendix for details regarding model specifications. * Results obtained from linear regression with state fixed effects. ** Results obtained from linear regression with state fixed effects and HCC risk score. [a] Difference estimates represent percentage point changes.*

We also conducted sensitivity analyses of the functional improvement measures for the subset of patients covered under Medicare FFS that controlled for their HCC risk score at the start of home health care, since this covariate was not available for all patients with OASIS data (see Exhibit B-73 [Page 195] in the Technical Appendix). The results of these analyses indicated disparities in functional improvement for dual eligible beneficiaries that are similar to those shown in Exhibit 82. As part of our evaluation of the effects of HHVBP, we examine whether the measured disparities for patients with Medicaid coverage during 2013-2015 worsened or improved under the model.

To test whether the impact of HHVBP varied among patient subgroups defined based on dual eligibility or Medicaid status, we conducted difference-in-difference-in-differences (D-in-D-in-D) analyses. These analyses allow for differences in the D-in-D estimates for patient subgroups. In specifying these tests, we supplemented the interactions of treatment group and post-HHVBP indicators in our standard D-in-D models with a third interaction involving the patient subgroup of interest. For details regarding our methods, see Section A.5.1.7 [Page 106] in the Technical Appendix.

The results of our analyses suggest that the improvements occurring under HHVBP through the first five years of the model are largely occurring among patients without Medicaid coverage (Exhibit 83). For example, the D-in-D estimates by subgroup indicate lower unplanned ACH due to HHVBP among beneficiaries who are not dual eligible (-0.46 percentage points, $p<0.01$), while there was no statistically significant impact of HHVBP for dual eligible beneficiaries (-0.11 percentage points, $p=0.54$). A comparison of these D-in-D estimates points to a differential impact of HHVBP on beneficiaries based on whether they were dual eligible, with HHVBP leading to an increase in unplanned hospitalizations for dual eligible beneficiaries relative to those who are not dual eligible (D-in-D-in-D estimate of 0.35 percentage points, $p<0.001$).

There is a similar pattern in the findings for the two composite measures of changes in functioning (Exhibit 83). As with other impact measures that are based on OASIS data, these measures are not limited to Medicare FFS beneficiaries, and also include data for both beneficiaries enrolled in Medicare Advantage as well as patients with Medicaid coverage who are not also covered by Medicare. Based on D-in-D estimates for each patient subgroup, there is evidence of improvements in self-care and in mobility due to HHVBP for patients without Medicaid coverage, but not for patients with Medicaid ($p>0.10$ for both measures). The negative D-in-D-in-D estimates indicate that Medicaid patients are falling behind other patients under HHVBP with regard to their improvements in functioning while receiving home health services ($p<0.01$ for both measures in Exhibit 83). We found similar patterns based on sensitivity analyses of changes in functioning that also controlled for HCC risk score for the subset of patients with Medicare FFS coverage (see Exhibit B-74 [Page 196] in the Technical Appendix for details).

Exhibit 83. No Evidence of Improvements in Utilization or Composite Measures of Change in Functioning due to HHVBP among Home Health Patients with Medicaid Coverage, 2013-2020

Measure	Dual (Medicaid)			Non-Dual (Non-Medicaid)			Dual (Medicaid) minus Non-Dual (Non-Medicaid)		
	D-in-D	p-value	% Relative Change [b]	D-in-D	p-value	% Relative Change [c]	D-in-D-in-D	p-value	% Relative Change [b]
Unplanned Acute Care Hospitalization/First FFS HH Episodes ⇈ [a]	-0.11	0.54	-0.7%	-0.46	<0.01	-2.9%	0.35	<0.001	2.2%
ED Use (No Hospitalization)/First FFS HH Episodes ⇈ [a]	0.46	<0.01	3.4%	0.20	0.20	1.7%	0.26	<0.01	1.9%
Total Normalized Composite (TNC) Change in Self-Care †	0.004	0.85	0.3%	0.05	<0.01	3.4%	-0.05	<0.001	-3.9%
Total Normalized Composite (TNC) Change in Mobility †	0.008	0.21	2.0%	0.02	<0.01	4.2%	-0.01	<0.01	-2.5%

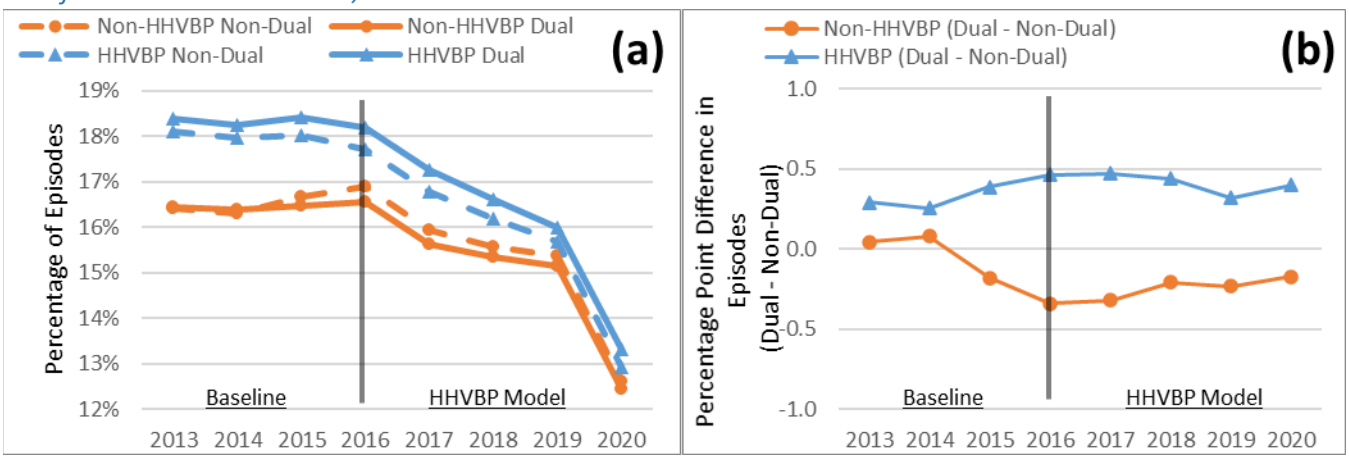
See Section A.5.1.7 (Page 106) in the Technical Appendix for details regarding model specifications. † Results obtained from linear regression with state linear trends. ⇈ Results obtained from linear regression with state linear trends and HCC risk score. [a] D-in-D values represent percentage point changes. [b] Calculated by dividing the model estimate by the baseline mean for dual eligible or Medicaid patients in HHVBP states (shown in Exhibit 80 and Exhibit 81). [c] Calculated by dividing the model estimate by the baseline mean for non-dual eligible or non-Medicaid patients in HHVBP states (shown in Exhibit 80 and Exhibit 81).

To further understand the implications of HHVBP for patients with and without Medicaid coverage, we plotted adjusted measure rates using estimates from the D-in-D-in-D analyses (see Exhibit 84 and Exhibit 85 below). For each measure, we first show trends during 2013-2020 by HHVBP status and dual eligible status (panel a of each Exhibit). We then show trends in the difference in outcomes between patients with and without Medicaid coverage, separately for those in HHVBP states and non-HHVBP states (panel b of each Exhibit). The second panel shows more directly whether there is a pattern of either worsening or improving disparities over time in HHVBP states relative to the comparison states.

Trends in adjusted annual unplanned ACH rates reflect declines during 2016-2020 for both dual eligible beneficiaries and other beneficiaries, in both HHVBP and comparison states (Exhibit 84 panel a). For all four groups, there was a steeper decline during 2019-2020, which may reflect effects of the COVID-19 PHE. The difference in hospitalization by dual eligible status among beneficiaries in HHVBP states remained positive during most of the 2013-2020 period, reflecting higher hospitalizations among dual eligible beneficiaries (Exhibit 84 panel b). In contrast, the difference in the percentage of beneficiaries hospitalized became negative over time in non-HHVBP states, indicating a trend towards lower hospitalizations among dual eligible beneficiaries relative to other beneficiaries. Therefore, the positive D-in-D-in-D estimate for the hospitalization measure in Exhibit 83 does not reflect a worsening disparity

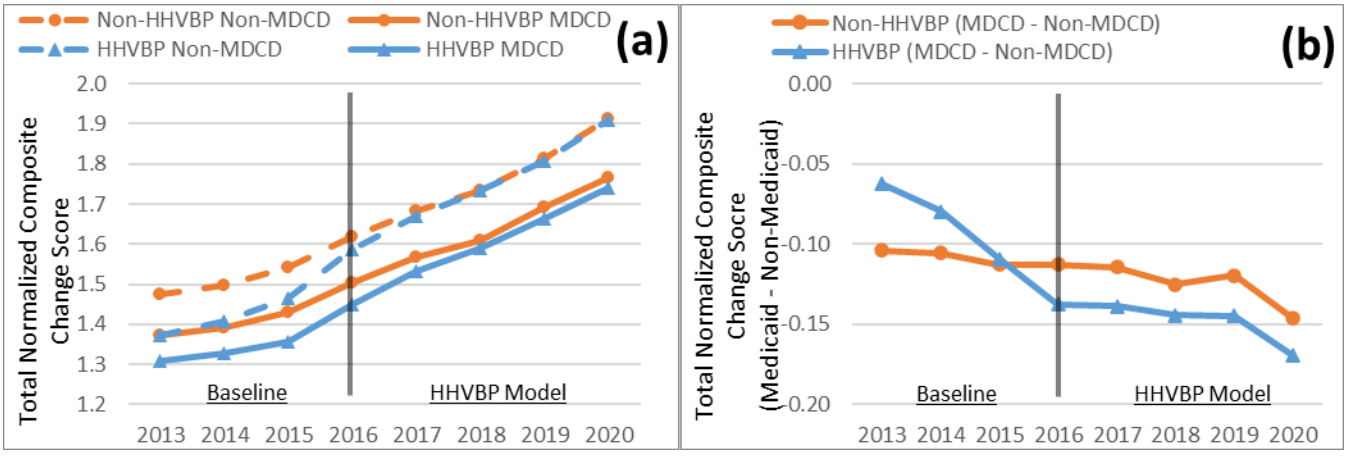
in hospitalization among dual eligible beneficiaries in HHVBP states. Instead, the differential impact of HHVBP reflects a gain occurring among dual eligible beneficiaries relative to other beneficiaries during the post-implementation period in non-HHVBP states that is not also observed in HHVBP states. We find the observed differences by dual eligible status to be relatively stable in 2020, during the emergence of the COVID-19 PHE.

Exhibit 84. (a) Decline in Adjusted Unplanned ACH among Both Dual Eligible and Non-Dual Eligible Beneficiaries and (b) No Evidence of a Growing Disparity in Adjusted Unplanned ACH among Dual Eligible Beneficiaries in HHVBP States, 2013-2020



Unlike trends in unplanned ACH, trends in composite measures of change in functioning indicate widening disparities over time which occurred to a greater degree in HHVBP states. For example, there were larger improvements in self-care over time among patients without Medicaid coverage compared to those with Medicaid coverage (Exhibit 85 panel a). Since a larger gap between these two groups emerged over time in HHVBP states compared with non-HHVBP states (Exhibit 85 panel a), there was a slightly larger widening in the disparity over time in HHVBP states (Exhibit 85 panel b). We do not find evidence of an important disruption in these trends in 2020.

Exhibit 85. (a) Slower Increase in Adjusted TNC Change in Self-Care among Medicaid Patients Compared to Non-Medicaid Patients and (b) Slightly Widening Disparity in Adjusted TNC Change in Self-Care for Medicaid Patients in HHVBP States Relative to Non-HHVBP States, 2013-2020



MDCD=Medicaid

10.4 Impacts Vary by Patient Race and Ethnicity

We used a similar approach to examine whether the impact of HHVBP varies based on the race and Hispanic ethnicity of home health patients.[35] In the baseline period, Hispanic beneficiaries accounted for a slightly higher percentage of home health episodes among FFS beneficiaries in HHVBP states than in the comparison states (9.5 percent and 8.5 percent, respectively), while Black beneficiaries accounted for a lower percentage of home health episodes in HHVBP states than in the comparison states (10.1 percent and 16.5 percent, respectively; Exhibit 86). These percentages declined in the post-HHVBP period in both groups of states. Beneficiaries who were identified as other race continued to account for approximately 1 to 3 percent of episodes in both groups of states, while beneficiaries identified as multi-race continued to account for 0.1 to 0.2 percent of episodes in both groups.

Black and Hispanic beneficiaries receiving home health services have several distinguishing characteristics relative to white non-Hispanic beneficiaries. In both HHVBP and non-HHVBP states, Black beneficiaries tend to be younger, are more than twice as likely to be dually eligible for Medicare and Medicaid and are over four times as likely to have ESRD than white non-Hispanic beneficiaries (Exhibit 86). Hispanic beneficiaries also tend to be younger, are more than three times as likely to have dual eligibility, are more likely to have ESRD, are less likely to reside in rural areas, were less likely to have been recently discharged from an inpatient facility prior to the start of home health care, are more likely to receive care from for-profit agencies, and are less likely to receive care from chain-affiliated agencies (Exhibit 86). These patterns by Black race and Hispanic ethnicity persisted in both the baseline and post-HHVBP periods. We found similar patterns when comparing the characteristics of a broader population of home health patients based on race and ethnicity (for details, see Exhibit B-70 [Page 191] in the Technical Appendix).

[35] For analyses of FFS beneficiaries receiving home health services, race and ethnicity were obtained from the Medicare Beneficiary Summary File. For analyses of all home health patients with OASIS data, race and ethnicity were obtained from OASIS assessments and supplemented with data from the MBSF when OASIS data were missing. For further details see Section A.2.1.1 (Page 47) in the Technical Appendix.

Exhibit 86. Characteristics of FFS Home Health Beneficiaries Differ by Race and Hispanic Ethnicity, 2013-2020

	Baseline (2013-2015)					Post Period (2016-2020)				
	Hispanic	Non-Hispanic				Hispanic	Non-Hispanic			
		Black	Other	Multi-	White		Black	Other	Multi-	White
FFS Episodes (N)										
HHVBP	418,834	446,521	53,912	5,758	3,496,949	468,411	766,925	109,249	8,568	6,349,665
Non-HHVBP	1,312,158	2,539,264	467,531	29,130	11,065,504	1,980,016	3,585,035	915,344	46,776	19,817,660
Average Age (Years)										
HHVBP	75.1	71.0	75.5	74.5	78.0	76.7	71.9	76.2	74.4	78.4
Non-HHVBP	73.5	70.6	77.0	73.3	77.3	74.0	71.3	77.6	74.0	77.4
Female										
HHVBP	64.1%	62.8%	61.5%	63.5%	61.7%	64.4%	60.9%	60.6%	62.0%	60.0%
Non-HHVBP	61.7%	63.7%	62.1%	62.1%	62.7%	60.3%	62.4%	61.3%	61.0%	60.8%
Medicare and Medicaid Dual Eligible										
HHVBP	81.7%	53.5%	50.8%	36.2%	20.9%	72.9%	47.5%	45.1%	35.0%	18.4%
Non-HHVBP	70.6%	57.2%	66.0%	43.6%	23.7%	67.8%	55.6%	62.8%	42.8%	23.2%
Average HCC Score (1st Episode)										
HHVBP	2.3	2.9	2.7	2.8	2.7	2.9	3.3	3.0	3.0	3.0
Non-HHVBP	2.5	2.6	2.4	2.6	2.6	2.8	3.0	2.6	2.9	2.9
ESRD										
HHVBP	3.4%	10.1%	6.4%	4.9%	1.9%	5.7%	11.8%	7.4%	5.3%	2.0%
Non-HHVBP	8.8%	8.1%	5.7%	4.5%	2.0%	10.3%	9.9%	6.3%	4.5%	2.2%
Discharge from Inpatient Facility within 14 Days										
HHVBP	32.6%	65.4%	65.7%	64.9%	64.1%	46.4%	66.8%	65.7%	62.5%	62.9%
Non-HHVBP	50.8%	50.9%	51.0%	57.3%	66.0%	52.5%	54.8%	51.8%	57.8%	64.0%
Rural										
HHVBP	0.2%	4.6%	2.3%	4.9%	5.6%	0.4%	4.9%	2.3%	4.3%	5.4%

	Baseline (2013-2015)					Post Period (2016-2020)				
	Hispanic	Non-Hispanic				Hispanic	Non-Hispanic			
		Black	Other	Multi-	White		Black	Other	Multi-	White
Non-HHVBP	3.2%	7.1%	5.1%	11.7%	10.9%	3.1%	7.4%	4.7%	12.7%	10.4%
HHA Ownership:										
For-Profit										
HHVBP	91.2%	70.9%	64.4%	67.3%	68.7%	86.3%	73.3%	68.0%	67.2%	71.2%
Non-HHVBP	86.5%	81.2%	80.7%	73.4%	64.4%	86.4%	81.2%	82.2%	70.3%	68.7%
Non-Profit										
HHVBP	8.1%	25.5%	31.0%	29.3%	28.0%	12.9%	24.3%	28.5%	30.4%	26.3%
Non-HHVBP	12.5%	17.1%	17.9%	24.4%	32.8%	12.6%	17.5%	16.9%	28.0%	29.4%
Government-Owned										
HHVBP	0.8%	3.6%	4.6%	3.4%	3.3%	0.8%	2.4%	3.5%	2.4%	2.5%
Non-HHVBP	1.0%	1.6%	1.4%	2.2%	2.9%	1.0%	1.4%	0.9%	1.7%	1.9%
HHA Chain Affiliation:										
Chain-Affiliated										
HHVBP	12.5%	50.6%	45.2%	46.9%	52.9%	23.2%	57.0%	50.4%	49.6%	55.4%
Non-HHVBP	14.6%	28.5%	19.1%	31.1%	38.7%	19.2%	36.2%	21.8%	30.6%	42.6%
No Chain Affiliation										
HHVBP	71.2%	39.1%	45.7%	43.2%	39.2%	70.7%	34.0%	40.0%	41.4%	35.7%
Non-HHVBP	81.6%	64.7%	76.9%	61.5%	52.6%	77.4%	57.8%	75.0%	61.9%	50.0%
Chain Affiliation Unknown/Missing										
HHVBP	16.3%	10.3%	9.1%	9.9%	7.9%	6.1%	9.1%	9.5%	9.0%	8.8%
Non-HHVBP	3.8%	6.7%	4.0%	7.4%	8.7%	3.4%	6.0%	3.2%	7.5%	7.4%

To evaluate whether the effects of HHVBP vary based on the race and ethnicity of home health patients, we examined the same set of impact measures used above for analyses of Medicaid patients: unplanned ACH, outpatient ED use, and composite measures of changes in mobility and self-care. Based on unadjusted analyses, Hispanic patients are less likely to have an unplanned ACH and an outpatient ED visit than white non-Hispanic patients, especially in HHVBP states (Exhibit 87). Hispanic patients tend to show somewhat less improvement in self-care and mobility than white non-Hispanic patients. Comparisons involving Black patients reveal different patterns. In both HHVBP and comparison states, frequencies of unplanned ACH and outpatient ED use are higher in the baseline and post-HHVBP periods for Black patients relative to white non-Hispanic patients, while changes in self-care and mobility are relatively similar between the two groups (Exhibit 87). These overall patterns by race and ethnicity persist across the baseline and post-HHVBP periods.

Exhibit 87. Unadjusted Unplanned Acute Care Hospitalization and Outpatient ED Use Highest among Black Non-Hispanic Patients while Unadjusted Total Normalized Composite Change in Self-Care and Mobility Highest among White Non-Hispanic Patients in Both HHVBP States and Non-HHVBP States, 2013-2020

Measure	Baseline (2013-2015)					Post Period (2016-2020)				
	Hispanic	Non-Hispanic				Hispanic	Non-Hispanic			
		Black	Other	Multi-	White		Black	Other	Multi-	White
Unplanned Acute Care Hospitalization/First HH Episodes										
HHVBP	9.6	18.9	16.4	17.2	16.2	13.0	18.4	15.5	15.8	15.3
Non-HHVBP	14.9	16.6	13.8	16.2	16.4	14.9	16.8	13.4	15.1	15.5
ED Use (No Hospitalization)/First FFS HH Episodes										
HHVBP	8.3	14.8	11.5	12.9	12.0	10.4	14.9	11.9	13.7	12.4
Non-HHVBP	12.5	14.1	9.3	13.1	12.4	12.9	14.2	9.4	13.3	12.5
Total Normalized Composite (TNC) Change in Self-Care										
HHVBP	1.4	1.3	1.3	1.3	1.4	1.6	1.8	1.8	1.8	1.9
Non-HHVBP	1.1	1.2	1.2	1.2	1.4	1.5	1.7	1.6	1.7	1.8
Total Normalized Composite (TNC) Change in Mobility										
HHVBP	0.4	0.4	0.4	0.4	0.5	0.6	0.7	0.6	0.6	0.7
Non-HHVBP	0.3	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.6	0.6

We conducted regression analyses to examine whether these differences in outcomes based on race and ethnicity are also observed when adjusting for differences in beneficiary case-mix and other factors (see section A.5.1.6 in the Technical Appendix for details). Results from these analyses indicate that the percentage of first home health episodes with an outpatient ED visit was 0.9 percentage points higher among Black beneficiaries compared with white non-Hispanic beneficiaries during the baseline period (Exhibit 88). Black patients also showed smaller improvements in self-care and mobility based on analysis of composite change in functioning scores. These differences represent disparities for Black beneficiaries prior to implementation of the model while accounting for demographic, clinical, socioeconomic, and geographic characteristics of beneficiaries, other CMMI models, and agency characteristics.

Exhibit 88. Higher Adjusted Outpatient ED Use and Lower Adjusted Total Normalized Composite Change in Self-Care and Mobility among Black versus White Non-Hispanic Beneficiaries Prior to HHVBP Implementation, 2013-2015

Measure	Subgroup Comparison	Difference Estimate	P-value
Unplanned Acute Care Hospitalization/First FFS HH Episodes** [a]	Black vs. White Non-Hispanic	-0.12	0.06
ED Use (No Hospitalization)/First FFS HH Episodes** [a]	Black vs. White Non-Hispanic	0.90	<0.001
Total Normalized Composite (TNC) Change in Self-Care*	Black vs. White Non-Hispanic	-0.03	<0.001
Total Normalized Composite (TNC) Change in Mobility*	Black vs. White Non-Hispanic	-0.01	<0.001

*See Section A.5.1.6 of the Technical Appendix for details regarding model specifications. * Results obtained from linear regression with state fixed effects.** Results obtained from linear regression with state fixed effects and HCC risk score. [a] Difference estimates represent percentage point changes.*

As with the analyses in the previous section that examined the impact of HHVBP on patients with Medicaid, we used D-in-D-in-D analyses to test whether the impact of HHVBP varied based on patient race and ethnicity. Across the four impact measures, D-in-D-in-D models provide evidence of more favorable impacts of the model for Black patients compared to white non-Hispanic patients. In particular, we find that the reductions in unplanned ACH and increases in composite self-care and mobility change scores due to HHVBP were larger for Black non-Hispanic patients than for white non-Hispanic patients (Exhibit 89). In contrast, we find no difference by race in the impact of HHVBP on outpatient ED use.

Exhibit 89. HHVBP Associated with Larger Improvements in Outcomes for Black versus White Non-Hispanic Beneficiaries 2013-2020

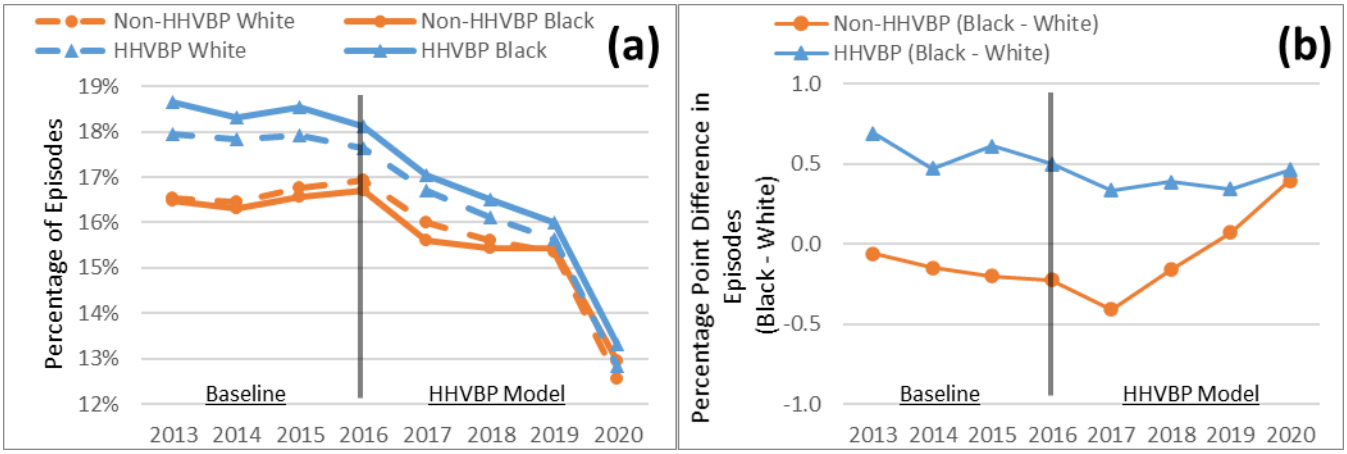
Measure	Black Non-Hispanic			White Non-Hispanic			Black Non-Hispanic – White Non-Hispanic		
	D-in-D	P-value	% Relative Change [b]	D-in-D	P-value	% Relative Change [c]	D-in-D-in-D	P-value	% Relative Change [b]
Unplanned Acute Care Hospitalization/First FFS HH Episodes ††[a]	-0.62	<0.01	-3.3%	-0.39	0.02	-2.4%	-0.23	0.10	-1.2%
ED Use (No Hospitalization)/First FFS HH Episodes ††[a]	0.27	0.17	1.8%	0.29	0.06	2.4%	-0.02	0.89	-0.1%
Total Normalized Composite (TNC) Change in Self-Care†	0.07	<0.001	5.2%	0.04	0.01	2.8%	0.02	0.03	1.5%
Total Normalized Composite	0.03	<0.001	6.9%	0.02	0.01	4.3%	0.01	<0.01	2.3%

Measure	Black Non-Hispanic			White Non-Hispanic			Black Non-Hispanic – White Non-Hispanic		
	D-in-D	P-value	% Relative Change [b]	D-in-D	P-value	% Relative Change [c]	D-in-D-in-D	P-value	% Relative Change [b]
(TNC) Change in Mobility ↿									

See Section A.5.1.7 of the Technical Appendix for details regarding model specifications. ↿ *Results obtained from linear regression with state linear trends.* ↾ *Results obtained from linear regression with state linear trends and HCC risk score.* [a] *D-in-D values represent percentage point changes.* [b] *Calculated by dividing the model estimate by the baseline mean for Black Non-Hispanic patients in HHVBP states (shown in Exhibit 87).* [c] *Calculated by dividing the model estimate by the baseline mean for white Non-Hispanic patients in HHVBP states (shown in Exhibit 87).*

The implications of the HHVBP Model for patients in specific race and ethnicity groups is illustrated using plots of adjusted measure rates. As with the trends seen by dual eligible status in the previous section, the frequency of unplanned ACH declined during 2016-2020, for both Black and white non-Hispanic beneficiaries in both HHVBP and comparison states (Exhibit 90 panel a). In HHVBP states, hospitalization rates remained higher for Black compared to white non-Hispanic beneficiaries and declined at similar rates during the post-HHVBP period. In the comparison states, there was a slightly steeper decline in hospitalization rates among white compared to Black non-Hispanic beneficiaries during the post-HHVBP period. The result is a relatively stable racial disparity in hospitalization rates in HHVBP states of approximately 0.5 percentage points and a trend towards an emerging racial disparity in non-HHVBP states (Exhibit 90 panel b). Hence, the more favorable impact of HHVBP on hospitalization rates among Black compared to white non-Hispanic beneficiaries based on the D-in-D-in-D model above reflects the fact that while there have been somewhat smaller declines in hospitalization among Black compared to white non-Hispanic beneficiaries in non-HHVBP states since the implementation of HHVBP, there have been relatively similar declines for beneficiaries in the two race groups in HHVBP states.

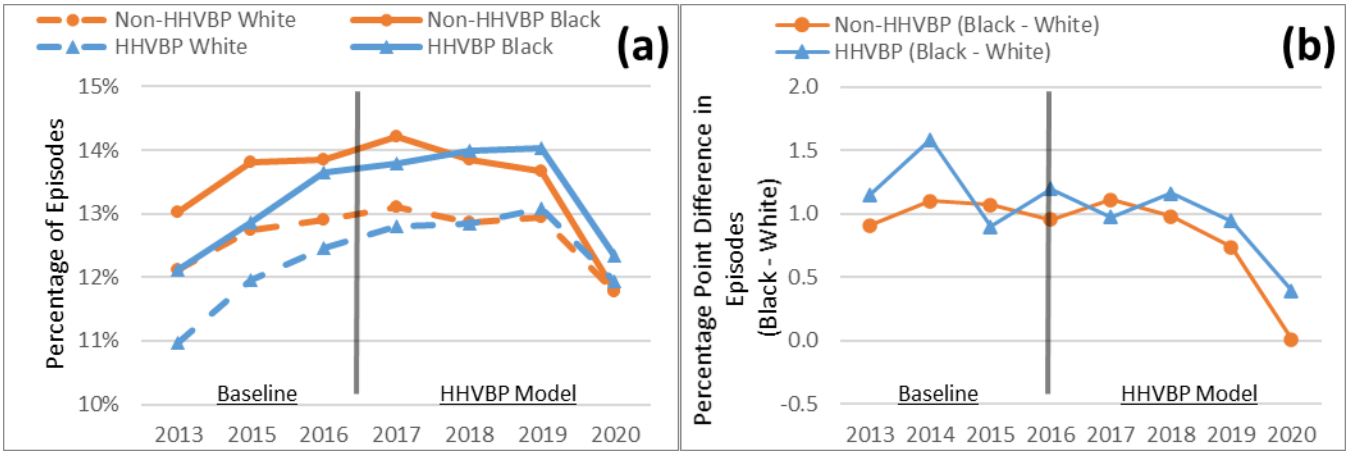
Exhibit 90. (a) Decline in Adjusted Unplanned ACH among Both Black and White Non-Hispanic Beneficiaries and (b) No Evidence of a Growing Disparity in Adjusted Unplanned ACH among Black Non-Hispanic Beneficiaries in HHVBP States), 2013-2020



Trends in outpatient ED use are similar for beneficiaries in both race groups for much of the observation period, for both HHVBP and comparison states (Exhibit 91). Following initial increases in ED use (which

are somewhat larger in HHVBP states) for both race groups, ED use then stabilizes and subsequently declines for all four groups in 2020. The result is a racial disparity in ED use of approximately one percentage point that remains relatively stable in both groups of states until 2020, when there is a narrowing of the disparity due to steeper declines in ED use among Black compared to white non-Hispanic beneficiaries in 2020. Together with the results of the D-in-D-in-D model, we conclude that HHVBP has had no impact on racial disparities in ED use.

Exhibit 91.(a) Increasing Adjusted ED Use (No Hospitalization) followed by a Recent Decline among both Black and White Non-Hispanic Beneficiaries and (b) Relatively Similar Racial Disparities in Adjusted ED Use in HHVBP and Non-HHVBP States, 2013-2020



We used similar analytic approaches to assess the implications of the HHVBP Model for Hispanic beneficiaries. When using multivariate regression to compare outcomes during the baseline period, we find lower rates of both unplanned ACH and ED use for Hispanic beneficiaries compared to white non-Hispanic beneficiaries (Exhibit 92). The percentage of home health episodes with a hospitalization was 0.83 percentage points lower for Hispanic beneficiaries, while the percentage of home health episodes with an outpatient ED visit was 0.65 percentage points lower for Hispanic beneficiaries. A comparison of composite change in functioning scores did not reveal consistent differences between Hispanic and white non-Hispanic patients, with lower change scores for self-care among Hispanic patients and no difference between the two groups in change scores for mobility (Exhibit 92).

Exhibit 92. Lower Adjusted Unplanned Hospitalizations and Outpatient ED Use and Lower Adjusted Total Normalized Composite Changes in Self-Care among Hispanic versus White Non-Hispanic Patients Prior to HHVBP Implementation, 2013-2015

Measure	Subgroup Comparison	Difference Estimate	P-value
Unplanned Acute Care Hospitalization/First FFS HH Episodes** [a]	Hispanic vs. White Non-Hispanic	-0.83	<0.001
ED Use (No Hospitalization)/First FFS HH Episodes** [a]	Hispanic vs. White Non-Hispanic	-0.65	<0.001
Total Normalized Composite (TNC) Change in Self-Care*	Hispanic vs. White Non-Hispanic	-0.02	0.02
Total Normalized Composite (TNC) Change in Mobility*	Hispanic vs. White Non-Hispanic	-0.003	0.34

See Section A.5.1.6 of the Technical Appendix for details regarding model specifications. Results obtained from linear regression with state fixed effects. ** Results obtained from linear regression with state fixed effects and HCC risk score. [a] Difference estimates represent percentage point changes.*

When using D-in-D-in-D models to examine impacts of HHVBP, we find a pattern of differential impacts of the model based on Hispanic ethnicity that reflects unfavorable impacts of HHVBP among Hispanic patients. Unlike the 0.39 percentage point reduction in hospitalizations due to HHVBP observed among white non-Hispanic beneficiaries, we find HHVBP to be associated with a 0.68 percentage point *increase* in hospitalizations for Hispanic beneficiaries (Exhibit 93). Similarly, unlike the positive impact of HHVBP on composite change scores for both self-care and mobility that is observed among white non-Hispanic patients, we find HHVBP to be associated with a reduction in composite change scores for Hispanic patients.

Exhibit 93. HHVBP Not Associated with Improvements in Outcomes for Hispanic Patients, 2013-2020

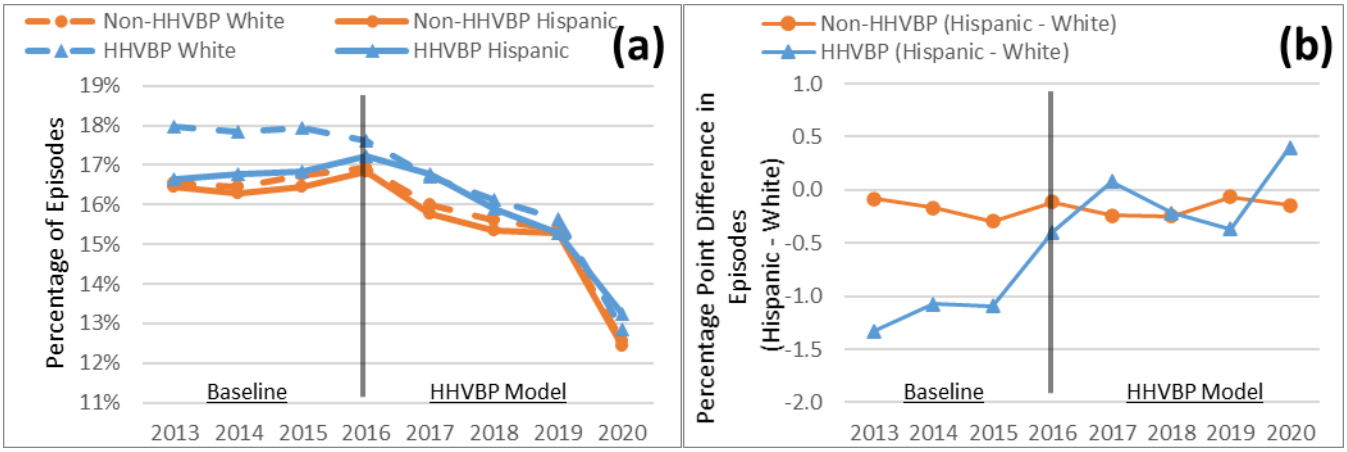
Measure	Hispanic			White Non-Hispanic			Hispanic – White Non-Hispanic		
	D-in-D	p-value	% Relative Change [b]	D-in-D	p-value	% Relative Change [c]	D-in-D-in-D	p-value	% Relative Change [b]
Unplanned Acute Care Hospitalization/First FFS HH Episodes ††[a]	0.68	<0.01	7.1%	-0.39	0.02	-2.4%	1.07	<0.001	11.1%
ED Use (No Hospitalization)/First FFS HH Episodes ††[a]	0.30	0.17	3.6%	0.29	0.06	2.4%	0.01	0.96	0.1%
Total Normalized Composite (TNC) Change in Self-Care [†]	-0.12	<0.001	-8.6%	0.04	0.01	2.8%	-0.16	<0.001	-11.4%
Total Normalized Composite (TNC) Change in Mobility [†]	-0.03	<0.01	-7.0%	0.02	0.01	4.3%	-0.04	<0.001	-9.4%

See Section A.5.1.7 in the Technical Appendix for details regarding model specifications. [†] Results obtained from linear regression with state linear trends.†† Results obtained from linear regression with state linear trends and HCC risk score. [a] D-in-D values represent percentage point changes. [b] Calculated by dividing the model estimate by the baseline mean for Hispanic patients in HHVBP states (shown in Exhibit 80 and Exhibit 81).[c] Calculated by dividing the model estimate by the baseline mean for white Non-Hispanic patients in HHVBP states (shown in Exhibit 80 and Exhibit 81).

Plots of adjusted measure rates show that the unfavorable impact of HHVBP on hospitalizations for Hispanic beneficiaries appears to result specifically from changes between 2015 and 2016, the first year of the model. In non-HHVBP states, trends in hospitalization are similar for Hispanic and white non-Hispanic beneficiaries during 2013-2020 (Exhibit 94 panel a). In contrast, there is a convergence in hospitalization rates between the two groups in HHVBP states that primarily occurs between 2015 and 2016, with hospitalization rates among Hispanic beneficiaries rising towards rates observed among white non-Hispanic beneficiaries. Starting in 2016, the difference in hospitalization rates between the

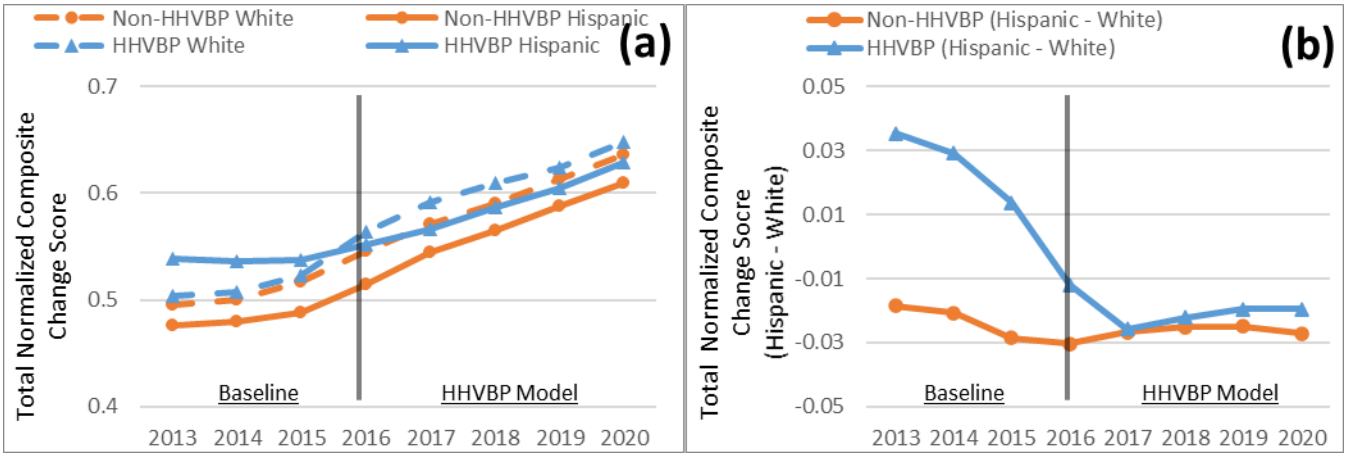
two groups in HHVBP states is smaller (within 0.5 percentage points), and is generally similar to the difference observed in non-HHVBP states (Exhibit 94 panel b). The unfavorable impact of HHVBP on hospitalizations for Hispanic beneficiaries therefore corresponds to a lessening of the initial advantage for Hispanic beneficiaries compared to white non-Hispanic beneficiaries in HHVBP states.

Exhibit 94. (a) Decline in Adjusted Unplanned ACH among Both Hispanic and White Non-Hispanic Beneficiaries and (b) Narrowing of the Difference in Adjusted Unplanned ACH by Hispanic Ethnicity in HHVBP States, 2013-2020



Comparisons of trends in composite change scores for mobility reveal patterns among Hispanic and white non-Hispanic patients that are similar to those observed above for hospitalization. In non-HHVBP states, there are relatively similar upward trends for both groups during 2013-2020 (Exhibit 95 panel a). In HHVBP states, however, there is a smaller increase for Hispanic patients than for white non-Hispanic patients, such that the initial advantage for Hispanic patients during the baseline period becomes a disparity in the post-HHVBP period (Exhibit 95 panel b). As with hospitalizations, there is a notable shift in the difference between Hispanic and white non-Hispanic patients in HHVBP states during 2015-2016, and thereafter the difference between the two groups is relatively similar in HHVBP and non-HHVBP states.

Exhibit 95. (a) Smaller Increase in Adjusted Total Normalized Composite (TNC) Change in Mobility among Hispanic versus White Non-Hispanic Patients in HHVBP States and (b) Emerging Disparity in Adjusted TNC Change in Mobility for Hispanic Patients in HHVBP States, 2013-2020



10.5 Discussion

While VBP programs are designed to promote quality of care generally, they may not necessarily achieve this goal equally for all populations. A potential unintended consequence of VBP programs is that they may not be as successful in encouraging improvements in quality of care for populations who were already predisposed to having worse outcomes, and consequently lead to wider gaps in quality of care. We note that this risk is not unique to the home health care setting; rather, it is common to programs that use provider financial incentives to promote quality of care. Alternatively, greater gains among populations for whom there is the most need for improvement could in theory result in a narrowing of gaps in quality of care. As a result, VBP programs could have either positive or negative implications for health equity among Medicare beneficiaries. In this section, we examined whether the impact of HHVBP on several key outcomes for home health patients has differed for historically underserved groups, including both patients with Medicaid coverage and certain racial and ethnic minorities.

Our analyses through the fifth year of the HHVBP Model do not yield consistent findings regarding the potential implications of HHVBP for health equity. For some measures where there was a favorable overall impact of HHVBP, we also found favorable impacts across patient subgroups. For example, HHVBP was associated with a reduction in hospitalizations for both Black and white non-Hispanic beneficiaries. However, HHVBP was not associated with a decline in hospitalization among dual eligible beneficiaries and was associated with an increase in hospitalization among Hispanic beneficiaries.

One possible explanation for our findings by Medicaid status is that there may be greater challenges with quality improvement among patients covered by Medicaid. Home health patients with Medicaid coverage had somewhat worse outcomes across a range of key outcomes before model implementation, and then lagged slightly further behind other patients in those same outcomes under the model. We found evidence that home health patients with Medicaid have higher levels of acuity, and they may face greater barriers in access to care across care settings. Such factors may pose additional challenges for agencies seeking to improve outcomes for this population, whether in response to HHVBP, public reporting of quality measures, or other quality initiatives.

We did not find a consistent pattern of racial and ethnic disparities in home health patient outcomes prior to model implementation. We also found that the model had different implications for different racial and ethnic minority groups, with a pattern of more favorable impacts of the model for Black compared to white non-Hispanic patients and less favorable impacts for Hispanic relative to white non-Hispanic patients. The unfavorable impacts for Hispanic patients appear to be strongly influenced by changes occurring in the first year of the model (2016). Over the more recent years of the model, any differences in outcomes by Hispanic ethnicity appear to be relatively stable and similar in HHVBP and non-HHVBP states, which does not suggest an ongoing differential impact of the model based on Hispanic ethnicity. Our findings for Hispanic patients may also be driven by impacts in specific states such as Florida, which is by far the largest HHVBP state and includes a disproportionately large percentage of the Hispanic patients in HHVBP states. We will explore this possibility as part of our future work.

Our findings highlight a potential need to target quality improvements among patients with Medicaid coverage in particular. Further research is needed to understand the drivers of their worse outcomes. As agencies in HHVBP Model states continue to gain experience responding to VBP incentives and other

quality initiatives and as the model is expanded to other states, there is potential for disparities involving Medicaid patients to either worsen or improve in the future. It will be important to continue to consider the implications of HHVBP for health equity as the use of VBP in the home health care setting continues to evolve.

11. Future Activities

This Annual Report presents findings of our evaluation for the first five years of the original HHVBP Model. Moving forward, we will continue to address the goals and research questions identified for this evaluation (see Section 1) and explore both intended and unintended effects through 2021, the year that agencies in the nine original HHVBP states received their final payment adjustment. In doing so, our future evaluation activities will build on our findings from these first five years. Below, we conclude with an overview of some of the further analyses and data collection activities that are being considered and represent priorities for further evaluation of the impact of HHVBP.

Evaluate the effects of applying larger payment adjustments. In this report, we conducted analyses of the impact of the HHVBP Model on measures of quality of care, utilization, and Medicare spending through the first three years of quality incentive payments to home health agencies. We will continue to assess whether the observed effects of HHVBP intensify in response to the application of a wider range of payment adjustments of up to ±7 percent in 2021. We will also ascertain whether the shift in incentives towards the claims-based quality measures through adjustments to the measure weights that began in 2019 and the accumulating experience of agencies with recent changes to the model may lead to a growing impact on claims-based outcomes for Medicare FFS beneficiaries, notably forms of utilization and Medicare spending.

Continue to explore potential implications of HHVBP for the utilization of home health services and beneficiary access to home health care. While there is no strong evidence to date of an overall impact of HHVBP on the utilization of home health services or of an adverse impact on access to home health care among Medicare FFS beneficiaries, the potential for such impacts has grown as the financial incentives under the model have become stronger over time. Given the extent of the geographic variation we have observed in measures of home health utilization and other potential indicators of access to home health care, it will be important to continue to consider whether HHVBP has unintended consequences for beneficiary access to care in certain geographic areas. In addition, access could be impaired for certain types of beneficiaries, such as those who are least likely to achieve improvements in functioning. As there is a wider range of potential payment adjustments under the model in 2021 and as agencies may have pre-emptively prepared for the national expansion of HHVBP, we will continue to assess whether HHVBP affects beneficiary access to care not only overall but also for subgroups of beneficiaries at greater risk of potential access issues.

Further examine changes in agency frontloading practices. We provide evidence in this report that HHVBP led to a shift in more of skilled nursing and therapy visits occurring during the first week of home health care, and our subgroup analysis suggests that frontloading was associated with greater reductions in the risk of unplanned hospitalizations for post-acute home health patients who had greater clinical risk. Change in such frontloading practices represents one possible mechanism for the improvements in outcomes observed under HHVBP. In future reports, we will explore potential longer-term impacts of frontloading for home health patients, including analysis of impacts on claims-based utilization and spending measures observed beyond the first home health episodes examined in this report. Also, our analyses to date have focused on frontloaded visits involving more visits during the first week relative to the second week, but it remains an open question if alternative distributions of visits during early weeks of an episode may produce greater impacts. We will examine whether having

alternative greater shares (e.g., 60 percent or more) of visits during the first week of episodes relative to later weeks may produce larger effects on outcomes.

Continue to explore the potential implications of HHVBP for health equity. If the gains in quality under HHVBP are not shared equally among subgroups of beneficiaries, the model could have important implications for health equity. In particular, a potential unintended consequence is that there are risks to both access to care and quality of care for populations for whom higher quality performance levels under the model may be more difficult to achieve. In this report, we find evidence of differential impacts of the HHVBP Model among home health patients based on both Medicaid coverage and race and ethnicity. This includes more favorable impacts of the model for Black non-Hispanic patients and less favorable impacts for Medicaid patients and Hispanic patients. The potential for such heterogeneity in the impacts of the model will be important to continue to consider, especially as the HHVBP is expanded nationally. In future work, we will continue to examine potential impacts of the model on home health utilization and quality of care with an emphasis on historically underserved subgroups of beneficiaries for whom either there is past evidence of disparities or there may be greater risks of emerging disparities. We will also explore the potential sources of the differential impacts observed based on Medicaid coverage and race/ethnicity, such as whether they may by driven by specific state-level impacts (e.g., in Florida) or may reflect variation in the response of agencies to the model based on their patient mix.

Examine potential effects of HHVBP on other publicly reported home health measures. CMS designed the original HHVBP measure set to be closely aligned with measures that were already included in CMS' HH Quality Reporting Program (QRP), and most of the HHVBP measures are also publicly reported (Exhibit 2). We will incorporate new measures into our evaluation with a goal of fully understanding the effects of the HHVBP Model within the broader context of the delivery of home health care and other relevant policy or programmatic changes. For example, we will explore analyses of CMS' publicly reported measures of spending (Medicare Spending Per Beneficiary-Post-Acute Care (MSPB-PAC) Home Health) and utilization (Potentially Preventable 30-Day Post-Discharge Readmission) as well as expanding our descriptive analyses of the claims-based discharge to community measure (see Section 8). We will also explore analyses of the OASIS-based measure for new and worsened pressured ulcers that was also introduced since the original HHVBP Model and represents an aspect of quality not directly incentivized by HHVBP. Additionally, we will explore the feasibility of examining the claims-based measure for potentially preventable hospitalizations that CMS plans to use in the expanded HHVBP Model in place of the two claims-based measures used in the original model (HHS, 2021).

Expand primary data collection activities to further explore experience of agencies under HHVBP. Building on previous primary data collection activities, we plan to field a survey to agencies in the nine HHVBP Model states as well as the 41 non-intervention states to gain quantifiable information about key structural and operational characteristics of agencies in both groups of states. We will use this survey to provide an update to the survey we fielded to agencies in 2018 and strengthen our understanding of how agency operations have been impacted and evolved over the course of the original HHVBP Model.

Continue exploring possible spillover effects of HHVBP into non-HHVBP states. In this year's report, we began to address the question of whether performance is similar among chain-affiliated HHAs in HHVBP and non-HHVBP states in our case study of the LHC Group. Our initial findings of comparable patterns in performance among LHC Group chain-affiliated HHAs in both HHVBP states and non-HHVBP states

supports our previous findings from surveys and interviews that suggested home health chain organizations do not vary their approach to quality improvement by an agency's location. To further examine whether these patterns are indicative of spillover, we plan to examine data prior to and following implementation of the HHVBP Model to observe whether performance on HHVBP measures shifted differentially for LHC Group agencies and non-chain affiliated agencies after the HHVBP Model was implemented. We will also consider the feasibility of assembling multiple years of data for other large home health chain organizations to expand our analyses to multiple chain entities to investigate whether the patterns are consistent across different chain organizations. As the presence of spillover would mute the observed differences between intervention and comparison states, we also will explore the implications of spillover for measuring the impact of HHVBP as well as the effect on the observed impact of the model being expanded nationwide in January 2023.

Continue to examine impacts on the use of potential substitutes for home health care. Given a degree of discretion over whether and how home health care is provided as well as the availability of alternative forms of care that may be considered as substitutes for some beneficiaries (e.g., SNF or outpatient therapy services), there is potential for home health utilization patterns to change in response to the increasing payment incentives under the model. In this report, we found that HHVBP led to modest increases in admissions to home health care during the most recent three years of the model for patients transitioning from acute inpatient settings within the past 14 days. We will continue to examine whether this impact persists into the final year of the original HHVBP Model when the quality incentive increases to ±7 percent.

Evaluate whether recent changes to the HH PPS modify the impacts of HHVBP. Recent changes in the HH PPS may have implications for how agencies respond to the HHVBP Model. The implementation of the Home Health PDGM in January 2020 shifted episode length from 60-days to 30-days for all FFS episodes. This shorter episode length may affect agency incentives regarding the timing of visits during episodes, including the use of frontloading visits which may have contributed to the observed gains under HHVBP. In addition, the PDGM also eliminates the use of counts of therapy services in determining case-mix adjusted payments, which may lead to fewer therapist visits per episode and may have financial implications for agency quality improvement activities. A potentially relevant finding for 2020 is that unlike in prior years of the model, we noted a decline in Medicare spending for home health services in HHVBP states compared to non-HHVBP states that was primarily driven by patterns in two HHVBP states: Arizona and Florida. While PDGM was implemented nationally at the start of 2020, there may be variation across states in the impact of PDGM. As data for 2021 become available, we will assess whether there is evidence of sustained changes in agency practices in Arizona and Florida following the introduction of PDGM that help to explain the observed changes in home health spending in these states relative to their regional comparison groups.

12. References

Arbor Research Collaborative for Health and L&M Policy Research. (2018) First HHVBP Annual Report. The Centers for Medicare & Medicaid Services, Center for Medicare & Medicaid Innovation. Accessed from: https://innovation.cms.gov/initiatives/home-health-value-based-purchasing-model.

Arbor Research Collaborative for Health and L&M Policy Research. (2019) Second HHVBP Annual Report. The Centers for Medicare & Medicaid Services, Center for Medicare & Medicaid Innovation. Accessed from: https://innovation.cms.gov/initiatives/home-health-value-based-purchasing-model.

Arbor Research Collaborative for Health and L&M Policy Research. (2020) Third HHVBP Annual Report. The Centers for Medicare & Medicaid Services, Center for Medicare & Medicaid Innovation. Accessed from: https://innovation.cms.gov/data-and-reports/2020/hhvbp-thirdann-rpt.

Arbor Research Collaborative for Health and L&M Policy Research. (2021) Fourth HHVBP Annual Report. The Centers for Medicare & Medicaid Services, Center for Medicare & Medicaid Innovation. Accessed from: https://innovation.cms.gov/data-and-reports/2021/hhvbp-fourthann-rpt.

CMS (Centers for Medicare and Medicaid Services). (2012) Medicare Benefit Policy Manual. Accessed from: https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/bp102c07.pdf.

CMS (Centers for Medicare and Medicaid Services). (2016) Home Health Value-Based Purchasing Model. Accessed from: https://innovation.cms.gov/initiatives/home-health-value-based-purchasing-model.

CMS (Centers for Medicare and Medicaid Services). (2018a) Home Health Star Ratings. Accessed from: https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HomeHealthQualityInits/HHQIHomeHealthStarRatings.

CMS (Centers for Medicare and Medicaid Services). (2018b) Modifications to the Quality of Patient Care Star Rating Algorithm for Home Health Agencies. Medicare Learning Network. Accessed from: https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HomeHealthQualityInits/Downloads/MLN-QoPC-Star-Rating_508_20180924.pdf.

CMS (Centers for Medicare and Medicaid Services). (2020a) Home Health Quality Reporting Program (HH QRP): COVID-19 Public Health Emergency (PHE) Tip Sheet. Accessed from: https://www.cms.gov/files/document/hhqrp-covid19phetipsheet-july2020v2.pdf.

CMS (Centers for Medicare and Medicaid Services). (2020b) COVID-19 Guidance for VBP Programs: Quality Reporting Requirements - Exceptions and Extensions. Accessed from: https://www.cms.gov/files/document/guidance-memo-exceptions-and-extensions-quality-reporting-and-value-based-purchasing-programs.pdf.

CMS (Centers for Medicare and Medicaid Services). (2021) Comprehensive Care for Joint Replacement Model. Accessed from: https://innovation.cms.gov/innovation-models/cjr.

CMS (Centers for Medicare and Medicaid Services). (2021) Provider Enrollment Moratoria. 2021, Accessed from: https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/Provider-Enrollment-Moratoria.

Damberg C, Elliott M, Ewing B. (2015) Pay-for-Performance Schemes that Use Patient and Provider Categories Would Reduce Payment Disparities. *Health Affairs* 34(1): 134-142.

Gilman M, Adams EK, Hockenberry JM, Milstein AS, Wilson IB, Becker ER. (2015) Safety-Net Hospitals More Likely Than Other Hospitals to Fare Poorly under Medicare's Value-Based Purchasing. *Health Aff (Millwood)* 34(3): 398-405.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2015a) Medicare and Medicaid Programs; CY 2016 Home Health Prospective Payment System Rate Update; Home Health Value-Based Purchasing Model; and Home Health Quality Reporting Requirements. Final Rule. *Federal Register* 80 FR 68623. 42 CFR 409, 424, 484: 68623-68719. Accessed from: https://www.federalregister.gov/documents/2015/11/05/2015-27931/medicare-and-medicaid-programs-cy-2016-home-health-prospective-payment-system-rate-update-home.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2015b) Medicare and Medicaid Programs; CY 2016 Home Health Prospective Payment System Rate Update; Home Health Value-Based Purchasing Model; and Home Health Quality Reporting Requirements. Proposed Rule. *Federal Register* 80 FR 39839. 42 CFR 409, 424, 484: 39839-39914. Accessed from: https://www.federalregister.gov/documents/2015/07/10/2015-16790/medicare-and-medicaid-programs-cy-2016-home-health-prospective-payment-system-rate-update-home.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2016) Medicare and Medicaid Programs; CY 2017 Home Health Prospective Payment System Rate Update; Home Health Value-Based Purchasing Model; and Home Health Quality Reporting Requirements. Final Rule. *Federal Register* 81 FR 76702. 42 CFR 409, 484: 76702-76797. Accessed from: https://www.federalregister.gov/documents/2016/11/03/2016-26290/medicare-and-medicaid-programs-cy-2017-home-health-prospective-payment-system-rate-update-home.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2017) Medicare and Medicaid Programs; CY 2018 Home Health Prospective Payment System Rate Update and CY 2019 Case-Mix Adjustment Methodology Refinements; Home Health Value-Based Purchasing Model; and Home Health Quality Reporting Requirements. Final Rule. *Federal Register* 82 FR 51676. 42 CFR 484: 51676-51752. Accessed from: https://www.federalregister.gov/documents/2017/11/07/2017-23935/medicare-and-medicaid-programs-cy-2018-home-health-prospective-payment-system-rate-update-and-cy.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2018) Medicare and Medicaid Programs: CY 2019 Home Health Prospective Payment System Rate Update and CY 2020 Case-Mix Adjustment Methodology Refinements; etc. Proposed Rule. *Federal Register*: 600. Accessed from: https://www.federalregister.gov/documents/2018/07/12/2018-14443/medicare-and-medicaid-programs-cy-2019-home-health-prospective-payment-system-rate-update-and-cy.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2018) Medicare and Medicaid Programs; CY 2019 Home Health Prospective Payment System Rate Update and CY 2020 Case-Mix Adjustment Methodology Refinements; Home Health Value-Based Purchasing Model; Home Health Quality Reporting Requirements; Home Infusion Therapy Requirements; and Training Requirements for Surveyors of National Accrediting Organizations. Final Rule. *Federal Register* 83 FR 56406. 42 CFR 409, 424, 484, 486, & 488: 56406-56638. Accessed from: https://www.federalregister.gov/documents/2018/11/13/2018-24145/medicare-and-medicaid-programs-cy-2019-home-health-prospective-payment-system-rate-update-and-cy.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2019) Medicare and Medicaid Programs; CY 2020 Home Health Prospective Payment System Rate Update; Home Health Value-Based Purchasing Model; Home Health Quality Reporting Requirements; and Home Infusion Therapy Requirements. Final Rule. *Federal Register* 84 FR 60478. 42 CFR 409, 414, 484, and 486: 60478-60646. Accessed from:

https://www.federalregister.gov/documents/2019/11/08/2019-24026/medicare-and-medicaid-programs-cy-2020-home-health-prospective-payment-system-rate-update-home.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2020) Medicare and Medicaid Programs, Basic Health Program, and Exchanges; Additional Policy and Regulatory Revisions in Response to the COVID-19 Public Health Emergency and Delay of Certain Reporting Requirements for the Skilled Nursing Facility Quality Reporting Program. Final Rule. *Federal Register* 85 FR 27550. 42 CFR 409, 42 CFR 410, 42 CFR 412, 42 CFR 413, 42 CFR 414, 42 CFR 415, 42 CFR 424, 42 CFR 425, 42 CFR 440, 42 CFR 483, 42 CFR 484, 42 CFR 600, and 45 CFR 156: 27550-27629. Accessed from: https://www.federalregister.gov/documents/2020/05/08/2020-09608/medicare-and-medicaid-programs-basic-health-program-and-exchanges-additional-policy-and-regulatory.

HHS (US Department of Health and Human Services), CMS (Centers for Medicare and Medicaid Services). (2021) Medicare and Medicaid Programs; CY 2022 Home Health Prospective Payment System Rate Update; Home Health Value-Based Purchasing Model Requirements and Model Expansion; Home Health and Other Quality Reporting Program Requirements; Home Infusion Therapy Services Requirements; Survey and Enforcement Requirements for Hospice Programs; Medicare Provider Enrollment Requirements; and COVID-19 Reporting Requirements for Long-Term Care Facilities. Final Rule. *Federal Register* 86 FR 62240. 42 CFR 409, 424, 483, 484, 488, 489, and 498:: 62240-62431. Accessed from: https://www.federalregister.gov/documents/2021/11/09/2021-23993/medicare-and-medicaid-programs-cy-2022-home-health-prospective-payment-system-rate-update-home.

Jones CD, Bowles KH, Richard A, Boxer RS, Masoudi FA. (2017) High-Value Home Health Care for Patients With Heart Failure: An Opportunity to Optimize Transitions From Hospital to Home. *Circ Cardiovasc Qual Outcomes* 10(5).

Joynt K, Jha A. (2013) Characteristics of Hospitals Receiving Penalties Under the Hospital Readmissions Reduction Program. *Journal of the American Medical Association* 309(4): 342-343.

Louisiana Health Care (LHC) Group Lafayette. (2021) LHC Group. Retrieved November 10, 2021, Accessed from: https://lhcgroup.com/about/our-story/.

McWilliams JM, Gilstrap LG, Stevenson DG, Chernew ME, Huskamp HA, Grabowski DC. (2017) Changes in Postacute Care in the Medicare Shared Savings Program. *JAMA Intern Med* 177(4): 518-526.

MedPAC (Medicare Payment Advisory Commission). (2020) Home Health Care Services. Accessed from: https://www.medpac.gov/wp-content/uploads/2021/10/mar21_medpac_report_ch8_sec.pdf.

Qi AC, Luke AA, Crecelius C, Joynt Maddox KE. (2020) Performance and Penalties in Year 1 of the Skilled Nursing Facility Value-Based Purchasing Program. *J Am Geriatr Soc* 68(4): 826-834.

RTI (RTI International). (2019) Evaluation of theMaryland All-Payer Model. Volume I: Final Report. Centers for Medicare & Medicaid Services; Center for Medicare and Medicaid Innovation. Accessed from: https://downloads.cms.gov/files/md-allpayer-finalevalrpt.pdf.

Ryan AM. (2013) Will Value-Based Purchasing Increase Disparities in Care? *New England Journal of Medicine* 369(26): 2472-2474.

Topaz M, Trifilio M, Maloney D, Bar-Bachar O, Bowles KH. (2018) Improving Patient Prioritization during Hospital-Homecare Transition: A Pilot Study of a Clinical Decision Support Tool. *Res Nurs Health* 41(5): 440-447.

Wasserstein R, Schirm A, Lazar N. (2019) Moving to a World Beyond "p < 0.05". *The American Statistician* 73(Suppl1): 1-19.