

# The Hilltop Institute



*analysis to advance the health of vulnerable populations*

## 2016 Health Home Evaluation Report

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# 2016 Health Home Evaluation Report

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## 2016 Health Home Evaluation Report

### Executive Summary

The Affordable Care Act (ACA) of 2010<sup>1</sup> presented an opportunity for states to improve care coordination for Medicaid participants with chronic conditions by providing care through the Health Home model. Under this legislation, each state can develop a program that offers a person-centered approach to providing enhanced care management and care coordination. The Maryland Department of Health and Mental Hygiene (DHMH) responded to this initiative and submitted a Medicaid State Plan Amendment (SPA) that was approved by the Centers for Medicare & Medicaid Services (CMS) in October 2013.

This report is an update of the 2015 Joint Chairmen’s Report on Patient Outcomes for Participants in Health Homes. Its purpose is to describe the outcomes of participants in the Maryland Health Home program. Maryland’s Health Home program targets Medicaid participants with a serious and persistent mental illness (SPMI) and/or an opioid substance use disorder (SUD) and risk of additional chronic conditions due to tobacco, alcohol, or other non-opioid substance use and children with serious emotional disturbances (SED). Individuals can participate in a Health Home if they are eligible for and engaged with a psychiatric rehabilitation program (PRP), mobile treatment service (MTS), or an opioid treatment program (OTP) that has been approved by DHMH to function as a Health Home provider.

Participating Health Homes receive an initial intake and assessment fee of \$100.85 when they enroll a new individual into the program. Health Home providers are also eligible for a \$100.85 monthly rate per participant for each month in which an enrollee receives at least two qualified Health Home services.<sup>2</sup> If an enrollee receives fewer than two services, the Health Home is not eligible to receive a payment for that individual for that month. Health Home services include care coordination, care management, health promotion, and referrals to community and social support services. The State received a 90% enhanced Federal Medical Assistance Percentage (FMAP) for the provision of Health Home services during the first eight quarters of the program. As of December 2016, payments to Health Home providers total approximately \$10,187,000.

Since the inception of the program, over 7,900 participants have received services from nearly 40 Health Home providers in 67 individual sites across the state of Maryland. The majority of the

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<sup>1</sup> Pub. L. 111-148 (Mar. 23, 2010), as amended by the Health Care and Education Reconciliation Act of 2010, Pub. L. 111-152 (Mar. 30, 2010).

<sup>2</sup> Previous reports and presentations by the Department have referred to this payment as a “per member per month (PMPM)” payment. Since receipt of the monthly payment not guaranteed and is contingent on the provision of at least two health home services by the enrollee, the characterization of the payment as a PMPM is not strictly accurate. Program staff is in the process of updating the State’s SPA, regulations and related documents to reflect this nuance.



participants were between the ages of 18 and 64 years, resided in the Baltimore metropolitan area, and were categorized as having moderate to very high co-morbidity levels. The most frequently accessed provider type were PRP providers, which enrolled nearly 75 percent of all Health Home participants.

The goal of the Health Home program is to improve health outcomes for individuals with chronic conditions by providing patients with an enhanced level of care management and care coordination while reducing costs. This evaluation is structured to provide a summary of health care utilization, quality, and costs for calendar years (CYs) 2013 through 2015. The outcomes of Health Home participants are compared with a comparison group of other Medicaid participants with similar characteristics.

This analysis suggests that incremental progress towards achieving these goals may be underway. However, preliminary results should be interpreted with caution, as sufficient time has not passed since the implementation of the program to detect meaningful and sustained differences in long-term health outcomes, as well as other factors such as small sample sizes and limited data availability. Given these considerations, the results of these analyses suggest the following:

- Participation in a Health Home may be associated with an increase in the use of ambulatory care services. Health Home study group participants with an ambulatory care visit increased by 1.9 percentage points from 84.1 percent to 86.0 percent. During the same time period, participants in the comparison group with at least one ambulatory care visit decreased by 0.2 percentage points from 84.5 percent to 84.3 percent.
- The descriptive analysis shows that the percentages of participants that had at least one ED and/or one inpatient visit both decreased the longer those participants stayed in the Health Home program. ED utilization rates decreased from 37.6 percent of participants having at least one ED visit during the first six months of program participation to 27.5 percent with at least one ED visit during the 19 to 24 month enrollment span. Inpatient utilization rates went from 10.0 percent of participants with at least one inpatient visit during first six months of enrollment to 1.7 percent during the 19 to 24 month enrollment span having an inpatient visit. The regression analysis suggests that there are conflicting impacts of Health Home participation on ED and inpatient utilization, estimating that participation is related to a statistically significant increase in ED visits and a decrease in inpatient visits between CY 2013 and CY 2015.
- The descriptive analysis and regression analysis both suggest that participants who received care from MTS providers had a higher percentage of inpatient hospitalizations, ED visits, and 30-day all-cause hospital readmissions when compared with those who received care from OTP or PRP providers. This may be



due in part to the fact that the MTS population is higher risk than the other Health Home participants.

- The regression results suggest that those in the Health Home program have 50 percent higher annual health care costs than those in the comparison group at baseline and that participating in the Health Home program is related to a 24 percent increase in total annual health care costs between CY 2013 and CY 2015, holding all other variables constant.



## 2016 Health Home Evaluation Report

### Introduction

Section 1 of this report provides background information on the Health Home program as a whole, including an overview of the implementation of Health Homes in other states. Section 2 details the progress of the Maryland Health Home program, including descriptive statistics of participant characteristics between Health Homes. Section 3 describes Health Home participants' patterns of health care utilization. Section 4 provides a comparison of outcomes between Health Home participants and a comparison group comprised of similar Medicaid participants.

### Section 1. The Health Home Model

#### Background

Health Homes are intended to improve health outcomes for individuals with chronic conditions by providing patients with an enhanced level of care management and care coordination. The Affordable Care Act (ACA) created the option for state Medicaid programs to establish Health Homes.<sup>3</sup> Health Homes provide an integrated model of care that coordinates primary, acute, behavioral health, and long-term services and supports for Medicaid participants who have two or more chronic conditions, one chronic condition and a risk for developing a second chronic condition, or a serious and persistent mental illness. In response to this initiative, DHMH submitted a Medicaid SPA that was approved by the Centers for Medicare & Medicaid Services (CMS) effective October 1, 2013.

The concept of the Health Home evolved from the Medical Home model, introduced by the American Academy of Pediatrics in 1967 to provide more centralized care for children with special health care needs. While a "Medical Home" initially denoted a single source for all of a patient's medical information, it came to refer more broadly to an approach to primary care that is comprehensive, coordinated, and patient- and family-centered (Sia, Tonninges, Osterhus, & Taba, 2004). In 2007, four primary care specialty societies (the American Academy of Physicians, the American Academy of Family Physicians, the American College of Physicians, and the American Osteopathic Association) agreed on the Joint Principles of the Patient-Centered Medical Home (PCMH) (Higgins, Chawla, Colombo, Snyder, & Nigam, 2013). The PCMH was to include a personal physician, a physician-directed medical practice, a whole-person orientation, coordination across providers and specialties, safe and high-quality care, enhanced access to care, and payment that recognized the benefit provided to patients who have a patient-centered medical home (American Academy of Family Physicians (AAFP), American

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<sup>3</sup> ACA § 2703(a) (42 USC § 1396w-4(a)).



Academy of Pediatrics (AAP), American College of Physicians (ACP), American Osteopathic Association (AOA), 2007).

There has been growing recognition of the fragmentation between behavioral health and primary care faced by individuals with mental health and/or SUDs, who are more likely to die prematurely from untreated and preventable chronic illnesses (Scott, & Happell, 2011). According to CMS, Medicaid is “the single largest payer for mental health services in the United States and is increasingly playing a larger role in the reimbursement of SUD services” (CMS, 2014). Additionally, Medicaid beneficiaries with serious mental illnesses (SMIs) and SUDs are more likely to have co-occurring chronic conditions than are similar Medicaid beneficiaries (Dickey, Normand, Weiss, Drake, & Azeni, 2002). These issues provide the motivation to examine the impact of additional care coordination and care management services on the health outcomes of vulnerable populations.

### **Health Home Programs Nationwide**

As of November 2016, CMS approved 29 Health Home programs submitted by 20 states and the District of Columbia between 2011 and 2016 (CMS, 2016). Enrollment in these programs varies from less than 1,000 to over 500,000 participants. A majority of the programs are focused on participants with an SMI and/or an SUD. A significant proportion of programs have a broad focus, serving participants with chronic conditions. Two states have programs that are aimed at children with a serious emotional disturbance (SED). One state targets participants with HIV/AIDs. While some states have elected to auto-enroll (opt-out enrollment) all eligible Medicaid participants into the Health Home, other states require participants to actively choose to enroll (opt-in enrollment) and complete an intake process with a provider (CMS, 2016).

States are required to engage in activities to monitor the implementation and outcomes of their Health Home model. CMS established a multi-pronged approach to evaluating Health Homes. The data reporting requirements common to all states include a core set of eight metrics that were selected by CMS (CMS, 2010). These metrics target chronic disease, behavioral health, and appropriate utilization of health care. In order to implement a Health Home program, states submit a two-year SPA to CMS, during which time they receive an enhanced federal medical assistance percentage (FMAP) for the services provided. As part of their SPA, states outline their methodology for monitoring quality improvement, health care utilization, and the cost of care pertinent to their programs.

In addition to the reporting completed by the states, CMS is working with the U.S. Department of Health and Human Services Office of the Assistant Secretary for Planning Evaluation (ASPE) to conduct an independent evaluation of SPAs approved during the first three years of the evaluation (Urban Institute, 2012). A five-year analytical plan is in place that began in October 2011. The initial three years of the evaluation focuses on implementation, while the fourth and fifth year will measure changes in quality, cost, utilization, and health outcomes of



program recipients compared with non-participants. The evaluation will be used to develop a report to Congress in 2017 (Department of Health and Human Services, 2014).

In December 2016, DHMH reviewed Medicaid websites for states with an approved SPA to locate interim reports describing the implementation and outcomes of their Health Homes. In addition to Maryland, reports were published by Missouri, Maine, Iowa, Washington, Minnesota, and West Virginia. There was a range of different evaluations presented, reflecting the diversity of Health Home programs developed by these states. All states provided descriptions of their participant populations, including demographics, clinical characteristics, and enrollment data. The states selected various metrics to evaluate their programs but also incorporated some of the core measures designated by CMS. The metrics selected included Healthcare Effectiveness Data and Information Set (HEDIS)-derived outcome measures focusing on monitoring chronic disease management, emergency department (ED) visits, and total cost of care (Department of Mental Health and MO Healthnet, 2013; Momany, Damiano, Bentler, McInroy, & Nguyen-Hoang, 2014).

Only three states—Missouri, Iowa, and Minnesota—had sufficient data available to offer post-intervention information in their evaluation (Momany, Damiano, Bentler, McInroy, & Nguyen-Hoang, 2014; Momany, Damiano, & Bentler, 2014; Department of Mental Health and MO Healthnet, 2013; Momany, Damiano, & Bentler, 2014; Wholey, D. R., Finch, M., Shippee, N. D., White, K. M., Christianson, J., Kreiger, R., et al., 2016). All three reports offered preliminary results suggesting that their Health Home programs had effects on utilization and costs per Medicaid participant. The authors noted mixed results, with improvements in certain areas (e.g. reductions in ED visits and decreases in per member per month costs), but less or negative impact in other areas (e.g. preventive care visits). Caution must be used when interpreting these results. Each report applied different methods for conducting their analyses, used varying approaches in how they selected participants to include in the study, and may not have had sufficient time to detect changes in long-term health outcomes.



## Section 2. The Maryland Health Home Program

The Maryland Health Homes program builds on statewide efforts to integrate somatic and behavioral health services, with the aim of improving health outcomes and reducing avoidable hospital utilization. The program targets populations with behavioral health needs who are at high risk for additional chronic conditions, offering them enhanced care coordination and support services from providers from whom they regularly receive care. The program is focused on Medicaid participants with a serious and persistent mental illness (SPMI), an opioid SUD and risk of additional chronic conditions due to tobacco, alcohol, or other non-opioid substance use, and children with SED (CMS, 2013). In a Health Home, the center of a patient's care, instead of being in a somatic care setting, is in MTSs, PRPs, and OTPs. This service delivery method is intended to include nurses and somatic care consultants into these programs and to make sure individuals in MTS, PRPs, and OTPs receive improved somatic care.

Medicaid participants can enroll in Health Homes if they are eligible for and engaged with a PRP, MTS, or an OTP that has been approved by DHMH to function as a Health Home provider. Instead of auto-enrollment into the program, Maryland requires participants to actively choose to enroll and complete an intake procedure. In order to improve care coordination when enrolling into the Health Home, Medicaid participants are also required to consent to have their data shared with the Chesapeake Regional Information System for our Patients (CRISP), a regional health information exchange (HIE) serving Maryland and the District of Columbia. Individuals are excluded from Health Home participation if they are currently receiving other Medicaid-funded services that may duplicate those provided by Health Homes, such as targeted mental health care management.

Health Home providers must be enrolled as a Maryland Medicaid provider and accredited as a Health Home. A dedicated care manager must be assigned to each participant, and providers are required to maintain certain staffing levels based on the number of participants. The Health Home staff must include a Health Home director, physician, and nurse practitioner. Health Homes are responsible for documenting all services delivered, participant outcomes, and social indicators in the eMedicaid care management system. They must notify each participant's other providers of the participant's goals and the types of services the individual is receiving via the Health Home and encourage participation in care coordination efforts.

Figures 1a and 1b display the number of participating Health Home providers and provider sites by month. These data only include Health Home provider organizations that had at least one participant enrolled during that month. A small number of providers were active at the inception of the program. Within the first six months, the number of providers tripled. This number of participating providers remained stable in the second half of 2014, increased by six providers in 2015, and increased slightly throughout 2016.



**Figure 1a. Number of Participating Health Home Providers, by Month**

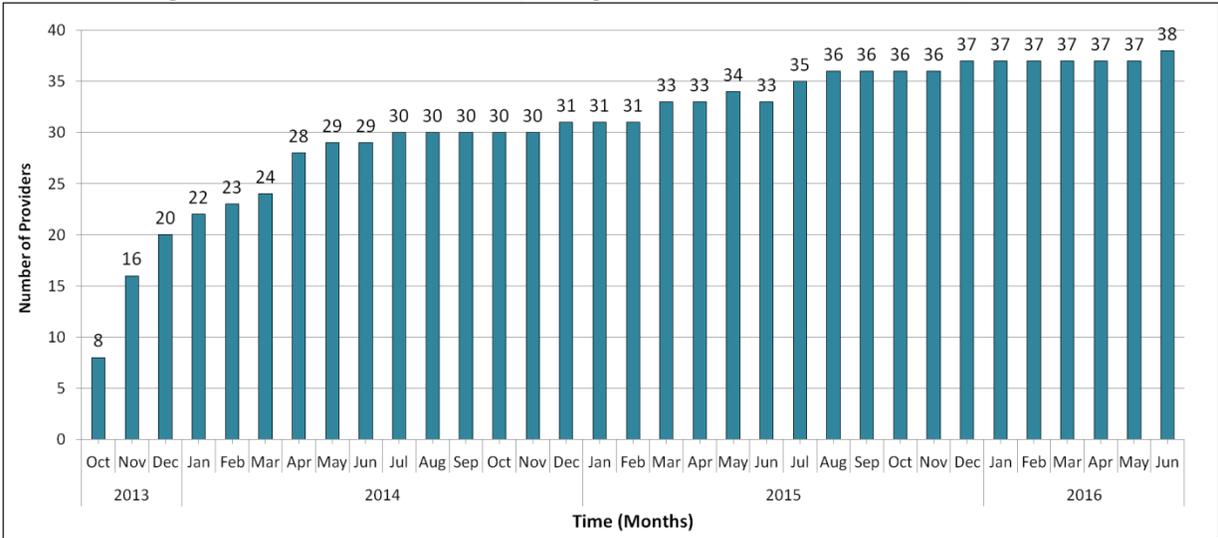
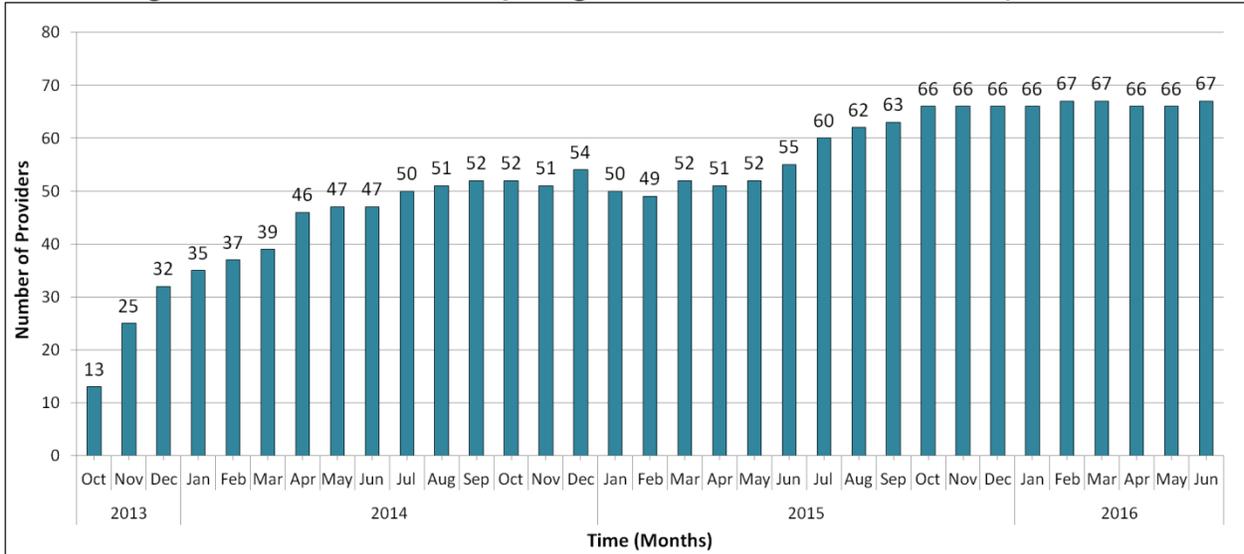


Figure 1b displays the number of participating Health Home providers by month according to the number of individual sites that are operational. These data only include Health Home sites that had at least one participant enrolled during that month. A small number of providers were active at the inception of the program—8 providers across 13 sites. Within the first six months the number of Health Home provider sites tripled to 39. The number of participating sites continued to increase in 2014 and through 2015. The number of Health Home provider sites has remained relatively steady since October 2015, ranging between 66 and 67 provider sites between then and June 2016.

**Figure 1b. Number of Participating Health Home Provider Sites, by Month**



## **Health Home Data**

This report presents measures that were selected to provide an overview of the patient outcomes for participants in Health Homes. The measures were calculated using data that Health Home providers entered into the eMedicaid care management data system and data from the Maryland Medicaid Information System (MMIS2).

eMedicaid is a secure web-based portal that allows health care practitioners to enroll as a Medicaid provider, verify recipient eligibility, obtain payment information, and serve as a care management tracking tool for providers participating in Maryland's Health Home program. Within eMedicaid, providers enroll participants and report participants' diagnoses, outcomes, and services rendered. The measures of participant characteristics and Health Home services in the tables below are calculated from data reported by Health Home providers into the eMedicaid care management system.

## **Participant Characteristics**

Figure 2 presents enrollment data for the first ten quarters of the program. Enrollment is determined using data reported by Health Home providers into the eMedicaid care management system as of September 22, 2016. Figure 2 shows that a large portion of participants enrolled near the start of the program. While the enrollment of new participants dropped after the months immediately following implementation, new participants were continuously added every quarter, resulting in enrollment more than doubling between Quarters 1 and 7. During the most recent two years of the evaluation period, an average of more than 500 participants enrolled in the program during each quarter. This increase in Health Home participant enrollment is primarily due to the introduction of new provider sites, as the sizes of individual provider sites tend to remain stable after an initial ramp-up period.



**Figure 2. Number of Health Home Participants, by Enrollee Type and Quarter**

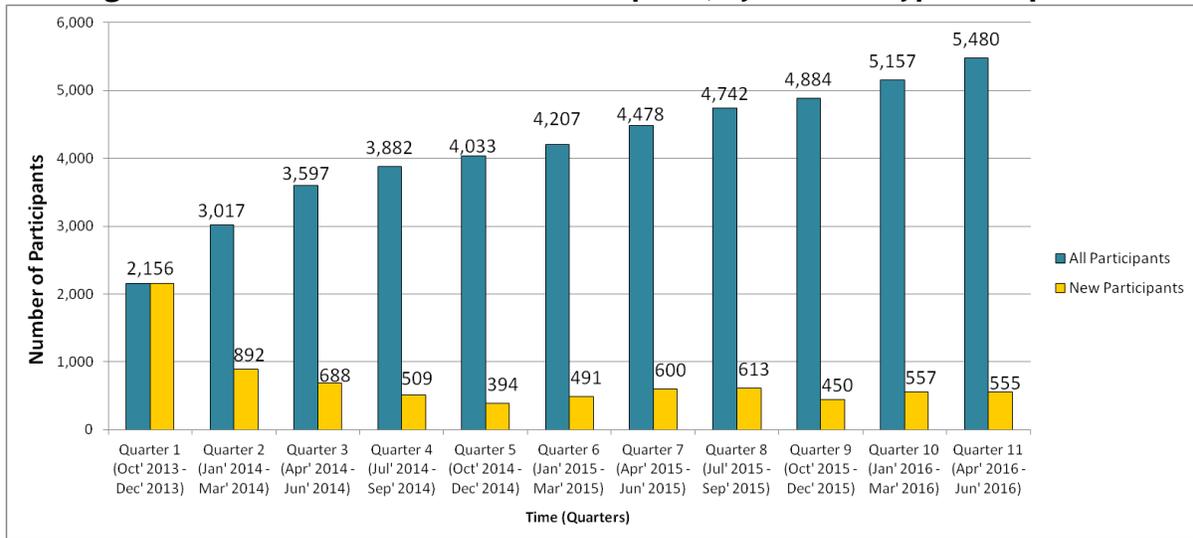


Figure 3 presents enrollment data by program type: PRP, MTS, or OTP. PRP providers consistently enrolled the largest share of Health Home participants – between 74 percent and 83 percent of participants each quarter across all 11 quarters. The percentage of participants enrolled in the MTS program ranged between 3.5 percent and 6.6 percent across the intervention quarters, while OTP enrollment ranged between 10.5 percent and 21.8 percent. As of Quarter 10, only three of the 38 providers offer care to participants through multiple program types. The remaining providers offer services as one program type.



**Figure 3. Number of Health Home Participants, by Program Type and Quarter**

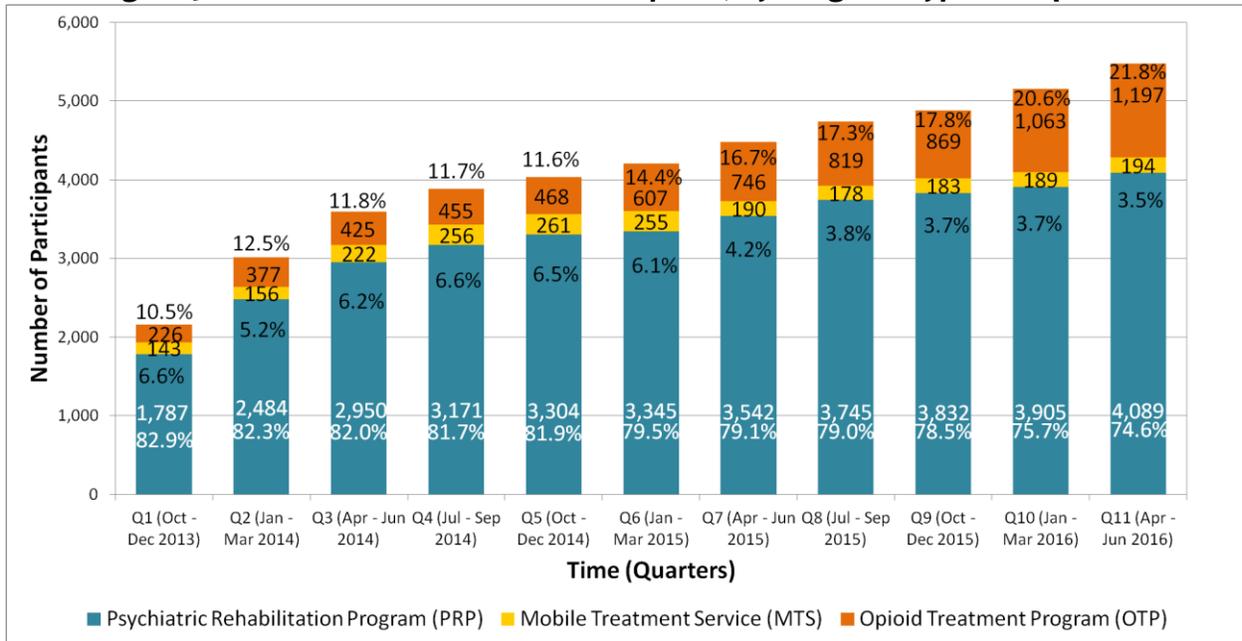


Table 1 presents the percentage of Health Home participants by various demographic characteristics. The largest proportion of participants was aged 40 to 64 years (56.9 percent), followed by those aged 21 to 39 years (25.4 percent). Approximately 13 percent of the participants were under the age of 21 years. Table 1 also shows that the vast majority of the Health Home population identified as either White (41.1 percent) or Black (47.3 percent). Those who identified as Other/Unknown, Asian, or Hispanic made up a small proportion (11.6 percent) of total participants. A slight majority of Health Home participants were male (54.0 percent). The region with the majority of participants was the Baltimore metropolitan area, with 64.8 percent of all Health Home participants. The next most common areas of residence were the Eastern Shore (17.1 percent) and Montgomery and Prince George’s Counties (10.7 percent).

A person’s co-morbidity level is estimated based on the Johns Hopkins Adjusted Clinical Groups (ACG) methodology, which uses claims data to classify individuals based on their projected and/or actual utilization of health care services. Approximately 57.4 percent of participants were categorized as having a very high or high co-morbidity level, 37.5 percent were classified as having a moderate co-morbidity level, and only 5.1 percent were classified as having a low co-morbidity level. Almost a third (32.1 percent) of Health Home participants were dually eligible for both Medicare and Medicaid.



**Table 1. Demographic and Clinical Characteristics of Health Home Participants**

Demographic/Clinical Characteristics	Health Home Participants	
	Number	Percentage
<b>Age Group (Years)</b>		
3 to 9	208	2.8%
10 to 14	469	6.3%
15 to 20	285	3.8%
21 to 39	1,896	25.4%
40 to 64	4,251	56.9%
<b>Race/Ethnicity</b>		
Asian	94	1.3%
Black	3,537	47.3%
White	3,075	41.1%
Hispanic	57	0.8%
Other/Unknown	710	9.5%
<b>Gender</b>		
Female	3,437	46.0%
Male	4,035	54.0%
Transgender	*	0.0%
<b>Region</b>		
Baltimore Metro	4,844	64.8%
Eastern Shore	1,281	17.1%
Montgomery and Prince George's County	802	10.7%
Southern Maryland	*	0.1%
Western Maryland	525	7.0%
Out of State	*	0.1%
<b>Adjusted Clinical Groups Co-Morbidity Level</b>		
Low Co-morbidity	384	5.1%
Moderate Co-morbidity	2,804	37.5%
High Co-morbidity	2,045	27.4%
Very-High Co-morbidity	2,240	30.0%
<b>Dual Medicaid-Medicare Eligibility</b>		
No	5,072	67.9%
Yes	2,401	32.1%
<b>Total</b>	<b>7,473</b>	

### Health Home Services

Health Homes are required to provide at least two services to a participant in a given month in order to qualify for a \$100.85 monthly rate per participant. Health home services include care coordination, care management, health promotion, and referrals to community and social support



services. Categories of services include: (1) comprehensive care management to assess, plan, monitor, and report on participant health care needs and outcomes; (2) care coordination to ensure appropriate linkages, referrals, and appointment scheduling across different providers; (3) health promotion to aid participants in implementation of their care plans; (4) comprehensive transitional care to ease the transition when discharged from inpatient settings and ensure appropriate follow-up; (5) individual and family support services to provide support and information that is language, literacy, and culturally appropriate; and (6) referral to community and social support services.

Figure 4 displays the percentage of participants by the number of services received per month. During the first month of the program, 12.6 percent of participants received two or more services and 75.2 percent of participants did not receive any services. As time progressed, the number of participants receiving two or more services per month increased, ranging from 63.1 to 83.0 percent. A corresponding decrease in the number of participants who did not receive any services is also noted. The percentage of participants not receiving any services ranged from 8.1 to 32.1 percent in each month between November 2013 and August 2016.



**Figure 4. Percentage of Health Home Participants Receiving 0, 1, or 2 or More Services, by Month**

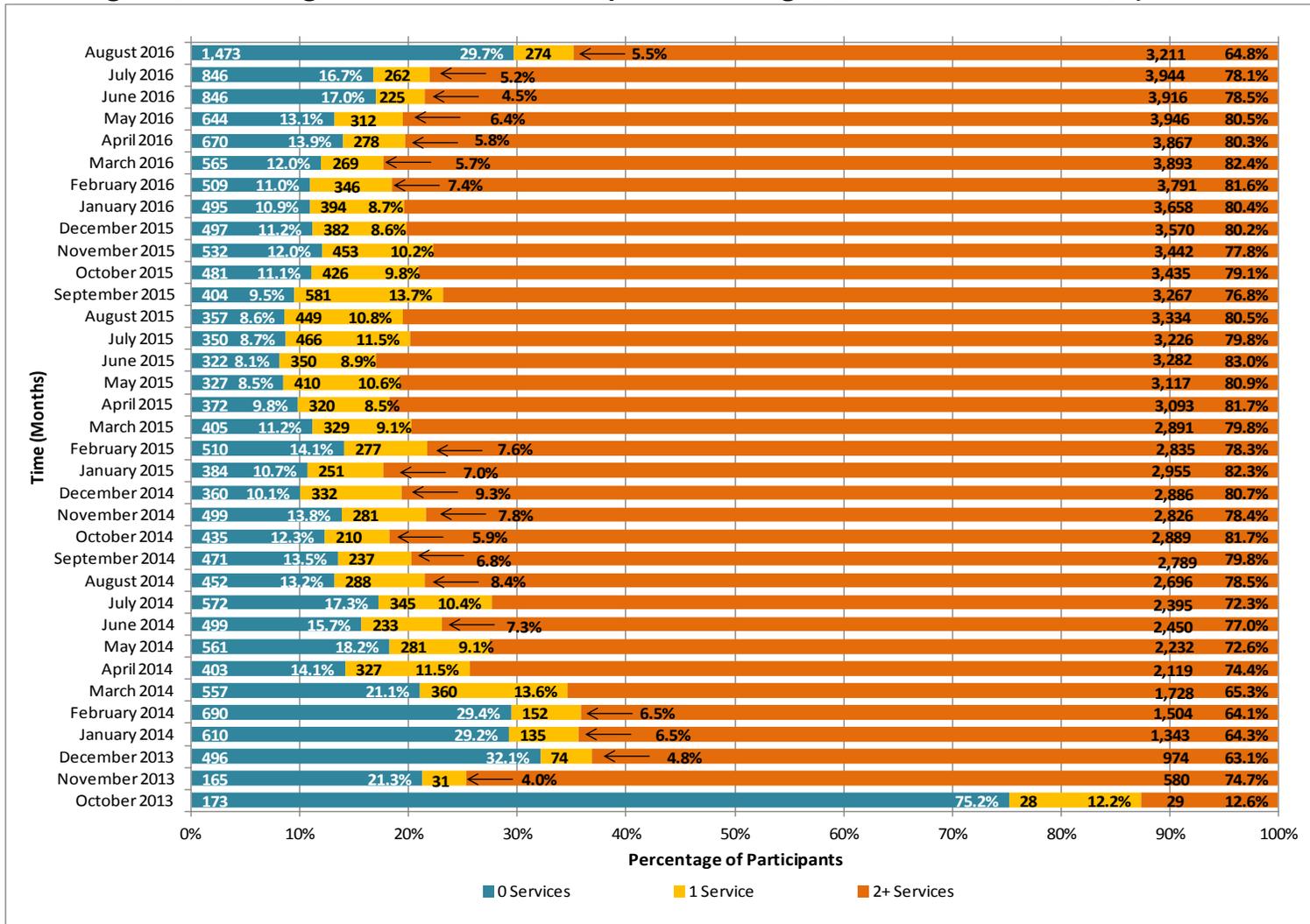


Figure 5 presents the average number of services among Health Home participants who received at least one service during the quarter. The average number of services increased as the program progressed, ranging from 3.0 in Quarter 1 to 6.3 in Quarter 8. The average number of services decreased slightly after Quarter 8 to 5.5 in Quarter 11.

**Figure 5. Average Number of Services Received by Health Home Participants, by Quarter**

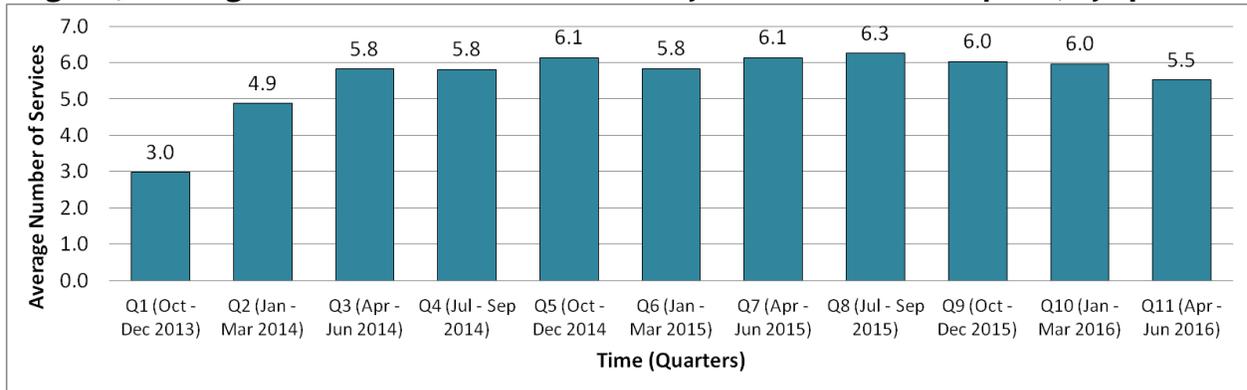


Figure 6 displays the percentage of participants who received at least one type of Health Home service required by CMS. The figure demonstrates that there is a strong demand from participants for the Health Home social services. Care coordination was consistently received at least once per quarter by approximately half of the participants. The proportion of participants receiving a comprehensive care management service increased from 33.6 percent in Quarter 1 to 80.6 percent in Quarter 4. The average proportion of participants receiving a comprehensive care management service from Quarter 4 onwards remained at approximately 80 percent for the following two years. Receipt of health promotion services increased from 36.9 percent in Quarter 1 to between 60.0 and 66.3 percent through the subsequent ten quarters. Comprehensive transitional care and referral to community and social support services were consistently received by the smallest proportion of participants.



**Figure 6. Percentage of Health Home Participants by Types of Health Home Services Received, by Quarter**

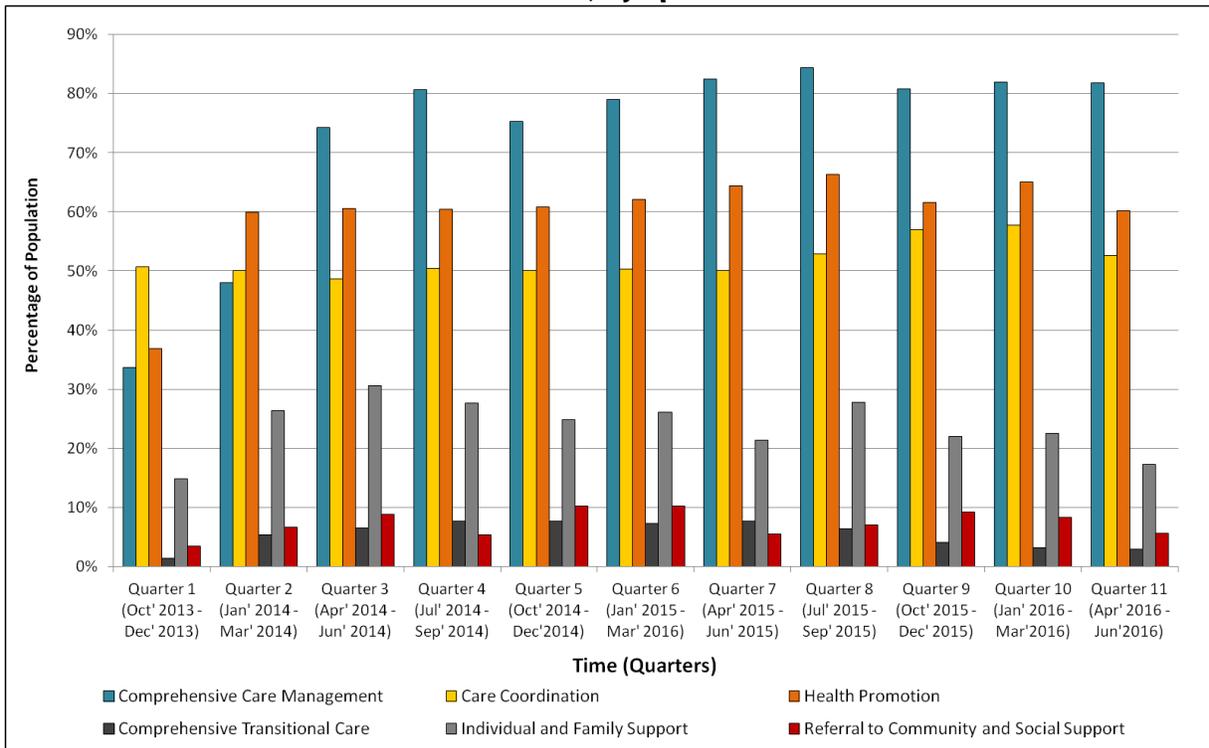


Table 2 presents the distribution of Health Home participants’ first and last clinical body mass index (BMI) recordings, categorized by BMI groupings aligned with HEDIS 2016 reporting thresholds.<sup>4</sup> The cohort is comprised of Health Home participants with at least two clinical BMI entries during their enrollment span. The greatest percentage of both first and last BMI recordings fell within the 25.0-29.9 BMI range – 26.7 percent of the first BMI recordings and 26.5 percent of the last BMI recordings fell within this category. Approximately 5 percent of first and last BMIs were recorded as less than 20.0. The largest difference between the first and last recorded BMI was in the 20.0-24.9 category. Eighteen percent of enrollees’ first recorded BMI were within 20-24.9, while in the last BMI recorded, 16.8 percent of enrollees fell within that range.

<sup>4</sup> Tables 2 and 3 present clinical results reported into the eMedicaid reporting system. These data have not been modified to exclude possible outliers. Therefore, data entry errors may potentially skew the estimates.

**Table 2. Number and Percentage of Health Home Participants with More than One Body Mass Index (BMI) Recorded, According to HEDIS BMI Thresholds**

BMI Grouping	First BMI		Last BMI	
	Number	Percent	Number	Percent
<20	201	5.1%	214	5.5%
20-24.9	705	18.0%	656	16.8%
25-29.9	1,045	26.7%	1,035	26.5%
30-34.9	865	22.1%	885	22.6%
35-39.9	524	13.4%	545	13.9%
≥40	573	14.6%	578	14.8%
<b>Total</b>	<b>3,913</b>	<b>100.0%</b>	<b>3,913</b>	<b>100.0%</b>

Table 3 presents the distribution of Health Home participants' first and last clinical blood pressure (BP) recordings, categorized by systolic and diastolic BP groupings that are aligned with HEDIS 2016 reporting thresholds. The cohort is comprised of Health Home participants that have had at least two BP values recorded in eMedicaid during their enrollment span. For systolic BP entries, nearly 80 percent of both the first and last BP entries were less than 140 and 20 percent were greater than or equal to 140. In both their first and last entries, nearly 50 percent of the diastolic BP entries recorded were less than 80, approximately 34 percent fell within the range of 80 to 89, and approximately 17 percent were greater than or equal to 90.

**Table 3. Number and Percentage of Health Home Participants with More than One Blood Pressure (BP) Recorded, According to HEDIS BP Thresholds**

Systolic BP Grouping	First BP		Last BP	
	Number of Participants	Percentage of Participants	Number of Participants	Percentage of Participants
<140	3,057	79.9%	3,051	79.7%
≥140	769	20.1%	775	20.3%
<b>Total</b>	<b>3,826</b>	<b>100.0%</b>	<b>3,826</b>	<b>100.0%</b>
Diastolic BP Grouping	Number of Participants	Percentage of Participants	Number of Participants	Percentage of Participants
<80	1,866	48.8%	1,894	49.5%
80-89	1,295	33.8%	1,300	34.0%
≥90	665	17.4%	632	16.5%
<b>Total</b>	<b>3,826</b>	<b>100.0%</b>	<b>3,826</b>	<b>100.0%</b>



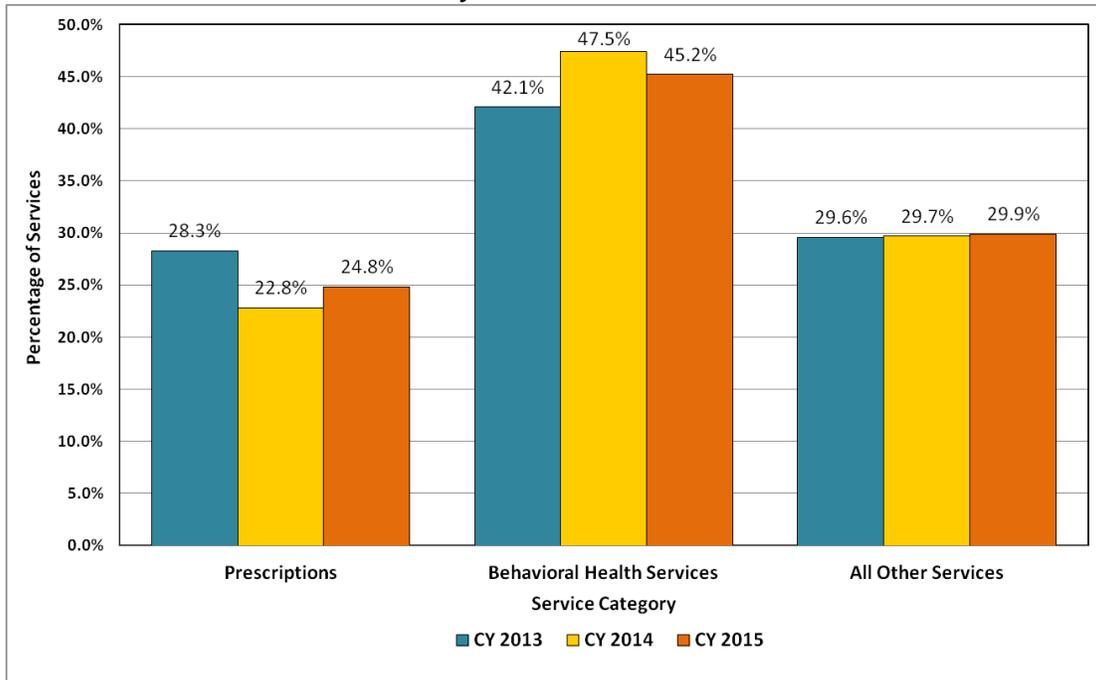
### Section 3. Health Home Participants Health Care Utilization Patterns

In contrast with the service data presented above, the values reported in the following sections are based on claims and encounters reported in the MMIS2. The figures and tables below describe the overall composition of health care services received by Health Home participants and categories of types of ED visits during calendar year (CY) 2013, CY 2014, and CY 2015. Those are followed by tables describing Health Home participants' inpatient and ED visit rates according to participants' length of enrollment in the Health Home program.

#### Composition of Total Medicaid Services

Figure 7 presents the overall composition of Medicaid services received by Health Home participants. The services were grouped into the following categories: prescriptions, behavioral health services, and all other services. In CY 2013, behavioral health services accounted for 42.1 percent of all Medicaid services received by Health Home participants. The proportion of behavioral health services increased to 47.5 percent in CY 2014 and then declined to 45.2 percent in CY 2015. The "all other services" category remained about the same across the study period at slightly less than 30 percent. Prescriptions dropped from 28.3 percent in CY 2013 to 22.8 percent in CY 2014, then increased to 24.8 percent in CY 2015.

**Figure 7. Composition of Types of Services Received by Health Home Participants, by Calendar Year**



## Emergency Department Utilization Patterns

Table 4 presents the percentage of Health Home participants who had at least one ED visit in CY 2013 through CY 2015. The table also shows the percentages of participants who visited the ED for behavioral health services and/or somatic care. To identify those ED visits related to behavioral health, the team used a grouping method based on classifications developed by the New York University (NYU) Center for Health and Public Service Research (Billings, Parikh, & Mijanovich, 2000).

In CY 2013, 34.5 percent of ED users had an ED visit with a diagnosis related to behavioral health; this percentage increased to 36.9 percent in CY 2014 and then decreased to 34.4 percent in CY 2015. A greater percentage of ED users, 89.2 percent, visited the ED for somatic care in CY 2015, compared to 88.7 percent in CY 2014 and 89.0 percent in CY 2013. Please note that participants in the table could have seen more than one type of provider. These categories are not mutually exclusive; therefore, the sum of the frequencies does not equal the total number of participants with any ED visit.

**Table 4. Percentage of Health Home Participants Completing ED Visits, by Service Type, CY 2013 – CY 2015**

Year	Total Participants	Number of Participants with Any ED Visit	Percentage with Any ED Visit	Number of Participants with a Behavioral Health ED Visit	Percentage of ED Users with a Behavioral Health ED Visit	Number of Participants with a Somatic Care ED Visit	Percentage of ED Users with a Somatic Care ED Visit
CY 2013	7,473	3,679	49.2%	1,271	34.5%	3,274	89.0%
CY 2014	7,473	4,198	56.2%	1,551	36.9%	3,723	88.7%
CY 2015	7,473	4,090	54.7%	1,408	34.4%	3,647	89.2%

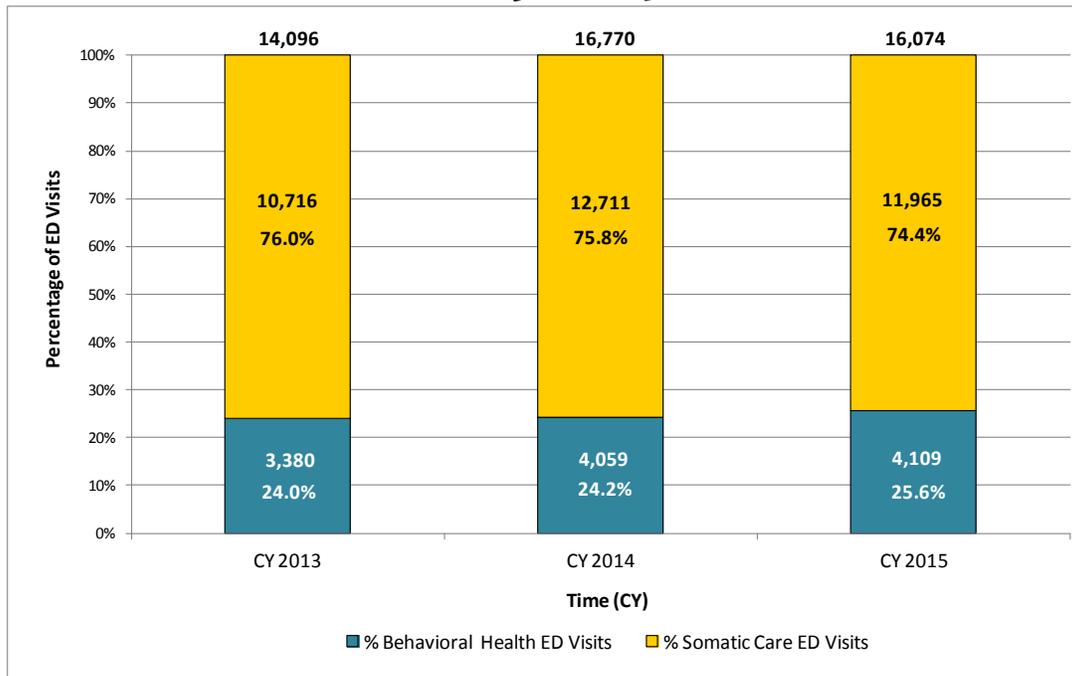
Figure 8 displays the distribution of Health Home participants' total number of ED visits, categorized by the type of care provided. Of the total ED visits in CY 2013, 24.0 percent were for behavioral health and 76.0 percent were for somatic care. A similar trend occurred in CY 2014. In CY 2015, behavioral health ED visits increased to 25.6 percent of all ED visits, while somatic care ED visits made up 74.4 percent.<sup>5</sup>

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<sup>5</sup> A preliminary analysis conducted by the Maryland Behavioral Health Network (MBHN) on a subset of Health Home providers suggests that there may have been decreases in non-behavioral health related health care service utilization rates, when comparing the period of January 1 through March 31 of CYs 2014 and 2015. These results are preliminary, and the methodology used to generate these rates has not been verified.



**Figure 8. Number and Composition of ED Visits Received by Health Home Participants, CY 2013 – CY 2015**



### **Health Care Utilization by Length of Enrollment**

Tables 5 and 6 present ED and inpatient utilization rates per participant by length of enrollment in a Health Home program during CY 2013 through CY 2015. The tables below summarize health care utilization patterns while participants were enrolled in the Health Home program.<sup>6</sup> The lengths of enrollment were calculated as of the end of CY 2015 and combine the time periods of participants with more than one enrollment span. As of December 31, 2015, the average length of enrollment in the Health Home program was 14 months.

ED utilization rates were highest during a participant’s first six months of enrollment, with 37.6 percent of total participants visiting the ED at least one time during that enrollment span. The ED utilization rate declined the longer those participants stayed in the Health Home program. Participants who were in a Health Home program between 19 to 24 months had the lowest ED utilization rate at 27.5 percent of participants with at least one ED visit during that enrollment span. Furthermore, the average number of ED visits per participant decreased the longer

<sup>6</sup> If a participant were discharged from the Health Home program, later visited the ED, and subsequently re-enrolled in the program, that visit is not included in the tables below



participants were enrolled in the program from 0.96 during the first six months of enrollment, to 0.68 when participants were enrolled 19 to 24 months.

**Table 5. ED Utilization Rates per Participant, by Length of Enrollment**

Length of Enrollment	Total Participants	Number with Any ED Visit	Percent ED Utilization	Number of ED Visits	Average ED Visits per Participant
0 to 6 Months	6,613	2,487	37.6%	6,348	0.96
7 to 12 Months	5,033	1,656	32.9%	4,043	0.80
13 to 18 Months	3,633	1,126	31.0%	2,808	0.77
19 to 24 Months	2,617	720	27.5%	1,767	0.68

Table 6 presents the inpatient utilization rates per participant by length of enrollment. Inpatient utilization rates were highest during participants' first six months in the program, with 10.0 percent of total participants visiting the hospital during that enrollment span. The inpatient utilization rate declined the longer participants were enrolled in the Health Home program. Participants who remained in a Health Home program for 19 to 24 months had the lowest inpatient utilization rate at 1.7 percent of total participants with any inpatient visit.

**Table 6. Inpatient Utilization Rates per Participant, by Length of Enrollment**

Length of Enrollment	Total Participants	Number with Any Inpatient Visit	Percent Inpatient Utilization
0 to 6 Months	6,613	660	10.0%
7 to 12 Months	5,033	486	9.7%
13 to 18 Months	3,633	302	8.3%
19 to 24 Months	2,617	45	1.7%



## Section 4. Health Home Participant Outcomes

This section of the report presents a comparison of the health care utilization, quality, and costs between Health Home participants and a comparison group of Medicaid participants. The analysis began with a description of the selection of the participant and comparison groups, followed by an overview of the groups' demographic characteristics, and then a presentation of the utilization, quality, and cost outcomes of interest.

### ***Evaluation Cohort Description***

The team selected a sub-population of the Health Home and other Medicaid participants to use as study and comparison groups for this evaluation in order to help estimate the effects of the program. Estimating the same measures between carefully selected groups of similar people can aid in distinguishing changes associated with participation in the Health Home program from changes due to other contributing factors. To identify the comparison group of interest, the team first created a sub-group of Health Home and other Medicaid participants that met the following criteria:

1. Aged 18 to 64 years
2. Were continuously enrolled in Medicaid from CY 2013 through CY 2015
3. Received care in CY 2012 from a provider of the same type as a Health Home provider, in order to estimate the outcomes of participants with similar health needs. These provider types include:
  - a. Drug Clinics (Provider Type 32)
  - b. Mobile Treatment Programs (Provider Type MT)
  - c. Psychiatric Rehab Services Facilities (Provider Type PR)

Once the selection of potential comparison group members was completed, the team used a propensity score matching statistical technique to select an evaluation cohort, i.e., a study and comparison group, in which the likelihood of joining the program is as similar as possible between the two groups. The likelihood of joining the program was estimated based on a participant's geographic region of residence, age, race/ethnicity, gender, ACG co-morbidity grouping, and type of Health Home provider seen. A detailed description of the process used to select the evaluation cohort is presented in Appendix A.



## ***Demographic Characteristics***

Table 7 provides an assessment of the study and comparison groups of several demographic and clinical characteristics. Overall, the propensity score matching technique produced a comparison group that was similar to the study group. In both groups, a majority of the participants were between the ages of 40 and 64 years, resided in the Baltimore metropolitan area, and were categorized as having a moderate to very-high co-morbidity level. Those in the study group are slightly younger and less likely to be an Other/Unknown race than those in the comparison group.

The characteristics of the study group differ from the wider Health Home population described earlier in the report. People in the study group are older, more likely to be Black, more likely to be female, less likely to be from the Eastern Shore, less likely to have low co-morbidities, and are more likely to be dually eligible for Medicare and Medicaid than people in the overall Health Home program.



**Table 7. Demographic and Clinical Characteristics of Study Group and Comparison Group**

Descriptive Characteristics	Health Home Study Group		Comparison Group	
	Number	Percentage	Number	Percentage
<b>Age Group (Years)</b>				
Under 21	61	1.9%	71	2.2%
Ages 21 to 39	961	29.2%	827	25.1%
Ages 40 to 64	2,268	68.9%	2,392	72.7%
<b>Race/Ethnicity</b>				
Asian	57	1.7%	31	0.9%
Black	1,612	49.0%	1,571	47.8%
White	1,401	42.6%	1,410	42.9%
Hispanic	31	0.9%	25	0.8%
Other/Unknown	189	5.7%	253	7.7%
<b>Gender</b>				
Female	1,618	49.2%	1,593	48.4%
Male	1,672	50.8%	1,697	51.6%
<b>Region</b>				
Baltimore Metro	2,117	64.4%	2,162	65.7%
Eastern Shore	342	10.4%	318	9.7%
Montgomery and Prince George's County	519	15.8%	505	15.4%
Southern Maryland	*	*	*	*
Western Maryland	308	9.4%	294	8.9%
Out of State	*	*	*	*
<b>Adjusted Clinical Groups Co-Morbidity Level</b>				
Low Co-morbidity	28	0.9%	86	2.6%
Moderate Co-morbidity	1,364	41.5%	1,406	42.7%
High Co-morbidity	951	28.9%	922	28.0%
Very-High Co-morbidity	947	28.8%	876	26.6%
<b>Dually Eligible</b>				
No	2,106	64.0%	2,164	65.8%
Yes	1,184	36.0%	1,126	34.2%
<b>Total</b>	<b>3,290</b>		<b>3,290</b>	

Table 8 compares the distribution of the study group and the comparison group by program type of their respective providers. PRP providers were seen by the largest proportion of both the study and comparison groups, at 77.4 and 83.7 percent of participants, respectively. Please note that the people in the comparison group could have seen more than one type of provider; these categories are not mutually exclusive. Therefore, the sum of the frequencies does not equal the total comparison group population.



**Table 8. Program Types of the Study Group and Comparison Group**

Provider Type	Health Home Study Group		Comparison Group	
	Number	Percentage	Number	Percentage
Psychiatric Rehabilitation Facility	2,545	77.4%	2,754	83.7%
Mobile Treatment Services	127	3.9%	157	4.8%
Opioid Treatment Program	618	18.8%	426	13.0%
<b>Total</b>	<b>3,290</b>		<b>3,290</b>	

### **Health Care Utilization Outcomes**

All measures presented in the tables below include the study and comparison groups detailed above. In order to generate comparable results, all percentages have been weighted to account for the matching technique and sample size difference between the study and comparison groups. A description of the analytical methods used is included in Appendix A.

#### **Inpatient Hospital Admissions**

Table 9 compares the percentage of Health Home study and comparison group participants with at least one inpatient hospital admission in CY 2013, CY 2014, and CY 2015. In CY 2013, 24.5 percent of people in the study group had at least one inpatient hospital admission; this increased slightly to 25.5 percent in CY 2014 and then decreased to 24.4 percent in CY 2015. Within the study group, the percentage of participants who were dually eligible for Medicaid and Medicare and had at least one inpatient hospital admission decreased from 23.9 percent in CY 2013 to 21.9 percent in CY 2015. The percentage of those who were not dually eligible for Medicare and Medicaid and had at least one inpatient hospital admission increased from 24.8 percent in CY 2013 to 25.9 percent in CY 2015.

In CY 2013, 21.2 percent of people in the comparison group had at least one inpatient hospital admission; this increased to nearly 23 percent in both CY 2014 and CY 2015. The percentage of participants in the comparison group who were dually eligible for Medicaid and Medicare and had at least one inpatient hospital admission remained stable from CY 2013 to CY 2015 at 21 percent. The percentage of participants in the comparison group who were not dually eligible and had an inpatient admission increased from 21.0 percent in CY 2013 to 23.6 percent in CY 2015. Throughout the evaluation period, the group of participants receiving services from MTS providers tended to have higher rates of inpatient hospital admissions, but this group experienced the largest decrease in inpatient utilization from CY 2013 to CY 2015 compared to those enrolled in PRPs and OTPs.



**Table 9. Percentage of Participants with at Least One Inpatient Hospital Admission, by Treatment Group, CY 2013 – CY 2015**

		Inpatient Hospital Admissions					
		Health Home Study Group			Comparison Group		
		CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Provider Type							
Non-Duals	OTP	21.9%	27.9%	28.7%	19.2%	24.5%	23.3%
	MTS	42.3%	33.7%	27.7%	35.2%	25.3%	34.3%
	PRP	24.8%	25.5%	24.5%	20.7%	23.9%	23.1%
<b>Total</b>		<b>24.8%</b>	<b>26.6%</b>	<b>25.9%</b>	<b>21.0%</b>	<b>24.0%</b>	<b>23.6%</b>
Duals	OTP	27.0%	26.3%	25.0%	33.3%	37.2%	36.4%
	MTS	43.5%	26.9%	30.8%	34.6%	20.7%	27.6%
	PRP	23.4%	22.2%	21.6%	20.5%	20.5%	20.3%
<b>Total</b>		<b>23.9%</b>	<b>23.6%</b>	<b>21.9%</b>	<b>21.6%</b>	<b>21.1%</b>	<b>21.2%</b>
All Participants	OTP	22.2%	27.8%	28.5%	20.4%	25.8%	24.7%
	MTS	42.5%	32.3%	28.4%	35.0%	23.6%	31.9%
	PRP	24.2%	24.6%	23.1%	20.6%	22.6%	22.0%
<b>Grand Total</b>		<b>24.5%</b>	<b>25.5%</b>	<b>24.4%</b>	<b>21.2%</b>	<b>22.9%</b>	<b>22.7%</b>

### Lengths of Inpatient Hospital Stay

Table 10 compares the average length of stay (in days) in CY 2013 through CY 2015 for the Health Home study and comparison groups. For the Health Home study group, the average length of stay was nearly the same for all three years (13.0 days in CY 2013 and CY 2014, and 13.1 days in CY 2015). Within the study group, those who were dually eligible for Medicaid and Medicare had slightly lower average lengths of stay than those who were not dually eligible. In CY 2013, the average length of stay for dually-eligible participants was 11.8 days and 13.6 days for non-duals; in CY 2014, the average length of stay for dually-eligible participants was 12.7 days and 13.2 days for non-duals; and, in CY 2015, the average length of stay for dually-eligible participants was 12.4 days and 13.5 days for non-duals. While the length of stay fell for those in the MTS study groups between CY 2013 and CY 2015, the average length of stay rose for participants in the OTP and PRP study groups during the period.

The average length of stay for the comparison group varied slightly over the years. For the comparison group as a whole, the average length of stay was 12.0 days in CY 2013, 13.0 days in CY 2014, and 12.3 days in CY 2015. A similar trend was seen in those who were dually-eligible for Medicare and Medicaid. Dually-eligibles' average length of stay was 11.1 days in CY 2013, 13.4 days in CY 2014, and 10.6 days in CY 2015. Non-duals experienced an increase in average length of inpatient hospital stays from CY 2013 to CY 2015. Non-duals' average length of stay was 12.4 days in CY 2013, 12.9 days in CY 2014, and 13.2 days in CY 2015.



Table 10. Average Length of Stay for Inpatient Hospital Admission, by Treatment Group, CY 2013 – CY 2015

		Inpatient Hospital Admissions											
		Health Home Study Group						Comparison Group					
		CY 2013		CY 2014		CY 2015		CY 2013		CY 2014		CY 2015	
	Provider Type	Number with One or More Visits	Average Length of Stay (Days)	Number with One or More Visits	Average Length of Stay (Days)	Number with One or More Visits	Average Length of Stay (Days)	Number with One or More Visits	Average Length of Stay (Days)	Number with One or More Visits	Average Length of Stay (Days)	Number with One or More Visits	Average Length of Stay (Days)
Non-Duals	OTP	127	10.4	162	11.9	166	11.8	75	7.8	94	10.6	89	8.5
	MTS	44	22.8	34	18.1	28	15.4	37	16.9	25	19.4	34	17.2
	PRP	352	13.5	353	13.3	331	14.2	354	13.2	398	13.1	380	14.0
<b>Total</b>		<b>523</b>	<b>13.6</b>	<b>549</b>	<b>13.2</b>	<b>525</b>	<b>13.5</b>	<b>454</b>	<b>12.4</b>	<b>506</b>	<b>12.9</b>	<b>493</b>	<b>13.2</b>
Duals	OTP	*	4.6	*	8.3	*	8.2	12	10.8	16	13.5	16	16.2
	MTS	*	17.1	*	23.3	*	17.5	18	10.2	12	22.3	16	6.9
	PRP	263	11.9	272	12.6	258	12.4	214	11.3	223	12.8	225	10.5
<b>Total</b>		<b>283</b>	<b>11.8</b>	<b>289</b>	<b>12.7</b>	<b>276</b>	<b>12.4</b>	<b>243</b>	<b>11.1</b>	<b>248</b>	<b>13.4</b>	<b>254</b>	<b>10.6</b>
All Participants	OTP	137	10.0	172	11.7	176	11.6	87	8.2	110	11.0	105	9.7
	MTS	54	21.7	41	19.0	36	15.8	55	14.7	37	20.3	50	13.9
	PRP	615	12.9	625	13.0	589	13.4	568	12.5	621	13.0	605	12.7
<b>Grand Total</b>		<b>806</b>	<b>13.0</b>	<b>838</b>	<b>13.0</b>	<b>801</b>	<b>13.1</b>	<b>697</b>	<b>12.0</b>	<b>754</b>	<b>13.0</b>	<b>747</b>	<b>12.3</b>

## Emergency Department Utilization

Table 11 displays the percentage of Health Home study and comparison group participants with at least one ED visit. In CY 2013, 54.8 percent of study group participants had at least one ED visit, rising to 56.6 percent in CY 2014 and then falling slightly in CY 2015 to 56.4 percent. Among participants in the Health Home study group and comparison group receiving services from an MTS provider, the percentage of those with an ED visit decreased by over 7 percentage points between CY 2013 and CY 2015. Dually-eligible participants had lower rates of ED visits than non-dual participants in all calendar years.

**Table 11. Percentage of Participants with at Least One Emergency Department Visit, by Treatment Group, CY 2013 – CY 2015**

		ED Visits					
		Health Home Study Group			Comparison Group		
	Provider Type	CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	63.5%	70.2%	71.1%	63.3%	64.0%	62.0%
	MTS	66.3%	59.4%	58.4%	66.7%	60.6%	64.6%
	PRP	56.6%	58.4%	57.9%	56.6%	59.2%	55.3%
<b>Total</b>		<b>59.0%</b>	<b>61.8%</b>	<b>61.7%</b>	<b>57.9%</b>	<b>59.8%</b>	<b>56.8%</b>
Duals	OTP	67.6%	68.4%	72.5%	63.9%	76.7%	65.9%
	MTS	60.9%	65.4%	57.7%	67.3%	55.2%	50.0%
	PRP	46.4%	46.9%	46.8%	46.0%	45.7%	43.3%
<b>Total</b>		<b>47.4%</b>	<b>48.0%</b>	<b>47.8%</b>	<b>47.3%</b>	<b>47.0%</b>	<b>44.7%</b>
All Participants	OTP	63.8%	70.1%	71.2%	63.4%	65.3%	62.4%
	MTS	65.4%	60.6%	58.3%	66.9%	58.6%	59.2%
	PRP	52.1%	53.2%	52.7%	52.5%	53.8%	50.6%
<b>Grand Total</b>		<b>54.8%</b>	<b>56.6%</b>	<b>56.4%</b>	<b>54.3%</b>	<b>55.2%</b>	<b>52.3%</b>

## Ambulatory Care Utilization

An ambulatory care visit is defined as contact with a doctor or nurse practitioner in a clinic, physician's office, or hospital outpatient department.<sup>7</sup> Ambulatory care utilization often serves as a measure of access to care. Higher rates of ambulatory care can offer an alternative to less efficient care for non-emergent conditions in an ED visit setting as well as prevent a condition from becoming exacerbated to the extent that it requires an inpatient admission.

<sup>7</sup> This definition excludes ED visits, hospital inpatient services, substance abuse treatment, mental health, home health, x-ray, and laboratory services.



Table 12 presents the percentage of Health Home study and comparison group participants with at least one ambulatory care visit. Over the evaluation period, the percentage of Health Home participants in the study group with an ambulatory care visit was 94.0 percent in CY 2013, 95.2 percent in CY 2014, and 94.9 percent in CY 2015. The ambulatory care visit rate for the comparison group dropped from 92.4 percent in CY 2013 to 90.5 percent in CY 2015.

In each calendar year, participants in both the study and comparison groups who received services from a PRP provider had a higher rate of ambulatory care utilization compared to participants receiving services from the other provider types. Dually-eligible participants in the study group had higher rates of ambulatory care utilization than non-dual participants did in CY 2013 and CY 2014, but a slightly lower rate in CY 2015. Dually-eligible participants in the study group had ambulatory care visit rates that were 5.0 percentage points higher than the control group in CY 2013 and 6.3 percentage points higher in CY 2015.

**Table 12. Percentage of Participants with at Least One Ambulatory Care Visit, by Treatment Group, CY 2013 – CY 2015**

		Ambulatory Care Visits					
		Health Home Study Group			Comparison Group		
	Provider Type	CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	85.0%	91.6%	91.2%	87.7%	87.7%	89.0%
	MTS	83.7%	87.1%	88.1%	81.0%	87.9%	85.9%
	PRP	97.2%	97.3%	97.3%	95.4%	94.4%	92.7%
<b>Total</b>		<b>93.2%</b>	<b>95.2%</b>	<b>95.1%</b>	<b>93.3%</b>	<b>93.0%</b>	<b>91.7%</b>
Duals	OTP	78.4%	81.6%	87.5%	88.9%	83.7%	81.8%
	MTS	91.3%	88.5%	76.9%	76.9%	75.9%	84.5%
	PRP	96.3%	95.9%	95.2%	91.3%	89.7%	88.8%
<b>Total</b>		<b>95.6%</b>	<b>95.3%</b>	<b>94.6%</b>	<b>90.6%</b>	<b>88.9%</b>	<b>88.3%</b>
All Participants	OTP	84.6%	90.9%	90.9%	87.8%	87.3%	88.3%
	MTS	85.0%	87.4%	85.8%	79.6%	83.4%	85.4%
	PRP	96.8%	96.7%	96.3%	93.8%	92.5%	91.1%
<b>Grand Total</b>		<b>94.0%</b>	<b>95.2%</b>	<b>94.9%</b>	<b>92.4%</b>	<b>91.5%</b>	<b>90.5%</b>

### Nursing Home Admissions

Table 13 presents information on nursing home stays. In CY 2013, 1.2 percent of participants in the study group and 2.2 percent of participants in the comparison group had at least one nursing home admission. In CY 2015, 2.4 percent of study group participants and 2.7 percent of comparison group participants had a nursing home admission. OTP study group participants had the largest increase in nursing home admissions, from 0.6 percent in CY 2013 to 2.9 percent in CY 2015. In both the study and comparison groups, dually-eligible participants had, on average, lower rates of nursing home admissions than non-dual participants did, with the exception of the



comparison group in CY 2015. For study group participants, the rate of dually-eligible participants with at least one nursing home admission increased from 0.5 percent in CY 2013 to 1.5 percent in CY 2015. These rates were lower than the comparison group of dually-eligible enrollees, which increased from 1.8 percent in CY 2013 to 2.9 percent in CY 2015.

**Table 13. Percentage of Participants with at Least One Nursing Home Admission, by Treatment Group, CY2013 - CY2015**

		Nursing Home Admissions					
		Health Home Study Group			Comparison Group		
		CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Provider Type							
Non-Duals	OTP	0.7%	3.3%	3.1%	2.1%	2.3%	1.6%
	MTS	2.9%	2.0%	3.0%	2.9%	2.0%	1.0%
	PRP	1.8%	2.0%	2.9%	2.6%	2.9%	3.0%
<b>Total</b>		<b>1.6%</b>	<b>2.3%</b>	<b>3.0%</b>	<b>2.4%</b>	<b>2.7%</b>	<b>2.6%</b>
Duals	OTP	0.0%	0.0%	0.0%	2.8%	2.3%	4.5%
	MTS	0.0%	0.0%	0.0%	1.9%	0.0%	3.4%
	PRP	0.5%	0.9%	1.6%	1.7%	2.4%	2.9%
<b>Total</b>		<b>0.5%</b>	<b>0.9%</b>	<b>1.5%</b>	<b>1.8%</b>	<b>2.3%</b>	<b>2.9%</b>
All Participants	OTP	0.6%	3.1%	2.9%	2.1%	2.3%	1.9%
	MTS	2.4%	1.6%	2.4%	2.5%	1.3%	1.9%
	PRP	1.3%	1.5%	2.3%	2.3%	2.7%	2.9%
<b>Grand Total</b>		<b>1.2%</b>	<b>1.8%</b>	<b>2.4%</b>	<b>2.2%</b>	<b>2.6%</b>	<b>2.7%</b>

## Health Care Quality Outcomes

### 30-Day All-Cause Hospital Readmissions

The 30-day all-cause hospital readmission rate, based on National Committee for Quality Assurance (NCQA) definitions, was calculated as the percentage of acute inpatient stays during the measurement year that were followed by an acute inpatient readmission for any diagnosis within 30 days. The HEDIS 2013 specifications identify inclusion criteria for types of stays and hospitals. The HEDIS specifications also limit the population to people continuously enrolled in Medicaid with respect to the date of discharge.

Table 14 displays the percentage of Health Home study and comparison group participants with at least one 30-day all-cause hospital readmission. Participants receiving services from MTS providers had a greater likelihood of having a 30-day all-cause hospital readmission, occurring at almost twice the rate in most years as those enrolled in OTP and PRP programs. Dually-eligible



participants had lower rates of 30-day all-cause hospital readmissions than non-dual participants did in both the study and comparison groups across the study period.

**Table 14. Percentage of Participant with at Least One 30-Day All-Cause-Hospital Readmission, by Treatment Group, CY2013 - CY2015**

		30-Day All-Cause Hospital Readmissions					
		Health Home Study Group			Comparison Group		
	Provider Type	CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	3.6%	6.7%	6.4%	3.8%	4.7%	2.1%
	MTS	18.3%	11.9%	6.9%	12.4%	10.1%	12.1%
	PRP	6.4%	7.3%	6.9%	6.1%	6.0%	6.3%
<b>Total</b>		<b>6.2%</b>	<b>7.4%</b>	<b>6.8%</b>	<b>6.0%</b>	<b>5.9%</b>	<b>5.6%</b>
Duals	OTP	0.0%	2.6%	0.0%	5.6%	4.7%	6.8%
	MTS	0.0%	7.7%	0.0%	1.9%	1.7%	0.0%
	PRP	0.4%	0.6%	0.7%	0.8%	0.8%	0.2%
<b>Total</b>		<b>0.4%</b>	<b>0.8%</b>	<b>0.6%</b>	<b>0.9%</b>	<b>1.0%</b>	<b>0.4%</b>
All Participants	OTP	3.4%	6.5%	6.0%	4.0%	4.7%	2.6%
	MTS	15.0%	11.0%	5.5%	8.9%	7.0%	7.6%
	PRP	3.8%	4.2%	4.0%	4.1%	4.0%	3.8%
<b>Grand Total</b>		<b>4.1%</b>	<b>4.9%</b>	<b>4.4%</b>	<b>4.2%</b>	<b>4.2%</b>	<b>3.7%</b>

### Appropriateness of ED Care

One widely used methodology to evaluate the appropriateness of care in the ED setting is based on classifications developed by the New York University (NYU) Center for Health and Public Service Research (Billings, Parikh, & Mijanovich, 2000). The algorithm assigns probabilities of likelihoods that the ED visit falls into one of the following categories:

1. *Non-emergent*: Immediate care was not required within 12 hours based on patient’s presenting symptoms, medical history, and vital signs.
2. *Emergent but primary care treatable*: Treatment was required within 12 hours, but it could have been provided effectively in a primary care setting (e.g., CAT scan or certain lab tests).
3. *Emergent but preventable/avoidable*: Emergency care was required, but the condition was potentially preventable/avoidable if timely and effective ambulatory care had been received during the episode of illness (e.g., asthma flare-up).
4. *Emergent, ED care needed, not preventable/avoidable*: Ambulatory care could not have prevented the condition (e.g., trauma or appendicitis).



5. *Injury*: Injury was the principal diagnosis.
6. *Alcohol-related*: The principal diagnosis was related to alcohol.
7. *Drug-related*: The principal diagnosis was related to drugs.
8. *Mental-health related*: The principal diagnosis was related to mental health.
9. *Unclassified*: The condition was not classified in one of the above categories.

Table 15 presents the distribution of “non-emergent” ED visits for the Health Home study and comparison groups according to the NYU classification. If a visit is classified as more than 50 percent likely to fall into Categories 1 or 2 as described above, then it is considered “non-emergent.” The estimates presented in the table therefore show the percentage of participants who went to the ED when either immediate care was not required within 12 hours or it could have been provided in a primary care setting.

In CY 2013, 34.2 percent of the study group had a non-emergent ED visit, compared to 33.3 percent of the comparison group. The non-emergent ED visit rate increased for both groups in CY 2014 and then decreased in CY 2015, to 33.4 percent for the study group and 32.0 percent for the comparison group. During the evaluation period, participants receiving services from OTP providers generally had higher rates of non-emergent ED visits than those receiving services from the other provider types.

**Table 15. Percentage of Participants with at Least One Non-Emergent ED Visit, by Treatment Group, CY2013 - CY2015**

		Non-Emergent ED Visits					
		Health Home Study Group			Comparison Group		
		CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	45.4%	49.8%	48.4%	39.5%	43.9%	39.5%
	MTS	41.3%	37.6%	41.6%	41.0%	41.4%	42.4%
	PRP	34.1%	35.4%	34.2%	36.4%	39.3%	34.4%
<b>Total</b>		<b>37.6%</b>	<b>39.6%</b>	<b>38.6%</b>	<b>36.9%</b>	<b>40.2%</b>	<b>35.6%</b>
Duals	OTP	51.4%	57.9%	35.0%	41.7%	55.8%	40.9%
	MTS	39.1%	30.8%	38.5%	34.6%	39.7%	17.2%
	PRP	27.2%	26.4%	24.4%	25.7%	26.4%	25.4%
<b>Total</b>		<b>28.2%</b>	<b>27.5%</b>	<b>25.1%</b>	<b>26.6%</b>	<b>27.8%</b>	<b>25.6%</b>
All Participants	OTP	45.8%	50.3%	47.6%	39.7%	45.1%	39.7%
	MTS	40.9%	36.2%	40.9%	38.9%	40.8%	33.1%
	PRP	31.1%	31.3%	29.6%	32.3%	34.2%	30.8%
<b>Grand Total</b>		<b>34.2%</b>	<b>35.0%</b>	<b>33.4%</b>	<b>33.3%</b>	<b>35.7%</b>	<b>32.0%</b>



## Health Care Cost Outcomes<sup>8</sup>

The following tables present preliminary data on the costs of health care for participants in the study and comparison groups. The estimated costs for CY 2015 should be considered preliminary due to the limited amount of time that has passed for adjudication of these claims and encounters. The interim administrative claims and encounter data that are available at this point may be missing payment information, and/or reversals of payment denials may not be reflected. In addition, these data have not been revised to exclude outliers with extremely high or low total costs. Given the small sample size for some of the sub-populations, those outliers may have a significant effect on the average costs per group.

The cost estimates are based on capitation and fee-for-service (FFS) payment information. Capitation summaries included regular monthly payments made by DHMH to a member's managed care organization (MCO) and "kick" payments made to a MCO for births and hepatitis C treatments. FFS payments were stratified into the following six reporting categories: inpatient, outpatient, professional fees, and all other costs (e.g., pharmacy, dental, long-term care, and home health).

Table 16 presents the average health care costs for hospital inpatient admissions by treatment group for CYs 2013 through 2015. Average hospital inpatient health costs for participants in the Health Homes study group decreased from CY 2013 to CY 2015, while costs for participants in the comparison group increased during this study period. Total inpatient costs for the study group decreased slightly from \$10,884 in CY 2013 to \$10,125 in CY 2015, while total inpatient costs for the comparison group increased from \$10,741 in CY 2013 to \$11,821 in CY 2015. This trend was not observed among dually-eligible Health Home participants, whose average hospital inpatient health care costs increased between CY 2013 and CY 2015.

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<sup>8</sup> While the amounts charged for health care services are available on FFS claims, managed care encounters do not list payment amounts reliably. Costs for health care services received by participants covered by a Medicaid managed care organization are estimated through an imputation methodology.



**Table 16. Average Hospital Inpatient Health Care Costs by Treatment Group and Provider Type, CY 2013- CY 2015**

		Average Hospital Inpatient Health Costs					
		Health Home Study Group			Comparison Group		
	Provider Type	CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	\$18,049	\$32,974	\$15,038	\$13,570	\$17,940	\$16,365
	MTS	\$26,138	\$19,223	\$23,463	\$23,715	\$27,201	\$26,174
	PRP	\$17,082	\$17,540	\$19,411	\$20,254	\$19,969	\$21,226
<b>Total</b>		<b>\$19,228</b>	<b>\$19,473</b>	<b>\$17,565</b>	<b>\$19,925</b>	<b>\$20,274</b>	<b>\$21,189</b>
Duals	OTP	\$1,404	\$1,479	\$1,820	\$5,854	\$2,621	\$5,022
	MTS	\$1,885	\$3,438	\$1,564	\$3,259	\$5,849	\$1,936
	PRP	\$1,870	\$2,114	\$2,363	\$2,044	\$2,618	\$2,028
<b>Total</b>		<b>\$1,908</b>	<b>\$2,231</b>	<b>\$2,262</b>	<b>\$2,285</b>	<b>\$2,785</b>	<b>\$2,198</b>
All Participants	OTP	\$12,501	\$23,975	\$12,394	\$10,426	\$13,051	\$12,584
	MTS	\$17,605	\$14,762	\$15,642	\$14,510	\$18,660	\$16,231
	PRP	\$8,470	\$8,190	\$8,691	\$10,578	\$11,052	\$11,411
<b>Grand Total</b>		<b>\$10,884</b>	<b>\$10,882</b>	<b>\$10,125</b>	<b>\$10,741</b>	<b>\$11,670</b>	<b>\$11,822</b>

Table 17 presents the average health care costs for outpatient health care by treatment group for CY 2013 through CY 2015. Average outpatient health costs increased across the study period for both the Health Home study group and the comparison group. Outpatient health costs were slightly higher for participants in the study group for both duals and non-duals. Among non-duals, MTS participants had higher average outpatient costs than OTP and PRP program participants did.



**Table 17. Average Outpatient Health Care Costs by Treatment Group and Provider Type, CY 2013- CY 2015**

		Average Outpatient Health Costs					
		Health Home Study Group			Comparison Group		
	Provider Type	CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	\$2,591	\$1,855	\$4,424	\$1,497	\$3,266	\$3,743
	MTS	\$7,113	\$9,166	\$8,938	\$4,133	\$5,770	\$6,905
	PRP	\$3,818	\$4,458	\$5,167	\$3,839	\$3,907	\$4,401
<b>Total</b>		<b>\$4,226</b>	<b>\$4,724</b>	<b>\$5,860</b>	<b>\$3,595</b>	<b>\$3,936</b>	<b>\$4,465</b>
Duals	OTP	\$529	\$941	\$634	\$1,993	\$1,502	\$1,122
	MTS	\$652	\$723	\$807	\$1,143	\$932	\$1,245
	PRP	\$1,312	\$1,100	\$1,110	\$1,064	\$1,147	\$973
<b>Total</b>		<b>\$1,347</b>	<b>\$1,199</b>	<b>\$1,196</b>	<b>\$1,118</b>	<b>\$1,162</b>	<b>\$990</b>
All Participants	OTP	\$2,137	\$1,634	\$3,571	\$1,652	\$2,706	\$2,937
	MTS	\$3,787	\$4,301	\$4,701	\$2,445	\$2,979	\$4,027
	PRP	\$2,183	\$2,172	\$2,381	\$2,186	\$2,270	\$2,373
<b>Grand Total</b>		<b>\$2,641</b>	<b>\$2,777</b>	<b>\$3,262</b>	<b>\$2,175</b>	<b>\$2,352</b>	<b>\$2,495</b>

Table 18 presents the average health care costs for professional services (including costs for physicians and specialists) by treatment group for CY 2013 through CY 2015. Average health care costs for professional services increased among the participants in the Health Home study group between CY 2013 and CY 2015, while costs decreased among the comparison group during the same time period. Study group participants had higher average professional health care costs than participants in the comparison group did across the study period, regardless of dual-eligibility status or provider type.



**Table 18. Average Professional Services Health Care Costs by Treatment Group and Provider Type, CY 2013- CY 2015**

		Average Professional Health Costs					
		Health Home Study Group			Comparison Group		
	Provider Type	CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	\$4,545	\$4,129	\$7,623	\$2,047	\$2,290	\$5,024
	MTS	\$15,781	\$17,576	\$18,247	\$9,298	\$9,427	\$9,209
	PRP	\$19,932	\$19,892	\$19,886	\$8,926	\$8,081	\$8,291
<b>Total</b>		<b>\$13,478</b>	<b>\$13,815</b>	<b>\$15,202</b>	<b>\$8,183</b>	<b>\$7,399</b>	<b>\$7,698</b>
Duals	OTP	\$6,014	\$7,135	\$8,207	\$4,355	\$3,952	\$5,080
	MTS	\$15,657	\$16,362	\$16,894	\$10,255	\$10,091	\$9,337
	PRP	\$23,144	\$23,201	\$22,579	\$11,111	\$10,052	\$9,304
<b>Total</b>		<b>\$20,461</b>	<b>\$20,942</b>	<b>\$20,795</b>	<b>\$10,883</b>	<b>\$9,845</b>	<b>\$9,179</b>
All Participants	OTP	\$4,715	\$4,435	\$7,677	\$2,354	\$2,536	\$5,030
	MTS	\$15,743	\$17,169	\$17,791	\$9,617	\$9,680	\$9,257
	PRP	\$21,459	\$21,516	\$21,232	\$9,767	\$8,882	\$8,710
<b>Grand Total</b>		<b>\$16,161</b>	<b>\$16,539</b>	<b>\$17,353</b>	<b>\$9,165</b>	<b>\$8,333</b>	<b>\$8,252</b>



Table 19 presents the average health care costs for all other services by treatment group for CYs 2013 through 2015. Other services include prescriptions, long-term care, home health, dental, capitation payments, kick payments, and any other service incurred. Among all participants, other services health costs increased from CY 2013 to CY 2015. As a whole, participants in the Health Home study group had lower other services health costs than the comparison group did. Other services health costs for dually-eligible Health Home participants were less than half of costs for dually-eligible participants in the comparison group in CY 2014 and CY 2015.

**Table 19. Average Other Services Health Care Costs by Treatment Group and Provider Type, CY 2013- CY 2015**

		Average Other Services Health Costs					
		Health Home Study Group			Comparison Group		
	Provider Type	CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	\$13,876	\$18,421	\$19,585	\$12,855	\$16,770	\$18,710
	MTS	\$19,206	\$23,840	\$24,120	\$16,654	\$18,639	\$18,619
	PRP	\$16,522	\$19,123	\$19,966	\$15,661	\$18,945	\$19,400
<b>Total</b>		<b>\$15,528</b>	<b>\$18,840</b>	<b>\$19,760</b>	<b>\$15,124</b>	<b>\$18,417</b>	<b>\$19,115</b>
Duals	OTP	\$4,319	\$3,631	\$5,407	\$9,857	\$9,547	\$10,115
	MTS	\$6,583	\$10,852	\$8,164	\$20,763	\$16,446	\$19,510
	PRP	\$8,193	\$8,274	\$9,296	\$15,625	\$18,726	\$22,624
<b>Total</b>		<b>\$8,380</b>	<b>\$8,494</b>	<b>\$9,063</b>	<b>\$15,705</b>	<b>\$18,255</b>	<b>\$22,132</b>
All Participants	OTP	\$13,626	\$17,994	\$19,248	\$12,758	\$16,426	\$18,405
	MTS	\$17,662	\$22,266	\$22,760	\$17,176	\$18,222	\$18,780
	PRP	\$15,077	\$16,978	\$17,812	\$15,655	\$18,906	\$19,965
<b>Grand Total</b>		<b>\$14,669</b>	<b>\$17,429</b>	<b>\$18,231</b>	<b>\$15,205</b>	<b>\$18,392</b>	<b>\$19,580</b>



Table 20 presents the total average health care costs by treatment group for CYs 2013 through 2015. Total average health care costs increased across the study period for participants in the study and comparison groups. Participants in the Health Home study group had higher total average health care costs than participants in the comparison group, with the exception of dually-eligible participants receiving services through an OTP provider. These participants had lower average total health costs than their non-Health Homes counterparts.

**Table 20. Average Total Health Care Costs per Person by Treatment Group and Provider Type, CY 2013- CY 2015**

		Average Total Health Care Costs					
		Health Home Study Group			Comparison Group		
	Provider Type	CY 2013	CY 2014	CY 2015	CY 2013	CY 2014	CY 2015
Non-Duals	OTP	\$18,796	\$24,758	\$29,924	\$14,861	\$20,322	\$25,471
	MTS	\$44,021	\$48,709	\$49,693	\$31,703	\$33,684	\$34,715
	PRP	\$39,845	\$42,284	\$43,444	\$27,246	\$29,696	\$30,750
<b>Total</b>		<b>\$31,425</b>	<b>\$36,032</b>	<b>\$39,007</b>	<b>\$25,189</b>	<b>\$28,097</b>	<b>\$29,804</b>
Duals	OTP	\$ 7,966	\$ 9,243	\$10,417	\$11,565	\$10,237	\$11,247
	MTS	\$18,875	\$20,551	\$19,361	\$18,296	\$18,272	\$17,873
	PRP	\$26,125	\$26,355	\$26,030	\$17,092	\$17,426	\$17,647
<b>Total</b>		<b>\$23,647</b>	<b>\$24,344</b>	<b>\$24,395</b>	<b>\$17,029</b>	<b>\$17,266</b>	<b>\$17,479</b>
All Participants	OTP	\$17,842	\$23,317	\$28,108	\$14,590	\$19,302	\$24,086
	MTS	\$36,406	\$39,323	\$39,697	\$27,292	\$28,017	\$28,630
	PRP	\$33,337	\$34,488	\$34,762	\$23,445	\$24,963	\$25,614
<b>Grand Total</b>		<b>\$28,625</b>	<b>\$31,675</b>	<b>\$33,416</b>	<b>\$22,439</b>	<b>\$24,306</b>	<b>\$25,430</b>



## Section 5. Health Home Regression Analysis Results

This section of the report presents the results of regression analyses that tested the effects of Health Home participation on health care utilization, care quality, and cost outcomes. Multivariate regression analysis is a method for understanding the relationship between an outcome of interest (e.g., inpatient admission or emergency department visit) and independent variables expected to affect that dependent variable (e.g. participation in a program expected to improve health outcomes). Lacking a randomized experimental design for this study, it is essential to control for differences in characteristics of the patients in the study group and control group by adding independent variables to measure those characteristics in the regression model. Explicitly including data on measures (e.g. age, health status, and program) that may influence the dependent variable allows the model to rigorously assess the effect of the primary independent variable(s) of interest (e.g. emergency department use).<sup>9</sup>

The regression method used to analyze the effects of participation in the Health Home program was difference-in-differences. Difference-in-differences is a quasi-experimental method used to examine the effects of program interventions in which the outcomes hypothesized to be impacted by program participation are obtained for both the treatment and comparison group before and after program implementation. The tables and figures below present the unadjusted average CY 2013 and CY 2015 results as well as the difference-in-differences regression results for the study and comparison groups. A detailed description of the methodology and regression models used for the various outcomes is included in Appendix B.

### Emergency Department Utilization

Figure 9 presents the unadjusted average number of ED visits per year. The average number of ED visits did not change significantly between CY 2013 and CY 2015 for either group and rose slightly for the study group. In CY 2013, the average number of ED visits for the study group was 2.20 and the average number of ED visits per year was 2.30 for the comparison group. In CY 2015, the average number of ED visits per year was 2.32 for the study group and 2.30 for the comparison group.

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<sup>9</sup> Rubinfeld, D. L. (2000). Reference guide on multiple regression. *Reference manual on scientific evidence*, 179, 425-469.



**Figure 9. Average Number of ED Visits, by Treatment Group, CY 2013 and CY 2015**

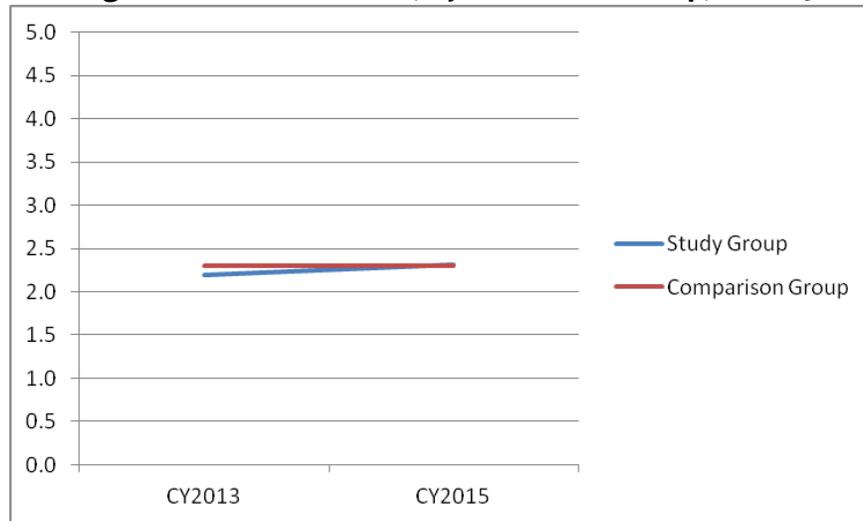


Table 21 presents the negative binomial regression results modeling the effect of participation in the Health Home program on counts of ED visits. Having high or very-high co-morbidity, being a younger adult, being Black, living in the Baltimore Metropolitan Region, and visiting a MTS provider were each associated with higher counts of ED visits. The estimated Incidence Rate Ratio (IRR) for the HH variable is 0.89. This estimate suggests that, holding all other variables constant, if a person in the study group is expected to go the ED 2 times a year, a Health Home participant is expected to go to the ED  $2 \times (0.89) = 1.78$  times a year at baseline. The IRR estimate of 1.03 for the POST variable indicates that both the study and comparison group had 3 percent more visits to the ED in CY 2015 than they did in CY 2013. The IRR estimate of 1.07 for the HH\_POST variable suggests that participating in the HH program is related to having 7 percent more ED visits between CY 2013 and CY 2015, holding all other variables constant.

**Table 21. Results of Regression on Counts of ED Visits, CY 2013 and CY 2015**

OUTCOME: Counts of ED Visits			
Negative Binomial Regression Model			
Independent Variable Name	Independent Variable Description	Incidence Rate Ratio Estimates	
HH	Health Home Program Indicator	0.89	**
POST	POST Time Period Indicator (CY2015)	1.03	**
HH_POST	HH*POST Interaction Term	<b>1.07</b>	**
RACE/ETHNICITY	Black	1.24	**
SEX	Female	1.09	**
AGE GROUP	40 to 64	0.65	**



ACG COMORBIDITY	High Comorbidity	1.99	**
	Very-High Comorbidity	3.89	**
REGION	Baltimore Metropolitan Region	1.16	**
	Montgomery and Prince George's Counties	0.65	**
	Western Maryland	0.97	
TYPE OF PROVIDER	Visited an OTP Provider During CY2012	0.84	**
	Visited an MTS Provider During CY2012	1.45	**
	Visited a PRP Provider During CY2012	0.73	**
The asterisks are * for 95% statistical significance and ** for 99%.			

### Inpatient Hospital Admissions

Figure 10 presents the unadjusted average number of inpatient hospital admissions per year. The average number of inpatient hospital admissions per year went down for the study group between CY 2013 and CY 2015, while remaining the same for the comparison group for the same period. In CY 2013, the average number of inpatient hospital admissions was 0.47 for the study group and 0.42 for the comparison group. In CY 2015, the average number of inpatient hospital admissions per year for the study group dropped slightly to 0.44 and the average number of inpatient hospital admissions per year for the comparison group remained at 0.42.

**Figure 10. Average Number of Inpatient Hospital Admissions, by Treatment Group, CY 2013 and CY 2015**

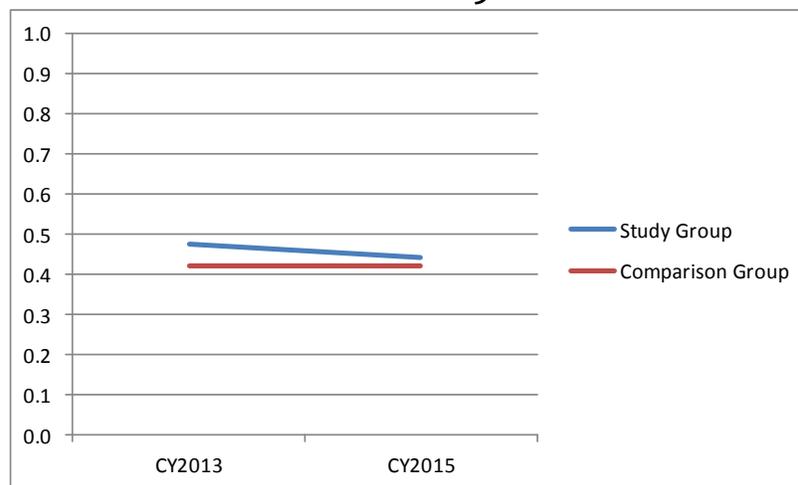


Table 22 presents the regression results modeling the effect of participation in the Health Home program on counts of inpatient hospital admissions. Having high or very-high co-morbidity, being a younger adult, living in Baltimore, Montgomery, or Prince George's County, and visiting



an MTS provider were each associated with higher inpatient hospital admissions counts. The IRR estimate of 1.07 for the HH variable indicates that those in the Health Home program have 7 percent more inpatient hospital admissions than those in the comparison group. The IRR estimate of 1.07 for the POST variable indicates that the study and comparison group have 7 percent more inpatient hospital admissions in CY 2015 than they did in CY 2013. The IRR estimate of 0.93 for the HH\_POST variable suggests that participating in the HH program is related to having 7 percent fewer inpatient hospital admissions between CY 2013 and CY 2015, holding all other variables constant.

**Table 22. Results of Regression on Counts of Inpatient Hospital Admissions, CY 2013 and CY 2015**

<b>OUTCOME: Counts of Inpatient Hospital Admissions</b>			
<b>Negative Binomial Regression Model</b>			
<b>Independent Variable Name</b>	<b>Independent Variable Description</b>	<b>Incident Rate Ratio Estimates</b>	
HH	Health Home Program Indicator	1.07	**
POST (CY15)	POST Time Period Indicator (CY2015)	1.07	**
HH_POST	HH*POST Interaction Term	<b>0.93</b>	<b>**</b>
RACE/ETHNICITY	Black	1.04	**
SEX	Female	1.00	**
AGE GROUP	40 to 64	0.74	**
ACG COMORBIDITY	High Comorbidity	1.77	**
	Very-High Comorbidity	3.52	**
REGION	Baltimore Metropolitan Region	1.41	**
	Montgomery and Prince George's Counties	1.30	**
	Western Maryland	1.20	**
TYPE OF PROVIDER	Visited an OTP Provider During CY2012	0.80	**
	Visited an MTS Provider During CY2012	1.72	**
	Visited a PRP Provider During CY2012	0.76	**
The asterisks are * for 95% statistical significance and ** for 99%.			

### Non-Emergent Emergency Department Visits

Figure 11 presents the unadjusted average number of non-emergent ED visits per year. The number of ED visits classified as non-emergent dropped for both the comparison and study groups between CY 2013 and CY 2015. In CY 2013, the average number of non-emergent ED visits was 1.53 for the study group and 1.59 for the comparison group. In CY 2015, the average number of non-emergent ED visits per year was 0.84 for the study group and 0.86 for the comparison group.



**Figure 11. Average Number of Non-Emergent ED Visits, by Treatment Group, CY 2013 and CY 2015**

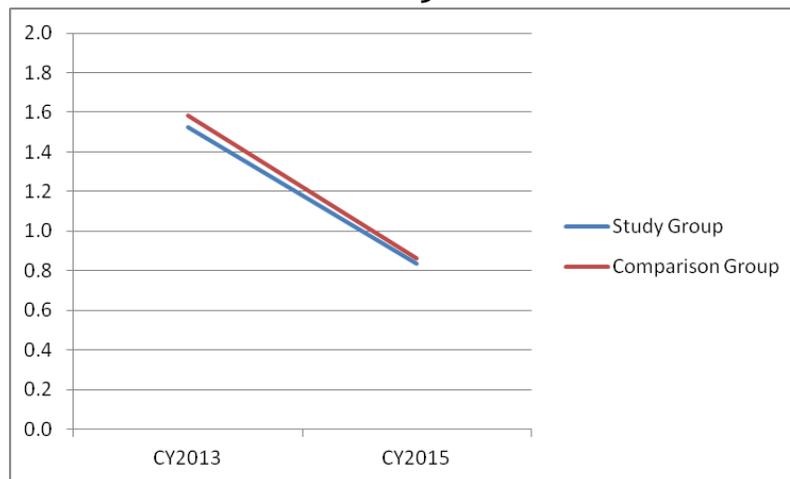


Table 23 presents the regression results modeling the effect of participating in the Health Home program on counts of non-emergent ED visits. Having high or very-high co-morbidity, being Black, being a younger adult, and visiting an MTS provider were each associated with higher non-emergent ED visit counts. People living in Montgomery and Prince George’s Counties and those that visited a PRP provider were less likely to have a non-emergent ED visit. The IRR estimate for the HH variable indicates that those in the Health Home program have 12 percent fewer non-emergent ED visits than those in the comparison group. The IRR estimate of 0.58 for the POST variable indicates that the study and comparison group had 42 percent fewer non-emergent ED visits in CY 2015 than they did in CY 2013. The IRR estimate of 1.02 for the HH\_POST variable suggests that participating in the HH program is related to having 2 percent more non-emergent ED visits between CY 2013 and CY 2015, holding all other variables constant.

**Table 23. Results of Regression on Counts of Non-Emergent ED Visits, CY 2013 and CY 2015**

OUTCOME: Counts of Non-Emergent ED Visits			
Negative Binomial Regression Model			
Independent Variable Name	Independent Variable Description	Incident Rate Ratio Estimates	
HH	Health Home Program Indicator	0.88	**
POST (CY15)	POST Time Period Indicator (CY2015)	0.58	**
HH_POST	HH*POST Interaction Term	<b>1.02</b>	**
RACE/ETHNICITY	Black	1.37	**
SEX	Female	1.24	**



AGE GROUP	40 to 64	0.73	**
ACG COMORBIDITY	High Comorbidity	1.79	**
	Very-High Comorbidity	2.82	**
REGION	Baltimore Metropolitan Region	1.08	**
	Montgomery and Prince George's Counties	0.53	**
	Western Maryland	0.99	**
TYPE OF PROVIDER	Visited an OTP Provider During CY2012	0.91	**
	Visited an MTS Provider During CY2012	1.18	**
	Visited a PRP Provider During CY2012	0.78	**
The asterisks are * for 95% statistical significance and ** for 99%.			

Figure 12 presents the unadjusted percentages of participants with at least one avoidable hospital admission (PQI) per year. The percent of the population with an avoidable hospital admission increased slightly for both the study and comparison groups. In CY 2013, 1.91 percent of the study group had a PQI and 1.79 percent of the comparison group had a PQI. In CY 2015, 2.31 percent of the study group had a PQI and 1.98 percent of the comparison group had a PQI.

### Avoidable Hospital Admissions

**Figure 12. Percentage of Participants with at Least One Avoidable Hospital Admission, by Treatment Group, CY 2013 and CY 2015**

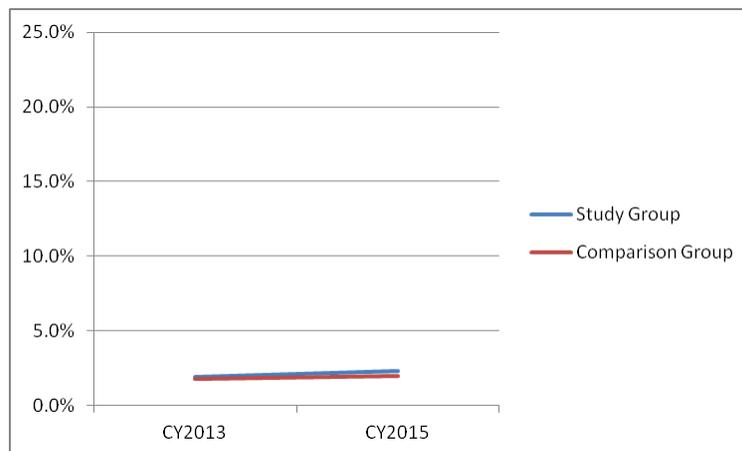


Table 24 presents the regression results modeling the effect of participation in the Health Home program on the likelihood of having at least one PQI per year. Having a high or very-high comorbidity, being female, and/or being an older adult were each associated with increased likelihoods of having a PQI. People who visited a PRP were about half as likely to have a PQI as those that did not. The IRR estimates for the HH, POST, and HH\_POST variables indicate that



there is no significant relationship between joining the program, time passing from CY 2013 and CY 2015, or participating in the program over time on the likelihood of an avoidable admission.

**Table 24. Results of Regression on the Likelihood of an Avoidable Hospital Admission, CY 2013 and CY 2015**

<b>OUTCOME: Likelihood of an Avoidable Hospital Admission</b>			
<b>Logistic Regression Model</b>			
<b>Independent Variable Name</b>	<b>Independent Variable Description</b>	<b>Odds Ratio Estimates</b>	
HH	Health Home Program Indicator	0.93	
POST (CY15)	POST Time Period Indicator (CY2015)	1.11	
HH_POST	HH*POST Interaction Term	1.10	
RACE/ETHNICITY	Black	1.19	
SEX	Female	1.47	**
AGE GROUP	40 to 64	1.74	**
ACG COMORBIDITY	High Comorbidity	1.78	**
	Very-High Comorbidity	5.76	**
REGION	Baltimore Metropolitan Region	1.43	
	Montgomery and Prince George's Counties	1.36	
	Western Maryland	1.59	
TYPE OF PROVIDER	Visited an OTP Provider During CY2012	1.24	
	Visited an MTS Provider During CY2012	1.12	
	Visited a PRP Provider During CY2012	0.49	**
The asterisks are * for 95% statistical significance and ** for 99%.			

### 30-Day Hospital Readmissions

Figure 13 presents the unadjusted percentages of participants with at least one 30-day hospital readmission per year. The percent of the population with a 30-day hospital readmission increased slightly for the study group while dropping slightly for the comparison group. In CY 2013, 4.13 percent of the study group had a 30-day hospital readmission, and 4.22 percent of the comparison group had a 30-day hospital readmission. In CY 2015, 4.41 percent of the study group had a 30-day hospital readmission, and 3.74 percent of the comparison group had a 30-day hospital readmission.



**Figure 13. Percentage of Participants with at Least One 30-Day Hospital Readmission, by Treatment Group, CY 2013 and CY 2015**

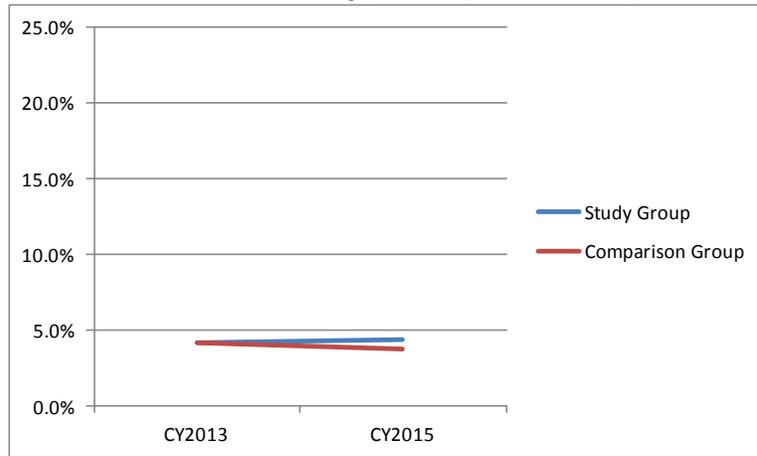


Table 25 presents the regression results modeling the effect of participating in the Health Home program on the likelihood of having at least one 30-day hospital readmission per year. Having a high or very-high co-morbidity, being Black and/or a younger adult, and visiting an MTS provider were each associated with increased likelihoods of having a 30-day hospital readmission. The odds ratio estimates for the HH, POST, and HH\_POST variables indicate that there is no significant relationship between joining the program, time passing from CY 2013 and CY 2015, or participating in the Health Home program between CY 2013 and CY 2015 on the likelihood of an avoidable admission.

**Table 25. Results of Regression on the Likelihood of a 30-day Hospital Readmission, CY 2013 and CY 2015**

OUTCOME: Likelihood of a 30-Day Hospital Readmission			
Logistic Regression Model			
Independent Variable Name	Independent Variable Description	Odds Ratio Estimates	
HH	Health Home Program Indicator	0.91	
POST (CY15)	POST Time Period Indicator (CY2015)	0.88	
HH_POST	HH*POST Interaction Term	1.22	
RACE/ETHNICITY	Black	1.30	**
SEX	Female	0.96	
AGE GROUP	40 to 64	0.66	**
ACG COMORBIDITY	High Comorbidity	1.72	**
	Very-High Comorbidity	3.79	**
REGION	Baltimore Metropolitan Region	1.56	**
	Montgomery and Prince George's Counties	1.37	
	Western Maryland	1.31	
TYPE OF	Visited an OTP Provider During CY2012	0.76	



PROVIDER	Visited an MTS Provider During CY2012	1.89	**
	Visited a PRP Provider During CY2012	0.80	
The asterisks are * for 95% statistical significance and ** for 99%.			

### Cost Outcomes

Figure 14 presents the unadjusted average annual total health care costs per year. The average total costs increased for both the study and comparison groups, but the total annual costs for the study group started higher than the comparison group and remained higher. In CY 2013, the average total health care costs of the study group were \$28,148, and the average total health care costs were \$22,109 for the comparison group. In CY 2015, the average total health care costs of the study group increased to \$33,174, and the average total health care costs of the comparison group increased to \$24,911.

**Figure 14. Average Total Annual Health Care Costs, by Treatment Group, CY 2013 and CY 2015**

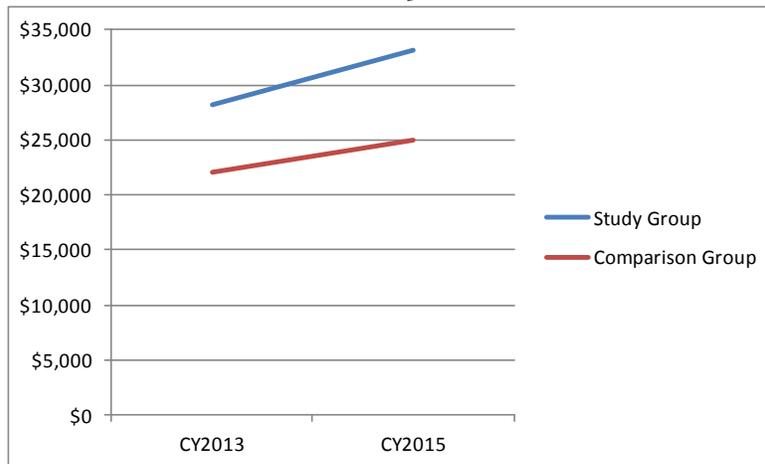


Table 26 presents the regression results modeling the effect of participating in the Health Home program on the log of the total annual health care costs. Higher levels of comorbidities, visiting an MTS and/or PRP provider, and living in the Baltimore Metropolitan, Montgomery and Prince George’s County, or Western regions were each associated with increases in total annual average health care costs. The parameter estimate for the HH variable indicates that those in the Health Home program have 50 percent higher annual health care costs than those in the comparison group. The parameter estimate for the HH\_POST variable suggests that participating in the Health Home program is related to having 24 percent higher total annual health care costs between CY 2013 and CY 2015, holding all other variables constant.



**Table 26. Results of Regression on Total Annual Health Care Costs, CY 2013 and CY 2015**

<b>OUTCOME: Log of the Total Annual Health Care Costs</b>			
<b>Linear Regression Model</b>			
<b>Independent Variable Name</b>	<b>Independent Variable Description</b>	<b>Parameter Estimates</b>	
HH	Health Home Program Indicator	0.50	**
POST (CY15)	POST Time Period Indicator (CY2015)	-0.05	
HH_POST	HH*POST Interaction Term	0.24	**
RACE/ETHNICITY	Black	-0.02	
SEX	Female	-0.01	
AGE GROUP	40 to 64	0.08	**
ACG COMORBIDITY	High Comorbidity	0.24	**
	Very-High Comorbidity	0.54	**
REGION	Baltimore Metropolitan Region	0.22	**
	Montgomery and Prince George's Counties	0.25	**
	Western Maryland	0.10	*
TYPE OF PROVIDER	Visited an OTP Provider During CY2012	0.01	
	Visited an MTS Provider During CY2012	0.56	**
	Visited a PRP Provider During CY2012	0.43	**
The asterisks are * for 95% statistical significance and ** for 99%.			

## Limitations

The data presented in this report were current as of October 31, 2016. Typically, MMIS2 data are not considered complete until 12 months have passed for adjudication of FFS claims and 6 months for submission of managed care encounters. Therefore, measures based on MMIS2 data, particularly for recently occurring time periods, should be considered preliminary.

The results presented in this report should be interpreted with caution, as sufficient time has not passed since the implementation of the program to detect meaningful and sustained differences in long-term health outcomes. Further, increases and decreases in care utilization observed when comparing the Health Home study and comparison groups were small. Due to the limited data available, it is difficult to discern whether fluctuations in utilization can be attributed exclusively to participation in a Health Home or were driven by other causes. The Health Homes often have few participants, especially when limiting the analysis to people who were continuously enrolled for a full calendar year. In addition, the results of this analysis are not generalizable to the Medicaid population at large.

The cost information provided does not exclude outliers with extremely high or low total costs and is not adjusted to account for changes in the fees paid by Medicaid for the same service



received at different points in time. The final evaluation may include other components such as analysis within different time intervals, participants' diagnoses and health services history, and information about the Health Home program implementation.



## Conclusion

Health Homes are intended to improve health outcomes for individuals with chronic conditions by providing patients with an enhanced level of care management and care coordination. The Maryland Health Home program is aimed at Medicaid participants with either a SPMI and/or an opioid SUD and risk of additional chronic conditions due to tobacco, alcohol, or other non-opioid SUD, and children with SED. The information presented in this report provides evidence that Health Homes successfully tie this extremely vulnerable population to social and somatic care services and improve their access to preventive care.

The results of this preliminary analysis suggest that Health Home participants had a strong demand for the Health Home social services, such as care coordination and health promotion. When comparing the study group to a comparison group of Medicaid participants with similar characteristics, the results show mixed results in the overall trends for the health care utilization and outcomes measures for each group. For example, the Health Home study group had larger increases in rates of ambulatory care between CY 2013 and CY 2015 than the comparison group did.

Overall, both the descriptive and regression analyses included in this report do not offer conclusive evidence that Health Home participants experience better health care utilization, quality, and cost outcomes than their control group counterparts. Within the descriptive results, although the comparison group's overall utilization of services was often higher than that of the study group, the comparison group experienced more decreases in inpatient stays, ED visits, 30-day all-cause hospital readmissions, and avoidable ED visits. However, one outcome, inpatient admissions, had recurring positive results. Despite a higher overall rate of inpatient admissions, the descriptive results suggest that the average length of stay for those hospitalized was lower for certain populations within the study group than the comparison group. Additionally, the regression analysis indicates that there was a statistically significantly larger decrease in the frequency of inpatient visits for Health Home participants relative to that of the comparison group between CY 2013 and CY 2015, holding all other variables constant.

A complete evaluation of this program will be completed once more time has passed for the anticipated long-term outcomes to present themselves.



## Appendix A: Evaluation Cohort Selection

To select a group of Medicaid participants to use as an appropriate comparison for the health outcomes of participants in the Health Home program, the team first identified adults that had seen a PRP, OTP, or MTS provider and were continuously enrolled in Medicaid CY 2013 to CY 2015. Once the selection of potential matches was finished, the team implemented propensity score matching—a statistical technique that attempts to select a group of controls with which to compare the study population and minimize potential bias when comparing program-related outcomes. Propensity score matching creates a sample of participants and non-participants that are comparable across a set of independent characteristics theorized to have an effect on the outcomes of interest. By doing this, the groups are constructed to have a relatively similar likelihood of joining the study. For this analysis, the team created propensity scores by estimating a regression of the likelihood of joining the program on the following independent characteristics: geographic region of residence, age, race/ethnicity, gender, ACG co-morbidity grouping, dual, eligibility, and type of Health Home provider seen. The result was a one-to-one match between the study and comparison groups. Each member of comparison group can only be matched to one participant in the study group.

**Table 27. Number of Health Home and Comparison Group Participants**

Selection Criteria	Health Home Participants	Medicaid Participants
Full Group	7,905	1,226,105
Adults (aged 18-64) that had seen a PRP, OTP, or MTS provider and were continuously enrolled in Medicaid CY 2013 to CY 2015	5,468	16,209
Found an appropriate match via the propensity score selection process	3,290	3,290

To develop estimates of the outcomes of interest, the team used the generalized linear model procedure. The procedure takes into account the differences between the two groups, including their outcome variances, participation in the study versus comparison group, as well as the individual's propensity score.

Because of the propensity score method used to select the evaluation cohort, this analysis should not be considered to be generalizable to the Medicaid population at large or to all participants in the Health Home program. The people in the comparison group are only those that sought out care in a PRP, OTP, or MTS facility, as well as meeting the other criteria to match to the study population of interest. Furthermore, developing the group to be studied required reducing the sample by removing cases at the high and low ends of the distributions of the estimates propensity scores.



## Appendix B: Regression Methods

### Model Selection

Multivariate regression analysis is a method for understanding the relationship between a dependent variable (i.e. a specific measured outcome of interest; e.g. inpatient admission or emergency department visit) and independent variables expected to affect the dependent variable. A regression estimates the effects those independent variables have on that outcome by constructing an equation that minimizes differences between the actual values and the values that fit on the curve or line described by the equation. Lacking a randomized experimental design for this study, it is essential to control for systematic differences in characteristics of the patients in the study group and control group by adding independent variables to measure those characteristics in the regression model. Explicitly including data on measures (e.g. age, health status, and program) that may influence the dependent variable allows the model to control for these factors and rigorously assess the effect of the primary independent variable(s) of interest on the outcome.<sup>10</sup>

Difference-in-differences (DD) is a quasi-experimental method used to examine the effects of program interventions, such as the Health Homes program. To conduct a DD evaluation, the outcomes hypothesized to be impacted by program participation are obtained for both the treatment and comparison group, before and after program implementation. For this analysis, the outcomes of interest are health care utilization, quality, and cost outcomes. The DD method then estimates whether changes in those dependent variables, between the pre- and post-intervention periods for those that participated in the program, are statistically different from the changes over that time for those that did not participate in the Health Homes program. The benefit of using DD is that each group's baseline outcome serves as the group's own control to account for unobservable but fixed characteristics. A key assumption for DD is that the outcome in the study and comparison groups would change over time in the absence of the treatment such that the baseline difference between groups is a good estimate of what the post-baseline difference would have been. Using propensity score matching to select the comparison group helps to strengthen this assumption (see Appendix A).

In the DD analysis developed for this evaluation, the regression equation has the following structure:

$$Y_i = \beta_0 + \beta_1(HH) + \beta_2(POST) + \beta_3(HH * POST) + \beta_k(\text{Other Controls}) + \varepsilon_i(\text{Error})$$

The values of  $\beta$  are the coefficients of each variable and have the following interpretations:

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<sup>10</sup> Rubinfield, D. L. (2000). Reference guide on multiple regression. *Reference manual on scientific evidence*, 179, 425-469.



$\beta_1$  measures the treatment group effect (i.e. average differences between treatment and control). HH = 1 if the observation is a person participating in the Health Home program. HH = 0 if the observation is a person not participating in the Health Home program.

$\beta_2$  accounts for the time periods. POST = 1 if the observation occurred during CY 2015. POST = 0 if the observation occurred during CY 2013.

$\beta_3$  is the coefficient on HH\_POST, an interaction term, i.e., the product of the HH and POST categorical variables. HH\_POST = 1 if the observation is a person participating in the Health Home program and occurred during CY 2015. Otherwise, HH\_POST = 0.

HH\_POST is the most important term in the DD regression. It represents the true effect of participating in the intervention, because it controls for changes over time that are seen in both the study and comparison group. This removes biases in second period comparisons between the study and comparison group that could be the result of permanent differences between those groups, as well as biases from comparisons over time that could be the result of trends.

$B_k$  is a set of coefficients for the effects of other control variables.

$\beta_0$  and  $\varepsilon_i$  are, respectively, the estimates of the equation's intercept (when all the variables are zero) and the equation's errors (differences between the actual values and the values predicted by the equation). These coefficients are not included in the tables below, as they do not assist with interpretation of the outcomes.

### ***Interpretation of Tables***

Different regression models were selected according to the types of statistical distributions of the outcome variables.

Logistic regression models were used for the likelihood of any:

- Avoidable hospital admissions, and
- 30-day hospital readmissions.

Negative binomial regression models were used for the counts of:

- ED visits,
- Inpatient hospital admissions, and
- Non-emergent ED visits.

A linear regression model was used for:



- Total health care costs, after the costs were converted to logarithms.

In addition, analysts tested alternatives for the selection of the explanatory variables used and years of pre- and post- intervention to include in the models.

The numbers in the tables describing logistic regression results are odds ratio estimates. Odds ratios represent the change in the probability of the outcome of interest resulting from a change in the independent variable of one unit. For example, the odds ratio estimate for a value of “1” on the HH variable for having a non-avoidable hospital admission regression is 0.93 or about 7 percent less likely. An odds ratio less than one means the outcome is less likely; an odds ratio greater than one means an outcome is more likely.

The coefficients in the tables for a negative binomial regression are interpreted differently than the logistic regression results. Because the dependent variable is a count of how many times an outcome occurs over the course of the measurement period, the coefficient is called an Incidence Rate Ratio (IRR). For example, the model of the frequency of ED visits, the estimated IRR for the HH variable is 0.89. This regression estimates that, holding all other variables constant, if a person in the study group is expected to go the ED 2 times a year, a Health Home participant is expected to go to the ED  $2 \times (0.89) = 1.78$  times a year, at baseline. An IRR greater than one means the outcomes are more frequent; an IRR less than one means the outcomes are less frequent.

For the total annual health care costs regression, the cost outcome variable is a continuous measure rather than discrete counts. After converting the costs into logarithms, the parameter estimates for that model represent the percent change in the value of the outcome expected for every one-unit change in the explanatory variable. For example, the parameter estimate for the HH variable is 0.50 in the total annual health care costs regression. This regression estimates that, holding all other variables constant, those in the Health Home group are expected to have 50% higher total costs than those in the comparison group at baseline. Negative regression coefficients predict lower costs, while positive coefficients predict higher costs.



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