New York State Department of Health
Office of Quality and Patient Safety

Risk Factors for High Utilizers of the Emergency Department Among Health Home Enrollees

January 2018

NEW YORK STATE | Department of Health

Introduction

The Health Home (HH) program uses a care management model intended to improve quality outcomes for high risk individuals in New York State. Health Homes are a facet of the Medicaid Redesign Team (MRT) efforts to transform New York State's Medicaid program. The implementation of the Health Home program is an ongoing, multi-year process. In 2012 the Centers for Medicare and Medicaid Services (CMS) approved the NYS Health Home State Plan Amendment to implement Health Home services for Medicaid enrollees with chronic medical conditions and behavioral conditions in New York. The Health Home program is delivered via a care manager, who coordinates the planning and provision of the member's medical, behavioral, and social service needs.[1,2] By providing coordinated, comprehensive services the State believes it can "lower Medicaid costs and reduce preventable hospitalizations, emergency room visits and unnecessary care for Medicaid Members."[3]

This white paper is an introduction to Health Home emergency department (ED) utilization and the beginning of a series of papers discussing opportunities to reduce ED utilization for Medicaid members enrolled in a Health Home. This white paper will:

- Introduce the Health Home program and how it is theorized to impact ED utilization.
- Introduce and define Health Home High Utilizers, a subset of Health Home members which account for approximately 50 percent of Health Home ED utilization.
- Identify a series of risk factors which correlate with a heightened risk of being a high utilizer.

Health Homes:

Health Homes seek to achieve their dual goals via an integrated care coordination model.[4] In a Health Home, a member's service needs are coordinated by a care manager. The care manager leverages the Health Home's provider network to coordinate access to the medical, behavioral, and social services needs of the member. The Health Home provides a platform for sharing assessments, plans of care, and medical records among service providers to prevent the duplication of services and to ensure that providers have up-to-date information regarding the full scope of the member's needs.[1]

This paper focuses on ED utilization for calendar years 2013 through 2015. Health Home eligibility is restricted to Medicaid enrollees with two chronic conditions or a single qualifying condition. The single qualifying conditions are HIV and Serious Mental Illness (SMI).[5,6] Although ED utilization is not a consideration in determining Health Homes eligibility, Medicaid enrollees who qualify for Health Home services are medically complex compared to other Medicaid enrollees and are more likely to use ED services.

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[1] https://www.health.ny.gov/health_care/medicaid/program/update/2012/april12muspec.pdf
[2] https://www.health.ny.gov/health_care/medicaid/program/medicaid_health_homes/
[3] http://www.health.ny.gov/health_care/medicaid/program/medicaid_health_homes/docs/hh_mco_cm_standards.pdf
[4] https://www.medicaid.gov/state-resource-center/medicaid-state-technical-assistance/health-homes-technical-assistance/downloads/health-homes-slide-binder-march-2012-508.pdf
[5] SMI: Office of Quality and Patient Safety defined definition based on SAMHSA guidelines
[6] https://www.health.ny.gov/health_care/medicaid/program/medicaid_health_homes/docs/health_home_chronic_conditions.pdf

For the purposes of this white paper, Health Home members include only non-dual, Medicaid enrollees enrolled in a Health Home at any point during 2013 through 2015. Medicaid enrollees who are dually enrolled in Medicaid and Medicare are excluded from this analysis because utilization records may be absent from the Medicaid claims and encounters data if Medicare paid for the service.

Emergency Department Utilization:

This white paper uses a modified version of the Healthcare Effectiveness Data and Information Set (HEDIS) Ambulatory Care measure (AMB) to identify and count ED utilization. The measure results shown here are modified to include mental health and substance use events, which are normally excluded from the HEDIS AMB-ED utilization measure. This broader definition of ED utilization provides a more comprehensive picture of ED utilization for the populations targeted by the Health Home program. Approximately 70 percent of Health Home members have SMI and approximately 40 percent have substance use disorder (SUD).

Our analysis includes all New York State Medicaid ED utilization which occurred between January 1, 2013, and December 31, 2015. The ED utilization rate will be calculated using the following formula:

$$\frac{ED\ Events}{Member\ Months} * 1{,}000$$

ED events are defined as the number of times members used ED services during calendar years 2013, 2014, and 2015. Member Months are defined as the number of months a member was enrolled in Medicaid. For Health Home members, utilization includes all events during the individual calendar year, regardless of point in time Health Home enrollment for that year. The goal of this analysis is to identify risk factors for high ED utilization among Health Home members, not assess the Health Home's efficacy in reducing that utilization. Again, this is a first step in understanding ED utilization factors among the Health Home population.

For calendar years 2013 through 2015, New York State Medicaid enrollees averaged between 45 and 48 ED visits per 1,000 member months. During the timeframe of this study, average Medicaid ED utilization neither increased or decreased. It is important to note that during this timeframe the individuals in Medicaid can be transient, with new members enrolling and others leaving.

Table 1: Emergency Department Utilization by All Medicaid Enrollees

Year	Distinct Medicaid Members[1]	Visits per 1,000 Member Months
2013	5,364,647	48
2014	6,037,968	46
2015	6,416,494	45

[1]Includes only non-dual Medicaid members

One defining characteristic of ED utilization is that the utilization rate is heavily influenced by a small number of members. Most Medicaid enrollees (over 70 percent in any specific year) never use the ED. The average ED utilization rate is driven by a small number of members who visit the ED frequently. Although only one percent of Medicaid enrollees visit the ED six or more times in a year, they account for 18 percent of all ED visits. Figure 1 below demonstrates the skewed nature of ED utilization.

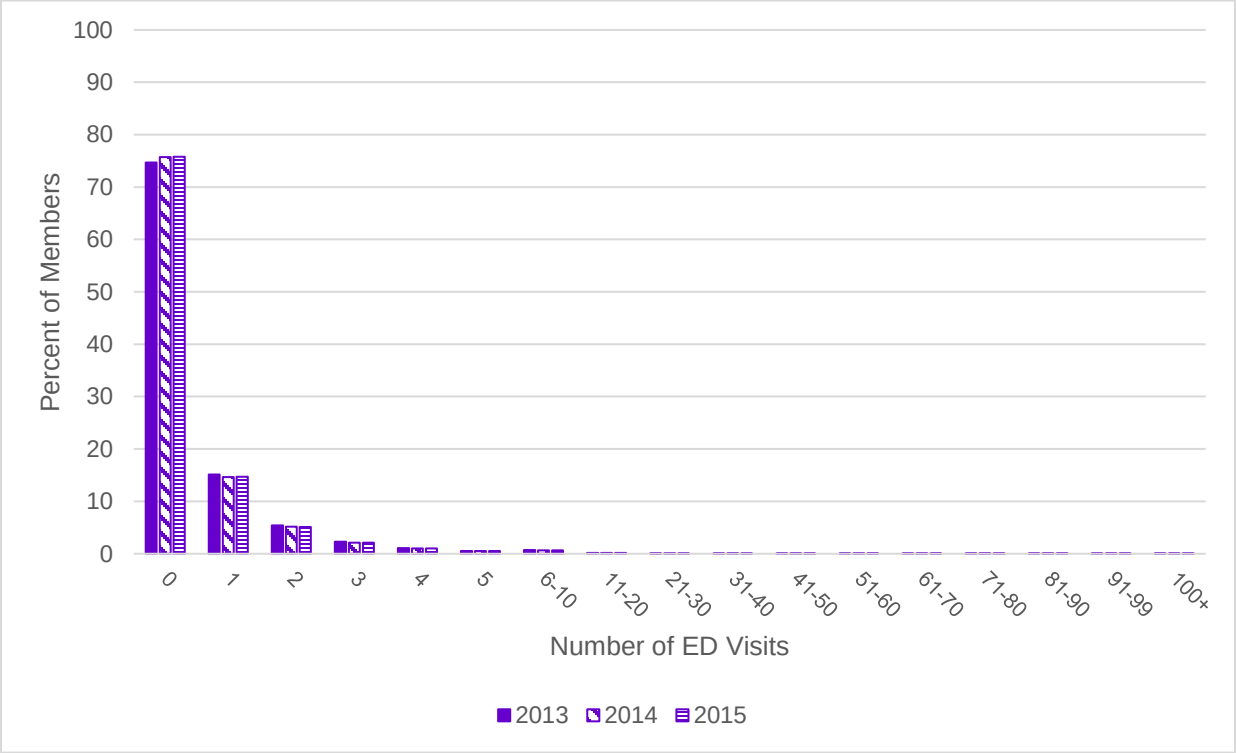

Figure 1: Distribution of Emergency Department Utilization (All Non-Dual Medicaid Enrollees)

As discussed previously, emergency department utilization is not a factor for Health Home eligibility. However, because Health Home members are medically complex, they have a higher average ED utilization rate. On average, Health Home members have an ED utilization rate slightly more than three times higher than the rate for the total Medicaid program. This can be viewed as a byproduct of the successful targeting of complex individuals for Health Home enrollment. This high rate of ED utilization suggests Health Homes members are the medically complex, high-risk, Medicaid enrollees the State intended to target with this program.

Table 2: Emergency Department Utilization by Health Home Members

Year	Distinct Health Home Members[1]	Visits per 1,000 Member Months
2013	50,195	165
2014	85,260	163
2015	115,570	161

[1]Includes only non-dual, enrolled Health Home members

As was seen with the over-all Medicaid program, Health Home emergency department utilization is also driven by a minority of members with exceedingly high utilization. The figure below shows this trend for Health Home members. The percentage of Health Home members with zero utilization (45 percent) is smaller than in the over-all Medicaid program (70 percent), but they remain the largest group. The percentage of Health Home members with one or more ED utilization events are consistently at least double the percentage of the Medicaid program. The Health Home members with 6 or more ED visits make up only 8 percent of enrollees but account for 50 percent of ED visits by all Health Home members.

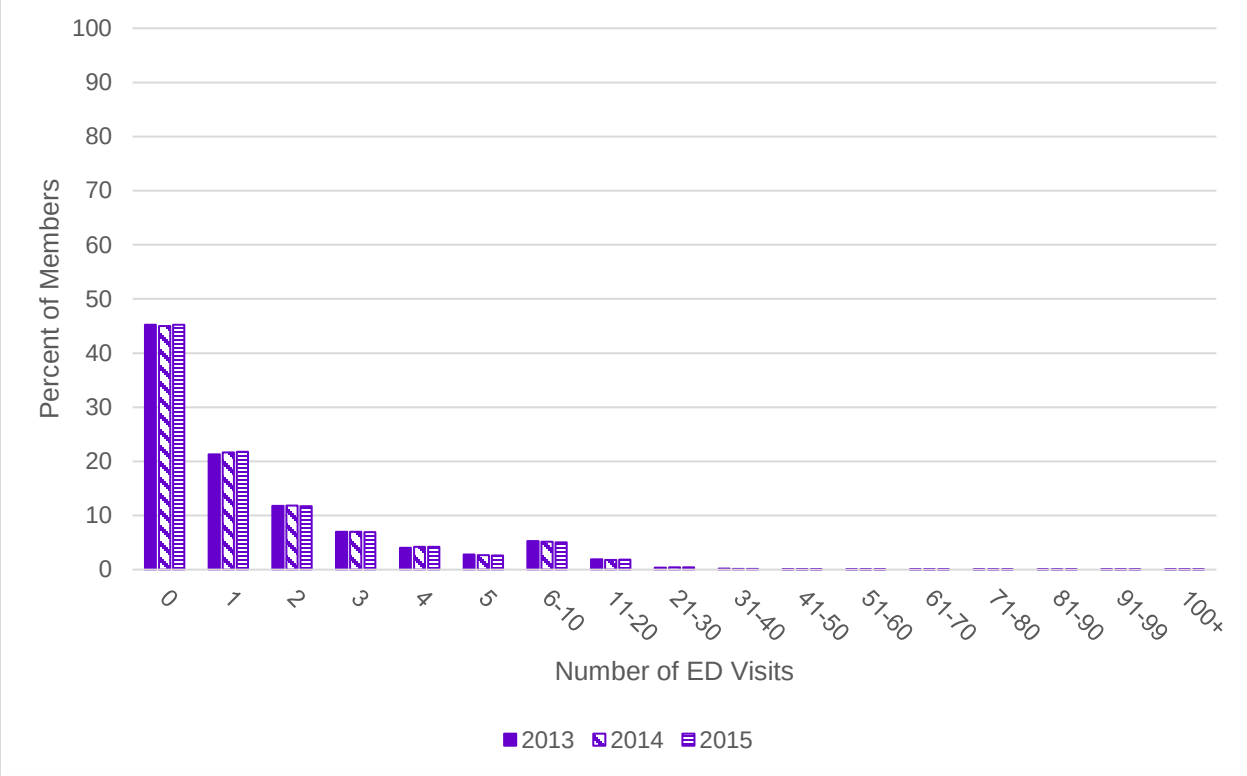

Figure 2: Distribution of Emergency Department Utilization (Non-Dual Health Home Enrolled Members)

On average, 55 percent of Health Home members use the emergency department in any specific calendar year. For measurement year 2015, 63,283 of the 115,570 members used the ED at least once. For the overall Health Home population, the average number of days between ED events was 42, compared to members with six or more ED events in a year having an average of 24 days between ED visits. Health Homes will be able to better target preventative services if they can identify members who are at high risk for frequent ED utilization. This paper defines members with unusually high ED utilization as Health Home High Utilizers (HU). This group is defined as Health Home members who use the ED six or more times in a calendar year. In the over-all Medicaid program, high utilizers account for only 1 percent of enrolled members. In Health Homes, 8 percent of those enrolled meet this definition. These members also represent an opportunity, because they represent approximately half of the ED utilization. This population is small enough to be targeted by the Health Homes, and it accounts for enough ED utilization to be

worth targeting. Efforts to reduce the emergency department utilization of these members could have a significant impact on the over-all utilization rate of New York State.

By identifying demographic and event risk factors for high utilization, Health Homes and care managers gain a systematic way to identify Health Home members with the highest risk profile. Once identified, these Health Home members could receive targeted services and interventions to prevent or reduce future ED utilization.

Health Home High Utilizers

It has been suggested through other literature that the best way to affect a change in ED use is to define a high utilizer cohort based on the population itself. Choosing a group that accounts for a larger percentage of the ED visits while keeping the cohort small enough so that using resources for policy intervention would be worthwhile.[7] The Health Home High Utilizers (HUs) are responsible for about 50 percent of ED visits of Health Home members but account for only about 8 percent of Health Home membership. This is a small population with recurrent utilization. If identified quickly enough, Health Homes could develop person-specific plans of care to interrupt this utilization and find other ways to meet the members' needs. Providing Health Homes and care managers with a set of risk factors which correlate with higher ED utilization is a realistic first step towards prevention. When Health Homes can identify high-risk members, care managers can prioritize those members for additional interventions and preventative measures.[7]

This paper presents a definition of Health Home high utilizers as Health Home members with six or more ED visits during a single calendar year. These members have an average ED utilization higher than 1,000 events per 1,000 member months, a rate that is approximately ten times higher than non-high utilizers. The substantial utilization of this population creates opportunities and challenges for Health Homes to intervene and change these utilization patterns.

[7] Hunt, K. A., Weber, E. J., Showstack, J. A., Colby, D. C., & Callaham, M. L. (2006). Characteristics of Frequent Users of Emergency Departments. *Annals of Emergency Medicine, 48*(1), 1-7.

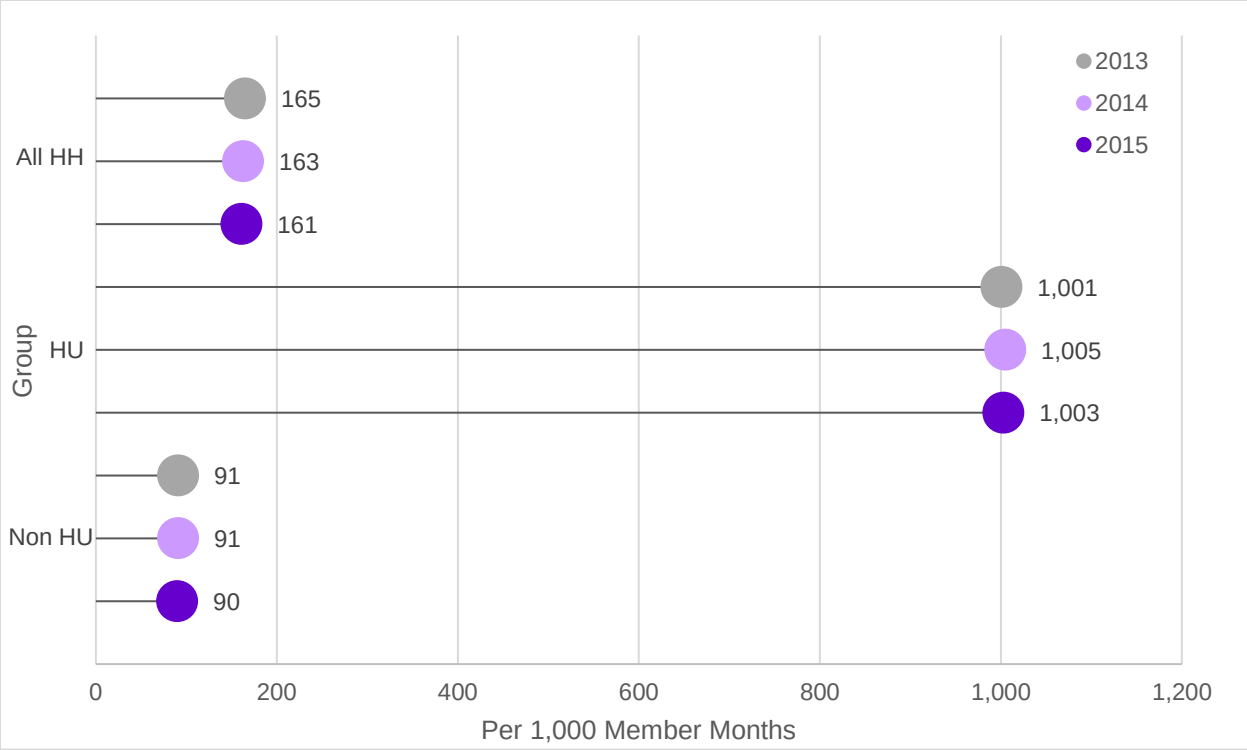

Figure 3: Health Home Emergency Department Utilization Rates (2013-2015)
Only non-dual enrolled Health Home members

Potential risk factors were examined, including both demographic risk factors such as gender and age, and utilization risk factors such as prior inpatient hospitalization.

This white paper uses Odds Ratios (OR) which is a statistical technique that shows the odds that an outcome (high utilizer) will occur give the presence of a particular characteristic (e.g. female) compared to the odds the outcome will occur in the absence of the characteristics (e.g. males).

This white paper does not seek to present a single model for high utilizer risk nor is any claim made about the causality of the risk. The risk factors presented here are almost certainly the end-result of interactions between the variables shown below and other variables beyond the scope of this paper. The goal of presenting this information is to start a conversation in Health Homes and the State. This white paper examines possible risk factors which include:

- Demographic Factors
- Populations of Interest
- Utilization Factors

Demographic Factors

Demographic factors such as age and gender are often used to identify sub-populations which have a higher utilization risk. Demographics examined include:

- age
- gender
- race/ethnicity
- location in NYS

- region in NYS

Tables 3 and 4 present the demographic risk factors examined.

Table 3: Health Home Members by Demographics[1]			
	2013 Distinct Health Home Members N (%)	2014 Distinct Health Home Members N (%)	2015 Distinct Health Home Members N (%)
Age			
0-17	58 (0)	114 (0)	108 (0)
18-44	21,954 (44)	36,454 (43)	48,916 (42)
45-64	27,115 (54)	46,886 (55)	63,717 (55)
65+	1,067 (2)	1,806 (2)	2,829 (3)
Gender			
Female	25,259 (50)	45,105 (53)	62,681 (54)
Male	24,936 (50)	40,155 (47)	52,889 (46)
Location			
New York City	30,055 (60)	46,672 (55)	61,920 (54)
Rest of State	19,859 (40)	38,145 (45)	53,167(46)
Unknown	281(0)	443(0)	483(0)
Region			
Central	2,513 (5)	5,654 (7)	8,562 (7)
Hudson Valley	4,025 (8)	6,764 (8)	8,792 (8)
Long Island	3,774 (8)	6,079 (7)	8,148 (7)
New York City	30,055 (60)	46,672 (55)	61,920 (54)
Northeast	2,485 (5)	4,123 (5)	5,537 (5)
Unknown	281(0)	443(0)	483(0)
Western	7,062 (14)	15,525 (18)	22,128 (19)
Race / Ethnicity			
Asian / Pacific Islander	705 (1)	1,269 (1)	1,905 (2)
Black	17,201 (34)	26,883 (32)	36,745 (32)
Hispanic	13,382 (27)	21,716 (25)	28,219 (24)
Other	2,984 (6)	4,709 (6)	6,243 (5)
Unknown	3,305 (7)	7,339 (9)	10,679 (9)
White	12,618 (25)	23,344 (27)	31,779 (28)
SSI			
SSI	24,411(49)	38,110(45)	47,880(41)
Non-SSI	25,784(51)	47,150(55)	67,690(59)

[1]Includes only non-dual, enrolled Health Home members

Table 4: Association Between Member Risk Factors and Health Home High Utilizer in 2013-2015 by Demographics[1]						
	2013		2014		2015	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Age						
0-17	0.2	0.0,1.7	0.4	0.1,1.2	0.3	0.1,1.1
18-44	1.4	1.3,1.5	1.5	1.4,1.6	1.5	1.4,1.5
45-64	Reference					
65+	0.2	0.1,0.3	0.2	0.1,0.3	0.2	0.2,0.3
Gender						
Female	Reference					
Male	0.9	0.8,0.9	0.9	0.8,0.9	1.0	1.0,1.0
Location						
New York City	Reference					
Rest of State	1.5	1.5,1.7	1.6	1.5,1.7	1.4	1.3,1.4
Unknown	NA[2]					
Region						
Central	2.0	1.7,2.2	2.1	1.9,2.3	1.8	1.7,1.9
Hudson Valley	1.4	1.2,1.5	1.4	1.3,1.5	1.3	1.2,1.4
Long Island	1.1	1.0,1.2	1.2	1.1,1.3	1.0	0.9,1.1
New York City	Reference					
Northeast	2.1	1.8,2.3	2.0	1.8,2.2	1.7	1.5,1.9
Unknown	NA[2]					
Western	1.6	1.5,1.7	1.6	1.5,1.7	1.3	1.2,1.4
Race / Ethnicity						
Asian / Pacific Islander	0.2	0.1,0.4	0.4	0.3,0.5	0.4	0.3,0.5
Black	Reference					
Hispanic	0.8	0.8,0.9	0.8	0.8,0.9	0.8	0.8,0.9
Other	1.2	1.0,1.3	1.0	0.9,1.2	1.0	0.9,1.1
Unknown	NA[2]					
White	1.4	1.3,1.5	1.3	1.2,1.4	1.2	1.1,1.2
SSI						
SSI	1.4	1.3,1.5	1.4	1.3,1.5	1.4	1.3,1.5
Non SSI	Reference					

[1]Includes only non-dual, enrolled Health Home members
[2]NA=Not applicable, Information is not known for members and is not useful for forming policy

Several of these demographic factors are notable. Differences across age and gender were minor. Health Home members living outside of New York City are more likely to be high utilizers than Health Home members living in New York City. Furthermore, this risk is concentrated in the Central, Northeast, and Western regions of New York. White members have the highest odds of any race of being a high utilizer. Although the OR varied across the measurement period, white members have a consistently higher odds of being a high utilizer than the black population.

Members receiving SSI benefits also have slightly higher odds of being a higher utilizer than those not receiving the benefit.

Populations of Interest

Populations of interest examined for this paper include:

- HIV: Members identified as being HIV positive
- SMI: Members identified as having serious mental illness
- SUD: Members identified as having substance use disorder
- Health and Recovery Plan (HARP): Members enrolled in a HARP
- Chronic Only: Members who have not been identified as having HIV, SMI or SUD

Except for members shown as Chronic Only, Health Home members may belong to more than one of the medical populations.

Table 5: Health Home Members by Populations of Interest[1]

	2013 Distinct Health Home Members N (%)	2014 Distinct Health Home Members N (%)	2015 Distinct Health Home Members N (%)
Medical Populations[2]			
Chronic Only	9,095 (18)	17,429 (20)	27,540 (24)
HIV	9,710 (19)	11,465 (13)	12,451 (11)
SMI	33,713 (67)	57,584 (68)	75,088 (65)
SUD	20,871 (42)	33,024 (39)	43,243 (37)
HARP Enrolled			
Yes	NA[3]	NA[3]	14,099 (12)
No	NA[3]	NA[3]	101,471 (88)

[1]Includes only non-dual, enrolled Health Home members
[2]Medical Populations are not mutually exclusive. Members may belong to more than one group with the exception of Chronic Only.
[3]NA=Not applicable, HARP program did not start until 2015

The goal of this paper is to identify risk factors for high ED utilization, not to build a formal predictive model. Health Home members often have multiple needs, and downstream care management agencies (CMAs) are often domain-specialists. To account for this and the programmatic goals of the Health Home, these populations of interest are shown with overlapping membership. The odds ratios shown below in table 6 compare each population of interest to these Chronic Only members. Table 6 shows that members with SUD and/or SMI have much higher odds of being HU members than Chronic Only members. While not as high as members in the SMI and SUD groups, members belonging to the HIV group (approximately 15 percent of members) have higher odds of becoming a HU than Chronic Only members. Chronic Only members, which make up approximately one quarter of the Health Home population, are the least likely to be ED high utilizers.

Table 6: Health Home Odds Ratios for High Utilizers by Populations of Interest[1]						
	2013 Odds Ratio	95% CI	2014 Odds Ratio	95% CI	2015 Odds Ratio	95% CI
Medical Populations[2]						
Chronic Only	Reference					
HIV	2.2	1.9,2.6	2.4	2.1,2.7	2.5	2.2,2.8
SMI	4.9	4.3,5.6	4.8	4.3,5.3	5.1	4.7,5.6
SUD	6.3	5.4,7.2	6.3	5.7,7.1	7.0	6.4,7.6
HARP Enrolled						
Yes	NA[3]	NA[3]	NA[3]	NA[3]	1.2	1.1,1.3
No	Reference					

[1]Includes only non-dual, enrolled Health Home members
[2]Medical Populations are not mutually exclusive. Members may belong to more than one group with the exception of Chronic Only.
[3]NA=Not applicable, HARP program did not start until 2015

Although SUD and SMI are both strong predictors of belonging to the HU group, we are unable to state whether HARP will be as well. The HARP program began in 2015 and the odds ratios may be affected by who was targeted for the first wave of this program. Further research and analysis into later years of the program is necessary to understand the relationship between HARP enrolled members and high utilization.

Utilization Factors

For this white paper, two types of utilization were examined: duration of continuous Health Home enrollment and inpatient utilization three months before an ED visit. As shown in table 7, continuous enrollment of Health Home members has been slowly trending towards being enrolled for 7-12 months (longer enrollment during a calendar year), increasing from approximately 50 percent of the population in 2013 to about 60 percent in 2015. Currently, the results in Table 8 show that there is no greater odds of becoming a HU for those who are enrolled longer in a Health Home than those who are enrolled for a shorter amount of time for the year. For prior inpatient events, only Health Home members with an ED visit were included in the population for the OR examining inpatient utilization in the three months before an ED visit. Due to the five to six times higher odds of becoming a HU in members with an inpatient visit three months before an ED visit this has been identified as a risk factor. A cross-sectional multicenter ED survey found very similar ORs regarding inpatient visits 3 months before ED use.[8]

[8] Sun, B. C., Burstin, H. R., & Brennan, T. A. (2003). Predictors and Outcomes of Frequent Emergency Department Users. *Academic Emergency Medicine, 10*(4), 320-328.

Table 7: Health Home Members by Utilization Factors[1]			
	2013 Distinct Health Home Members N (%)	2014 Distinct Health Home Members N (%)	2015 Distinct Health Home Members N (%)
Duration of Continuous Health Home Enrollment			
0 - 6	26,475 (53)	37,414 (56)	45,715 (40)
7 - 12	23,720 (47)	47,846 (44)	69,855 (60)
Inpatient Utilization In The Three Months Before an ED Visit[2]			
Yes	9,902 (36)	15,003 (32)	18,321 (29)
No	17,578 (64)	31,902 (68)	44,962 (71)

[1]Includes only non-dual, enrolled Health Home members
[2] Inpatient Utilization in the Three Months Before an ED Visit only includes HH members who had an ED visit

Table 8: Health Home Odds Ratios for High Utilizers by Utilization Factors[1]						
	2013 Odds Ratio	95% CI	2014 Odds Ratio	95% CI	2015 Odds Ratio	95% CI
Duration of Continuous Health Home Enrollment						
0 - 6	Reference					
7 - 12	1.0	0.9,1.1	1.0	0.9,1.0	0.9	0.9,1.0
Inpatient Utilization In The Three Months Before an ED Visit[2]						
Yes	6.0	5.5,6.4	5.1	4.7,5.4	5.5	5.3,5.8
No	Reference					

[1]Includes only non-dual, enrolled Health Home members
[2] Inpatient Utilization in the Three Months Before an ED Visit only includes HH members who had an ED visit

Next Steps

Approximately 8 percent of Health Home members account for about 50 percent of the Health Home ED utilization. These high utilizers present an opportunity for Health Homes to focus resources and preventative measures on a manageable number of members. Key findings that were found to have the biggest impact were the medical subpopulations, specifically the SUD population, which had roughly seven times more odds of being a high utilizer than the chronic population. Possibly one of the more useful potential risk factors determined in this white paper is Health Home members with an IP stay in the three months before an ED visit are more likely to be HUs. When a member has an IP stay, the Health Home knows that there are high odds that this member will be visiting the ED in the next three months and can target this member for interventions intended to prevent the ED visit. While we know that IP stays put patients at higher odds of visiting the ED, we don't know if there are higher odds for one specific type of IP stay over others. To determine this, we plan to investigate if there are differences in the odds of becoming a HU for members who have a medical, surgical or maternity IP stay. Knowing this will help Health Homes to better target members for interventions. In addition to IP stays, previous literature has found that HUs are more likely to have high outpatient utilization and to

have been transported by an ambulance.[9,10,11,12] We plan to investigate to determine if the same is true in our population. Although not as prominent, we found that living outside of New York City has on average a 1.5 greater odds for members to be a high utilizer compared to those living in New York City and there are slightly higher odds, 1.2, of being a high utilizer for the white population compared to the black population. Defining these risk factors and implementing these next steps should help us better understand risks associated with becoming HUs and help Health Homes better target members in the future.

This exploratory research is only the first step in understanding Health Home ED utilization. The risk factors identified in this paper present many questions which must be answered to thoroughly understand why high utilizers use the ED and how to reduce their utilization. High utilizers are a rapidly changing group with approximately 37 percent of these members in one year being a high utilizer the following year, making the development of a predictive model important so that Health Homes can target members at risk of becoming HUs before they do. Previous literature has attempted to create predictive models to predict members who will become HUs using various techniques such as logistic regression and random forest models.[13,14] A critical next step will be to create a model capable of predicting those members who after an initial ED visit are most likely to become a high utilizer while addressing confounders and unexpected risk factors found in this whitepaper. To achieve this, we will need to determine which of the predictive model types has the best ability to predict members at the highest risk of becoming HUs so that Health Homes can identify and target these members.

We have defined a HU in the New York State Health Home population as a member with six or more ED visits during a calendar year. These members account for around 50 percent of ED visits by Health Home members but only make up about 8 percent of the total Health Home population which is a small enough group to be targeted for an intervention. Over the course of this white paper we have identified a several risk factors for high ED use. These risk factors will be able to help Health Homes target members who are potential HUs until a formal predictive model is determined. Our current white paper and future work will contribute to the NYS Health Home State Plan Amendment goal of reducing ED visits.

[9] Funda, K. K., & Immekus, R. (2006). Frequent Users of Massachusetts Emergency Departments: A Statewide Analysis. *Annals of Emergency Medicine, 48*(1), 9-16.
[10]LaCalle, E., & Rabin, E. (2010). Frequent Users of Emergency Departments: The Myths, the Data, and the Policy Implications. *Annals of Emergency Medicine, 56*(1), 42-48.
[11] Hunt, K. A., Weber, E. J., Showstack, J. A., Colby, D. C., & Callaham, M. L. (2006). Characteristics of Frequent Users of Emergency Departments. *Annals of Emergency Medicine, 48*(1), 1-7.
[12] Sun, B. C., Burstin, H. R., & Brennan, T. A. (2003). Predictors and Outcomes of Frequent Emergency Department Users. *Academic Emergency Medicine, 10*(4), 320-328.
[13] Poole, S., Grannis, S., & Shah, N. H. (2016). Predicting Emergency Department Visits. *AMIA Jt Summits Transl Sci Proc*, 438-445.
[14] Billings, J., & Raven, M. C. (2013). Dispelling An Urban Legend: Frequent Emergency Department Users Have Substantial Burden Of Disease. *Health Affairs*, 2099-2108.