Report on Health Behaviors, Utilization, and Health Outcomes in the Healthy Michigan Plan

Healthy Michigan Plan Evaluation Domain III

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EXECUTIVE SUMMARY

The University of Michigan Institute for Healthcare Policy & Innovation (IHPI) is conducting an evaluation of the Healthy Michigan Plan (HMP) as required by the Centers for Medicare & Medicaid Services (CMS) through a contract with the Michigan Department of Health and Human Services (MDHHS). This report presents findings for Domain III, Evaluation of Health Behaviors, Utilization and Health Outcomes, focused on individuals who initially enrolled in the first year of the Healthy Michigan Plan and maintained continuous HMP-Managed Care coverage over two years.

As outlined in the Special Terms and Conditions of Michigan's Section 1115 Demonstration Waiver, the focus of Domain III is to understand the impact of HMP coverage on emergency department (ED), healthy behavior, and inpatient hospitalization rates; and to explore the association of these measures with enrollees' demographic characteristics and with HMP programmatic elements, such as regular primary care visits, completion of a Health Risk Assessment (HRA), and agreement to make a healthy behavior change.

The Domain III evaluation plan specifies four chronic conditions of interest — asthma, cardiovascular disease, chronic obstructive pulmonary disease (COPD), and diabetes — which have both an increased risk of needing emergency department and inpatient care as well as the potential for reducing these types of utilization through regular primary care and adoption of healthy behaviors.

METHODS

Data

This report uses administrative claims to analyze enrollees' initial 24 months of Healthy Michigan Plan-Managed Care (HMP-MC) enrollment. Data were drawn from the MDHHS Data Warehouse, including Medicaid claims across service types (e.g., medical, pharmacy), program enrollment data, demographic characteristics, and completion of health risk assessments. Additional data on vaccines were extracted from the Michigan Care Improvement Registry (MCIR), the statewide immunization information system.

Study Population

The study population included individuals whose initial month of HMP-MC enrollment occurred between April 2014 and March 2015, and who maintained HMP-MC enrollment for at least 11 of 12 months for each of the next two years from the initial HMP-MC month; enrollees also had to be 19-64 years on the last day of that period. Enrollees with fewer than 11 months of HMP-MC coverage in either year were excluded.

Variables

Demographic and enrollment files from the MDHHS Data Warehouse were used to identify demographic characteristics (age, gender, income level, prosperity region, health plan). Tables containing data on Health Risk Assessments (HRAs) were used to identify enrollees who had completed an HRA, and those who had agreed to a healthy behavior change.

The four chronic conditions of interest were identified by applying specifications for standard quality measures (e.g., Healthcare Effectiveness Data and Information Set, or HEDIS®, measures) to each enrollee's Year 1 utilization. Primary care visit patterns were categorized as regular primary care (≥1 visit in Year 1 and Year 2), no primary care (no visit either year), or primary care in one year only.

Outcome measures related to emergency department (ED) utilization were based on HEDIS® specifications. ED visit rates were generated to reflect the number of ED visits per 1,000 member-months. Enrollees were identified as high ED utilizers if they had ≥5 ED visits in the year. Multivariate regression models were used to understand the impact of primary care patterns and HRA completion on ED rates.

Healthy behaviors reflected preventive services included in the HMP Healthy Behavior Incentive Protocol, including preventive care visits, flu vaccine, other adult vaccines, breast cancer screening, cervical cancer screening, colon cancer screening, other types of screening, medical assistance with smoking and tobacco use cessation, and preventive dental care. A summary variable for "any preventive service" reflects receipt of any of the aforementioned services.

Outcome measures related to inpatient utilization were based on HEDIS® specifications. Inpatient utilization rates reflected the number of inpatient stays per 1,000 member-months. Multivariable regression models were used to assess the association of medical-surgical inpatient rates with primary care visits and HRA completion. Additional inpatient measures reflected the number of discharges for asthma, COPD, heart failure, and diabetes per 1,000 enrollees.

RESULTS

Demographic Characteristics

The population of 145,978 enrollees who met study criteria were:

- 54.2% women
- Evenly divided between age groups (19-34, 35-49, 50-64)
- Most likely to have an income at 0-35% of the Federal Poverty Level (FPL) (61.8%)
- Predominantly white (64.1%)

Nearly one quarter were identified as having one of the four chronic conditions of interest, including asthma (5.0%), cardiovascular disease (4.0%), COPD (8.8%), and diabetes (9.9%).

Health Risk Assessment

About one quarter of the study population (26.6%) completed the HRA process. Among enrollees who completed the HRA, nearly ninety percent selected a healthy behavior to change.

Primary Care Utilization
Most of the study population (71.7%) made regular primary care visits, defined as at least one primary care visit in both Year 1 and Year 2. Eleven percent of enrollees made no primary care visits in either year.

Among enrollees with one of the four chronic conditions of interest, over 90% had regular primary care visits, compared with only two-thirds of enrollees who had none of the four conditions.

Emergency Department Utilization
The rate of ED visits per 1,000 member-months decreased significantly from 71.03 in Year 1 to 69.50 in Year 2 for the overall study population. However, enrollees with one of the chronic conditions of interest demonstrated significant decreases in ED rates from Year 1 to Year 2. In contrast, enrollees who did not have a chronic condition demonstrated an increase in ED visit rates from Year 1 to Year 2.

Overall, 3.5% of enrollees were high ED utilizers (≥5 ED visits) in Year 1, as were 3.4% in Year 2. High ED utilizers were more likely to be women, younger than 50 years, black, or with one of the four chronic conditions of interest.

Enrollees who had regular primary care visits had higher adjusted ED visit rates in Year 2 compared to enrollees who had no primary care visits. This pattern was consistent for both enrollees with one of the chronic conditions of interest, as well as those without a chronic condition.

Enrollees who agreed to address at least one behavior change had lower adjusted ED visit rates in Year 2 compared to enrollees who did not complete an HRA. This pattern was consistent for enrollees with one of the chronic conditions of interest, and those without chronic conditions.

Healthy Behaviors
Overall, 83.7% of the study population received at least one preventive service over the two-year study period. Receipt of preventive services was more common among women, enrollees 50-64 years, white enrollees, and enrollees with one of the four chronic conditions of interest.

The proportion of enrollees who received at least one preventive service decreased from 71.5% in Year 1 to 68.5% in Year 2. However, two preventive services – flu vaccine and preventive dental care – saw an increase from Year 1 to Year 2.

Among enrollees who made regular primary care visits, 93.4% received at least one preventive service, compared to only 30.1% of enrollees who did not make primary care visits. This pattern was consistent across all preventive services studied.

Nearly all enrollees who completed an HRA (96.1%) received at least one preventive service, compared to only 79.2% of enrollees who did not complete an HRA. This pattern was consistent across all preventive services studied.

Enrollees who were eligible for HMP's healthy behavior incentive had higher rates of preventive services compared to enrollees who did not complete an HRA (and thus were not eligible for the incentive).

Among the subset of enrollees who reported their health status in both Year 1 and Year 2, 19.5% reported an improvement in health status. There was no difference in the proportion reporting improved health status between those who agreed to address at least one behavior change and those who did not complete an HRA.

Inpatient Utilization

For the overall study population, unadjusted medical, surgical and maternity inpatient rates increased from Year 1 to Year 2, with the largest increase observed in the maternity rate.

Higher medical-surgical inpatient rates were observed for women, enrollees older than 50, enrollees with an income 0-35% FPL, black enrollees, and enrollees with one of the four chronic conditions of interest.

Trends in inpatient utilization from Year 1 to Year 2 differed by chronic condition status. Among enrollees with one of the four chronic conditions of interest, the adjusted medical-surgical inpatient rate decreased from 13.83 per 1,000 member-months in Year 1 to 11.73 in Year 2. In contrast, among enrollees with no chronic condition, the adjusted medical-surgical inpatient rate increased from 3.14 in Year 1 to 3.80 in Year 2.

The rate of discharges related to asthma and diabetes decreased significantly from Year 1 to Year 2. In contrast, heart failure discharge rates increased significantly from Year 1 to Year 2. The rate of discharges related to COPD did not change significantly.

Enrollees who had regular primary care visits had higher adjusted medical-surgical inpatient rates in Year 2.

Among enrollees with one of the four chronic conditions of interest, those who agreed to address at least one behavior change had a lower adjusted Year 2 medical-surgical inpatient rate than their counterparts who did not complete an HRA. This pattern was reversed for enrollees without a chronic condition.

CONCLUSIONS

This report analyzing utilization patterns of HMP enrollees with continuous HMP-MC enrollment over two years demonstrates that ED visit rates decreased modestly from Year 1 to Year 2, with more substantial decreases observed for enrollees with one of the four chronic conditions of interest. Lower ED visit rates were observed for enrollees who agreed to address

at least one healthy behavior change, compared to those who did not complete a health risk assessment. Enrollees with regular primary care had higher rates of preventive service use than those with no primary care; similarly, enrollees who agreed to address at least one behavior change had higher rates of preventive service use than those who did not complete a health risk assessment. Among enrollees with one of the four chronic conditions of interest, inpatient utilization decreased from Year 1 to Year 2, and was lower for the subset who agreed to address at least one behavior change. These findings demonstrate that HMP features to promote regular primary care and health risk assessments are associated with lower rates of ED and inpatient utilization for HMP enrollees, particularly those with chronic conditions.

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INTRODUCTION

The University of Michigan Institute for Healthcare Policy & Innovation (IHPI) is conducting an evaluation of the Healthy Michigan Plan (HMP) as required by the Centers for Medicare & Medicaid Services (CMS) through a contract with the Michigan Department of Health and Human Services (MDHHS). This report presents findings for Domain III, Evaluation of Health Behaviors, Utilization and Health Outcomes, focused on individuals with initial enrollment in the first year of the Healthy Michigan Plan and who maintained continuous HMP-Managed Care coverage over two years.

As outlined in the Special Terms and Conditions of Michigan's Section 1115 Demonstration Waiver, the focus of Domain III is to understand the impact of HMP coverage on emergency department (ED), healthy behavior, and inpatient hospitalization rates; and to explore the association of these measures with enrollees' demographic characteristics and with HMP programmatic elements, such as regular primary care visits, completion of a Health Risk Assessment (HRA), and agreement to make a healthy behavior change.

The Domain III evaluation plan specifies four chronic conditions of interest (asthma, cardiovascular disease, chronic obstructive pulmonary disease, and diabetes) which have both an increased risk of needing emergency department and inpatient care as well as the potential for reducing these types of utilization through regular primary care and adoption of healthy behaviors. The report presents key outcome measures for the overall study population, and for enrollees with the chronic conditions of interest.

DOMAIN III HYPOTHESES

The Domain III hypotheses as outlined in the CMS Special Terms and Conditions are as follows:

Hypothesis III.1: Emergency Department Utilization

- Hypothesis 1a: Emergency department utilization among HMP enrollees will decrease from the Year 1 baseline.
- Hypothesis 1b: HMP enrollees who make regular primary care visits (at least once per year) will have lower adjusted rates of emergency department utilization compared to enrollees who do not have primary care visits.
- Hypothesis 1c: HMP enrollees who agree to address at least one behavior change will have lower adjusted rates of emergency department utilization compared to beneficiaries who do not agree to address behavior change.

Hypothesis III.2: Healthy Behaviors

- Hypothesis 2a: Receipt of preventive health services among the HMP population will increase from the Year 1 baseline.
- Hypothesis 2b: HMP enrollees who make regular primary care visits (at least once per year) will have higher rates of general preventive services compared to enrollees who do not have primary care visits.
- Hypothesis 2c: HMP enrollees who complete an annual health risk assessment will have higher rates of preventive services compared to enrollees who do not complete a health risk assessment.

Hypothesis 2d: HMP enrollees who agree to address at least one behavior change will demonstrate improvement in self-reported health status compared to enrollees who do not agree to address behavior change.
Hypothesis 2e: HMP enrollees who receive incentives for healthy behaviors will have higher rates of preventive services compared to enrollees who do not receive such incentives.

Hypothesis III.3: Hospital Admissions
Hypothesis 3a: Adjusted hospital admission rates for HMP enrollees will decrease from the Year 1 baseline.
Hypothesis 3b: HMP enrollees who make regular primary care visits (at least once per year) will have lower adjusted rates of hospital admissions compared to enrollees who do not have primary care visits.
Hypothesis 3c: HMP enrollees who agree to address at least one behavior change will have lower adjusted rates of hospital admission compared to enrollees who do not agree to address behavior change.

METHODS

Study Design and Time Period. This report reflects a secondary analysis of administrative claims and enrollment data for Healthy Michigan Plan enrollees. The report focuses on the enrollees' initial 24 months of Healthy Michigan Plan-Managed Care (HMP-MC) enrollment, to facilitate the analysis of trends over time.

Data Source. Data were drawn from the MDHHS Data Warehouse, including Medicaid claims across service types (e.g., medical, pharmacy), program enrollment data, demographic characteristics, and health risk assessment completion. Additional data on vaccines was extracted from the Michigan Care Improvement Registry (MCIR), the statewide immunization information system.

Data extraction was performed via a secure Virtual Private Network (VPN) connection by a data analyst with specific approval from MDHHS for this purpose, using existing protocols that require two layers of password protection. Data extraction is allowed under a Business Associate Agreement between the University of Michigan and the MDHHS. Data processing, encryption and storage were done in accordance with a data security protocol approved by the MDHHS Compliance Office.

Study Population. The study population included enrollees with two years of HMP-MC enrollment, and with administrative claims data available for two full years of utilization, allowing at least nine months of lag time for claims processing and adjudication.

Inclusion criteria were first applied for enrollees' initial year of coverage, as follows:
Initial HMP-MC enrollment timeframe: April 2014-March 2015
Minimum enrollment: enrolled in HMP-MC for at least 11 months of the 12-month period from their initial HMP-MC month
Age criteria: 19-64 years, as of the last day of the 12-month period

Enrollees who met inclusion criteria in Year 1 were assessed for eligibility in Year 2 (i.e., 13-24 months from initial enrollment); those with fewer than 11 months of HMP-Managed Care coverage and those older than 64 years at the end of Year 2 were excluded.

The flow chart below describes the process to identify the study population.

Table 1. Flow Chart for Identification of the Study Population

546,475	Enrollees with first HMP between April 2014 and March 2015
	Exclude 290,465 enrollees with less than 11 months HMP-MC in first 12-month period following initial HMP-MC
256,010	
	Exclude 206 enrollees younger than 19 years or older than 64 years at end of first 12-month period
255,804	Eligible in Year 1
	Exclude 109,826 enrollees with less than 11 months HMP-MC in second 12-month period (months 13-24) following initial HMP-MC, and/or older than 64 at end of second 12-month period
145,978	Study Population (Eligible Year 1 and Year 2)

Appendix Table A-1 shows the demographic characteristics of the study population compared to enrollees who met criteria in Year 1 but not Year 2.

Demographic and Programmatic Characteristics. Demographic characteristics were drawn from the MDHHS data warehouse. Gender was a fixed variable. Age was categorized as 19-34, 35-49, and 50-64 years based on age on the first day of the enrollee's HMP-MC coverage. Income level was based on the data field reflecting the determination of the enrollee's income as a percent of the Federal Poverty Level (FPL) in the first month of HMP-MC coverage. Race/ethnicity data from Medicaid demographic files were categorized as Hispanic, non-Hispanic white, non-Hispanic black, other or unknown; due to small cell sizes, the other and unknown groups were not included in race/ethnicity analyses. Residence in one of the 10 MDHHS prosperity regions (Appendix Figure A-1) was based on the enrollee's address in the first month of HMP-MC coverage. Health plan was based on the enrollee's Medicaid Health Plan in the first month of HMP-MC coverage. Prior enrollment in the Adult Benefit Waiver (ABW) program (a pre-HMP, limited-enrollment Medicaid program for childless adults) was identified if the enrollee had ≥1 month of ABW enrollment between April 2013 and March 2014 (the year prior to the start of HMP).

Health Risk Assessment Measures. Data were extracted from the Health Risk Assessment (HRA) table in the data warehouse for the combined Year 1 and Year 2 period, along with any information obtained prior to initial HMP-MC coverage. Individuals could have multiple HRA records. HRA records were used to categorize each enrollee's HRA status:

- HRA attestation – at least one HRA record includes physician attestation date, signaling completion of the HRA process
- Enrollee questions only – responses to some/all enrollee questions on one or more HRA record, but no record with a physician attestation date
- No HRA record – lack of data for any HRA-related activity

The enrollee-completed questions of the HRA include smoking or tobacco use in the past 30 days. Identification of individuals eligible for assistance with smoking or tobacco cessation was based on reported smoking or tobacco use in the past 30 days on any HRA record.

The enrollee-completed questions of the HRA also include a measure of the beneficiary's self-reported health status, defined as excellent, very good, good, fair or poor. Responses were calculated as the proportion who rated their health status as Excellent or Very Good vs. Good vs. Fair or Poor.

Enrollees who had completed an HRA were categorized based on the healthy behavior fields:

- Selected a healthy behavior
- No healthy behaviors to address
- Not ready for change
- Serious condition / healthy behavior not required

Enrollees with more than one HRA record were categorized as "selected a healthy behavior" if any records had documentation of healthy behavior selection.

Utilization-Based Measures. Utilization measures were based on established quality measurement initiatives, as detailed below. The most common source was the Healthcare Effectiveness Data and Information Set (HEDIS®),[1] a set of standardized performance measures developed by the National Committee for Quality Assurance (NCQA). HEDIS® 2016 specifications were used for this report.

Chronic Condition Status: Identification of the four chronic conditions of interest – asthma, cardiovascular disease, COPD, diabetes – was based on HEDIS® 2016 Relative Resource Use (RRU) specifications, with two modifications. HEDIS® measures typically require one year for identification of members who meet the chronic condition definition (i.e., the denominator), followed by a measurement year to assess utilization (i.e., the numerator). However, most HMP enrollees did not have Medicaid coverage prior to their HMP enrollment, which limited the availability of a pre-HMP identification period. Thus, HEDIS® criteria were modified to allow Year 1 data to both identify chronic condition status and assess baseline utilization rates. In addition, the HEDIS® COPD requirement of age ≥42 years or older was waived to allow results to reflect all enrollees with COPD.

A secondary chronic condition variable was generated based on the Chronic Condition Indicator from the Healthcare Cost and Utilization Project (HCUP),[2] sponsored by the Agency for Healthcare Research and Quality (AHRQ). The HCUP Chronic Condition Indicator categorizes diagnosis codes as chronic or not chronic; enrollees were identified for the HCUP Chronic Condition Indicator if they had any service that included a diagnosis code designated by HCUP as chronic.

Primary Care Utilization: Identification of primary care visits was based on Michigan Medicaid policy for primary care reimbursement. Classification of an outpatient visit as a primary care visit required two elements:

1. A procedure code included in the Physician Primary Care Rate Increase Initiative list;[3] and

[1] Further information about HEDIS® measures and technical resources can be found at https://www.ncqa.org/hedis/measures/

[2] Chronic Condition Indicator (CCI) for ICD-9-CM. Technical information available at https://www.hcup-us.ahrq.gov/toolssoftware/chronic/chronic.jsp

[3] MDHHS Physician Primary Care Rate Increase Initiative Database. January 2016. Available at https://www.michigan.gov/documents/mdhhs/Primary_Care_Incentive_Rates-012016_513682_7.pdf

2. A billing or rendering provider who was a Primary Care Provider of record for ≥1 Medicaid enrollee in the MDHHS data warehouse PCP table; or who had participated in Michigan's Primary Care Transformation (MiPCT) project and thus had been verified as a primary care provider; or who had a primary care specialty classification (e.g., family medicine, internal medicine) in both the Michigan Medicaid provider specialty table and the NPPES taxonomy table. NPIs known to be inaccurate from prior analyses were excluded.

Primary care visits identified through this method were used to calculate the proportion of enrollees with primary care visits during the year. A summary measure of primary care continuity reflected each enrollee's receipt of a primary care visit across the two study years, with four categories:

- Regular Primary Care: ≥1 primary care visit in Year 1 and Year 2
- No Primary Care: no primary care visit in either Year 1 or 2
- Year 1 Only: ≥1 primary care visit in Year 1 but not Year 2
- Year 2 Only: ≥1 primary care visit in Year 2 but not Year 1

Emergency Department (ED) Utilization: Identification of ED visits was based on the HEDIS® 2016 Emergency Department Utilization (EDU) measure. Consistent with HEDIS® specifications, ED visits that resulted in an inpatient admission were not counted, and non-institutional/non-surgical ED visits that occurred a day prior to or after an institutional ED/Observation/Inpatient visit were removed. Also consistent with HEDIS® specifications, ED visits for mental health or substance abuse were not included. After initial data review identified areas of undercounting, three observation visit codes (G0378, G0379, revenue code 0762) were added to the HEDIS® observation value set, along with codes G0380-G0384 for Hospital Type B emergency visits.

ED visits identified through this method were used to calculate two outcome measures:

ED Visit Rate – the number of ED visits per 1,000 member-months (the HEDIS® EDU measure)

High ED Utilization – the proportion of enrollees with ≥5 ED visits in the year

Healthy Behaviors: Receipt of preventive services was based on the MDHHS Healthy Behavior Incentive Protocol Code List.[4]

The healthy behaviors included the following:

Preventive Visit – the proportion of enrollees who received a preventive visit. *Note: This measure is based on CPT visit codes and could occur with any provide type, including specialists.*

Flu Vaccine – the proportion of enrollees who received a flu vaccine.

Other Adult Vaccine – the proportion who received a pneumococcal polysaccharide vaccine, pneumococcal conjugate vaccine, or hepatitis B vaccine.

Breast Cancer Screening *(NQF 0031[5])* – the proportion of women 40-64 years of age who had a mammogram to screen for breast cancer. *Note: This measure reflects evidence of screening; denominator exclusions were not applied. Also, the NQF standard age range is 40-69 years.*

[4] Healthy Michigan Plan §1115 Demonstration Waiver Extension Request Amendment. Attachment B – Revised Healthy Behaviors Incentive Protocol. Submitted for CMS Review on September 10, 2018. Available at https://www.michigan.gov/documents/mdhhs/Attachment_B_-_Revised_Healthy_Behaviors_Incentive_Protocol-Clean_632146_7.pdf

[5] NQF #0031 Breast Cancer Screening Measure Submission and Evaluation Worksheet. Available at www.qualityforum.org/Measure_Evaluation_Form/Cancer_Project/0031.aspx

Cervical Cancer Screening *(NQF 0032; included in Adult Core Measure Set[6])* – the proportion of women 21-64 years of age who received a Pap test to screen for cervical cancer. *Note: This measure reflects evidence of screening; denominator exclusions were not applied. Also, the NQF measure requires 3 years of enrollment.*

Colon Cancer Screening *(NQF 0034[7])* – the proportion of enrollees 50-64 years of age who received colon cancer screening by high-sensitivity fecal occult blood test, sigmoidoscopy with FOBT, or colonoscopy. *Note: This measure reflects evidence of screening; denominator exclusions were not applied.*

Other Screening – the proportion of enrollees who received screening for cancer, hepatitis C, HIV, osteoporosis, sexually transmitted infections, or tuberculosis.

Smoking and Tobacco Use Cessation, Medical Assistance (NQF 0027[8]) – among enrollees who reported smoking or tobacco use in the past 30 days on a Health Risk Assessment (HRA) record, the proportion who received tobacco cessation counseling or assistance from a medical professional. *Note: Consistent with NQF specifications, this measure reflects provider counseling, not medication.*

Preventive Dental Care – the proportion of enrollees who had at least one visit to a dental provider that included a preventive dental service.

Any Healthy Behavior – the proportion of enrollees who received at least one service from the Healthy Behavior Incentive Protocol.

As outlined in the CMS Special Terms and Conditions, two additional measures were generated to assess healthy behaviors for enrollees with diabetes:

Hemoglobin A1c Testing *(NQF 0057; included in Adult Core Measure Set)* – the proportion of enrollees with type 1 or type 2 diabetes who had hemoglobin A1c testing at least once. *Note: This measure reflects evidence of testing; denominator exclusions were not applied.*

Low-density Lipoprotein – Cholesterol (LDL-C) Screening *(NQF 0063)* – the proportion of enrollees with type 1 or type 2 diabetes who had an LDL-C screening performed at least once. *Note: This measure reflects evidence of screening; denominator exclusions were not applied.*

Inpatient (IP) Utilization: The primary measure of inpatient utilization was based on the 2016 HEDIS® Inpatient Utilization (IPU) measure. Consistent with HEDIS®, nursing home stays were removed, transfers were removed (with the source hospitalization remaining), and consecutive discharge dates were collapsed.

This method was used to calculate the following outcome measure:

Inpatient Rate – the number of medical, surgical, and maternity inpatient stays per 1,000 member-months (the HEDIS® EDU measure)

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[6] Centers for Medicare & Medicaid Services. Core Set of Adult Health Care Quality Measures for Medicaid (Adult Core Set). Technical Specifications and Resource Manual. Available at https://www.medicaid.gov/medicaid/quality-of-care/downloads/medicaid-adult-core-set-manual.pdf

[7] Centers for Medicare and Medicaid eCQI Resource Center. Colorectal Cancer Screening. Available at https://ecqi.healthit.gov/ecqm/measures/cms130v4

[8] NQF 0027 Medical Assistance with Smoking and Tobacco Use Cessation. Quality Positioning System (QPS) Measure Description Display Information. Available at http://www.qualityforum.org/QPS/MeasureDetails.aspx?standardID=390&print=0&entityTypeID=1

Secondary inpatient utilization measures were generated for condition-specific discharges, based on measures included in the Agency for Healthcare Research and Quality (AHRQ) Prevention Quality Indicators.[9] For these measures, chronic condition is linked to the discharge diagnosis (i.e., not based on utilization-based identification of chronic conditions). The condition-specific discharge measures included the following:

> ***Asthma in Younger Adults Admission Rate*** *(NQF 0283/PQI 15)* – the number of discharges for asthma short-term complications per 1,000 enrollees 19-39 years of age
>
> ***Chronic Obstructive Pulmonary Disease (COPD) in Older Adults Admission Rate*** *(NQF 0275/PQI 5)* – the number of discharges for chronic obstructive pulmonary disease (including asthma and bronchitis) per 1,000 enrollees 40-64 years of age
>
> ***Heart Failure Admission Rate*** *(NQF 0277/PQI 8)* – the number of discharges for congestive heart failure per 1,000 enrollees
>
> ***Diabetes Short-Term Complications*** *(NQF 0272/PQI 1)* – the number of discharges for diabetes short-term complications per 1,000 enrollees

Analysis Plan for Testing Hypotheses: The CMS Special Terms and Conditions called for calculating outcome measures for the overall HMP population, and for conducting bivariate analyses for key enrollee characteristics (gender, age, income level, race/ethnicity, prosperity region, health plan) and chronic condition subgroups (asthma, cardiovascular disease, COPD, diabetes). Chi-square tests were performed to assess within-year differences between subgroups. Paired t-tests were performed to assess differences between Year 1 and Year 2 results. Two-tailed P values <0.05 were considered to be statistically significant.

For hypotheses related to primary care:
Primary care-focused hypotheses were tested by comparing of enrollees who made regular primary care visits vs. enrollees with no primary care; definitions for those groups are described above. Enrollees who made visits in only one year were not included in hypothesis testing; however, detailed data about those groups can be found in the Appendix tables.

For hypotheses related to receipt of preventive services:
The array of preventive services outlined in the Special Terms and Conditions includes services recommended annually (e.g., flu vaccine) and services recommended once over a longer timeframe (e.g., cancer screening). The hypothesis testing the change in receipt of preventive services from Year 1 to Year 2 incorporated four services (receipt of any healthy behavior, a preventive care visit, flu vaccine, preventive dental care) recommended annually. In contrast, hypotheses evaluating receipt of preventive services relative to regular primary care and HRA completion incorporated the entire array of preventive services, but allowed for receipt of that service in either Year 1 or Year 2.

For hypotheses related to Health Risk Assessments:
The CMS Special Terms and Conditions outlined several hypotheses comparing enrollees who agreed to address at least one behavior change (defined above) vs. enrollees who did not agree to address a behavior change. To test these hypotheses, the latter group included enrollees who did not have a

[9] Agency for Healthcare Research and Quality. Prevention Quality Indicators Technical Specifications Updates. Available at https://www.qualityindicators.ahrq.gov/Modules/PQI_TechSpec_ICD10_v2018.aspx

completed HRA. The very small number of enrollees who completed an HRA but were "not ready for change" precluded their use as a comparison group for these hypotheses.

For comparison of enrollees who did vs. did not receive an incentive for healthy behavior, the former group included those with a completed HRA who selected a healthy behavior, had no behavior to address, or had a serious condition such that the healthy behavior requirement did not apply; the comparison group was those who did not complete an HRA.

The hypothesis related to change in health status was evaluated for the subset of enrollees with HRA records in both Year 1 and Year 2 that included self-reported health status. Change in health status was calculated as follows:

	Change Based on Year 2 Health Status		
Year 1 Health Status	**Improved**	**Stayed the Same**	**Got Worse**
Excellent/Very Good	--	Excellent, Very Good	Good, Fair, Poor
Good	Excellent, Very Good	Good	Fair, Poor
Fair/Poor	Excellent, Very Good, Good	Fair, Poor	--

For hypotheses related to emergency department utilization:
Analysis for the initial hypothesis related to ED utilization involved comparison of unadjusted Year 1 vs. Year 2 rates (ED visits per 1,000 member-months) and the proportion of enrollees who were high ED utilizers. Paired t-tests were performed to assess differences between Year 1 and Year 2 results.

Logistic regression models were run to identify enrollee characteristics associated with being a high ED utilizer in Year 1, Year 2, and both years. The regression models included gender, age, income level, race/ethnicity, prosperity region, health plan, and chronic conditions.

To understand the influence of key HMP elements (regular primary care, HRA completion) on ED utilization, multivariate negative binomial regression models were run to produce adjusted Year 2 ED rates, controlling for gender, age (categorical), income level at the start of Year 1 (categorical), race/ethnicity, prosperity region at the start of Year 1, and health plan at the start of Year 1. Due to the significant differences observed in bivariate analyses, separate multivariate models were run for enrollees with a chronic condition identified in Year 1 and those with no chronic condition in Year 1.

For hypotheses related to inpatient utilization:
Inpatient rates (inpatient stays per 1,000 member-months) were generated for Year 1 and for Year 2 for surgical, medical and maternity inpatient stays. To explore the initial hypothesis related to trends in inpatient utilization, multivariate negative binomial regression models were run to generate adjusted Year 1 and Year 2 medical-surgical inpatient rates, controlling for gender, age (categorical), income level at the start of Year 1 (categorical), race/ethnicity, prosperity region at the start of Year 1, and health plan at the start of Year 1. Due to the significant differences observed in bivariate analyses, separate multivariate models were run for enrollees with a chronic condition identified in Year 1 and those with no chronic condition in Year 1. These models used generalized estimating equations (GEE) to account for the repeated measures for each enrollee.

To understand the influence of key HMP features (regular primary care, HRA completion) on medical-surgical inpatient utilization, multivariate negative binomial regression models were run to produce adjusted Year 2 medical-surgical inpatient rates, controlling for gender, age, income level, race/ethnicity, prosperity region, and health plan. Due to the significant differences observed in bivariate analyses, separate multivariate models were run for enrollees with a chronic condition identified in Year 1 and those with no chronic condition in Year 1.

RESULTS

Study Population. Demographic characteristics of the study population of 145,978 enrollees with two years of continuous coverage in HMP-MC are reported in Appendix Table A-1. The study population included a higher proportion of women than men. The three age groups had roughly equal proportions. The predominant income category at the start of HMP-MC enrollment was 0-35% FPL. Nearly two-thirds were non-Hispanic white, with about one quarter non-Hispanic black. Over forty percent resided in the Detroit Metro region. Enrollment in each of 13 Medicaid health plans at the start of their HMP-MC enrollment ranged from 0.7% to 24.7%. Seventeen percent had prior Medicaid coverage through the Adult Benefit Waiver.

Chronic Conditions. Overall, 23.2% of the study population was identified as having one or more of the four chronic conditions of interest based on their Year 1 utilization (Appendix Table A-2). This includes 5.0% with asthma, 4.0% with cardiovascular disease, 8.8% with COPD, and 9.9% with diabetes. Four percent had more than one condition, while 76.8% had none of the four conditions.

The vast majority of enrollees (89.2%) had at least one service for a condition included in the HCUP Chronic Condition Indicator.

Health Risk Assessment. About one quarter of the study population (26.6%) completed the HRA process (see Table 2). Among enrollees who completed the HRA, nearly ninety percent selected a healthy behavior to change; less than 1% were categorized as not ready for behavior change, or having a serious health condition that precluded the healthy behavior requirement.

Table 2. HRA Completion

	N	%
At least one HRA completed with attestation	38,835	**26.6%**
Selected behavior to change	*34,427*	*23.6%*
No behavior to address	*4,061*	*2.8%*
Not ready for change	*202*	*0.1%*
Serious condition/healthy behavior not required	*145*	*0.1%*
No HRA completion	107,143	**73.4%**
Enrollee questions only	*36,354*	*24.9%*
No HRA record	*70,789*	*48.5%*

About three quarters of enrollees had no documentation of completing the full HRA process by their end of their first two years of HMP-MC enrollment. The proportion with no HRA completion varied substantially by health plan, ranging from 32.0% to 81.8% (Appendix Table A-3).

Primary Care Utilization. Most of the study population (71.7%) made regular primary care visits (at least one primary care visit in both Year 1 and Year 2). Among enrollees identified in Year 1 as having one of the four chronic conditions of interest, over 90% had regular primary care, compared with only two-thirds of enrollees who had none of the four conditions. Eleven percent of enrollees made no primary care visits in either year, while 17.4% had a primary care visit in one year only (Table 3).

Table 3. Primary Care Visit Patterns across Year 1 and Year 2

	Regular Primary Care	Year 1 only	Year 2 only	No Primary Care
Overall	71.7%	10.3%	7.1%	11.0%
Chronic Condition Identified in Year 1				
Asthma	90.2%	5.3%	2.4%	2.1%
Cardiovascular disease	92.3%	5.4%	1.1%	1.1%
Chronic obstructive pulmonary disease (COPD)	91.8%	6.0%	1.3%	1.0%
Diabetes	95.2%	3.1%	1.1%	0.5%
More than one condition	96.2%	2.8%	0.6%	0.4%
None of the four conditions	65.5%	11.8%	8.7%	14.0%

Row percentages may not add to 100.0% due to rounding.

Regular primary care was less common among men, enrollees 19-34 years, and non-Hispanic Black enrollees (Appendix Table A-4). The proportion with regular primary care visits ranged across prosperity regions from 68.1% to 79.4%, and across health plans from 56.1% to 78.0%.

Outcome Focus Area 1: Emergency Department Utilization

The ED visit rate per 1,000 member-months for the overall study population was 71.03 for Year 1 and 69.50 in Year 2. In bivariate analyses, significantly higher rates were observed in both study years for women, enrollees 19-34 years, enrollees with an income 0-35% FPL, black enrollees, and enrollees identified in Year 1 as having one of the four chronic conditions of interest (Appendix Table A-5). Rates varied substantially across prosperity regions and health plans.

For the overall study population, 3.5% were high ED utilizers (≥5 ED visits) in Year 1, and 3.4% were high ED utilizers in Year 2 (Appendix Table A-6). Among enrollees who were high ED utilizers in Year 1, 41.0% were also high ED utilizers in Year 2, which represents 1.45% of the overall study population. In bivariate analyses, a higher proportion of high ED utilization was observed among women, enrollees 19-34 or 35-49 years, enrollees in the lowest income group, Black enrollees, and enrollees identified in Year 1 as having one of the four chronic conditions of interest (Appendix Table A-7).

Multivariate analyses (Appendix Table A-8) identified characteristics of enrollees with increased odds of high ED utilization in Year 1, in Year 2, and in both years: women (vs. men), enrollees 19-34 or 35-49 years (vs. 50-64 years), and black (vs. white) enrollees. Enrollees identified in Year 1 as having any of the four chronic conditions (vs. no chronic condition) had increased odds of high ED utilization; those with more than one condition had the highest odds.

Hypothesis 1a: Emergency department utilization among the HMP enrollees will decrease from the Year 1 baseline.

ED Rate. The ED visit rate decreased significantly from 71.03 in Year 1 to 69.50 in Year 2 for the overall study population (Table 4). Enrollees with each of the chronic conditions also demonstrated significantly decreased ED visit rates in Year 2. In contrast, enrollees who were not identified in Year 1 as having one of the four chronic conditions had an increase in ED visit rate from Year 1 to Year 2.

Table 4. Emergency Department Visit Rate (Visits per 1,000 Member-Month), Year 1 vs. Year 2

	N	Year 1	Year 2	*P*-value
Overall Population	**145,978**	**71.03**	**69.50**	≤0.001
Chronic Condition Identified in Year 1				
Asthma	7,354	127.60	115.33	≤0.001
Cardiovascular disease	6,074	110.78	101.37	≤0.001
Chronic obstructive pulmonary disease (COPD)	12,776	116.08	105.33	≤0.001
Diabetes	14,411	94.19	89.06	≤0.001
More than one condition	5,834	*132.58*	*122.50*	≤0.001
None of the four conditions	112,067	60.88	61.45	0.140

P-value reflects paired t-test comparison of Year 1 vs. Year 2 rate

ED High Utilizers. For the study population overall, the proportion of enrollees who were high ED utilizers did not change significantly from Year 1 to Year 2 (Table 5). Among enrollees with chronic conditions identified in Year 1, the proportion who were high ED utilizers decreased from Year 1 to Year 2 in each group, but the magnitude of change did not reach statistical significance. Among enrollees with no chronic condition identified in Year 1, the proportion who were high ED utilizers did not change significantly from Year 1 to Year 2.

Table 5. Proportion of Enrollees with High ED Utilization, Year 1 vs. Year 2

	Year 1	Year 2	*P*-value
Proportion of High ED Utilizers	**3.5%**	**3.4%**	0.10
Chronic Condition Identified in Year 1			
Asthma	8.5%	7.7%	0.06
Cardiovascular disease	6.4%	5.8%	0.14
Chronic obstructive pulmonary disease (COPD)	7.1%	6.6%	0.11
Diabetes	5.6%	5.1%	0.12
None of the four conditions	2.7%	2.8%	0.88

P-value reflects paired t-test comparison of Year 1 vs. Year 2 rate

Hypothesis 1b: HMP enrollees who make regular primary care visits will have lower adjusted rates of ED utilization compared to HMP enrollees who do not have primary care visits.

In multivariate analysis, having regular primary care was associated with higher Year 2 ED visit rates (Table 6). Among enrollees identified in Year 1 as having one of the four chronic conditions of interest, those who had regular primary care had an adjusted Year 2 ED visit rate that was higher than

their counterparts who had no primary care. The same pattern was observed for enrollees who were not identified as having one of the chronic conditions – but with a larger magnitude of difference between those with regular primary care and those with no primary care.

Table 6. Influence of Primary Care Visit Pattern on ED Visit Rate in Year 2

	Year 2 Adjusted Rate	95% CI	*P*-value
Chronic Condition Identified in Year 1			≤0.001
Regular primary care	**93.68**	[86.34, 101.60]	
No primary care	**87.06**	[72.42, 104.40]	
No Chronic Condition Identified in Year 1			
Regular primary care	**59.39**	[57.16, 61.70]	≤0.001
No primary care	**25.68**	[24.44, 26.98]	

Multivariate negative binomial regression model, controlling for Year 1 characteristics: gender, age, FPL, race/ethnicity, prosperity region, health plan. *P*-value reflects paired t-test comparison of Year 1 vs. Year 2 adjusted rate.

Hypothesis 1c: HMP enrollees who agree to address at least one behavior change will have lower adjusted ED rates compared to HMP enrollees who do not agree to address behavior change.

In multivariate analysis, agreeing to a behavior change was associated with lower Year 2 ED visit rates (Table 7). Among enrollees identified in Year 1 as having one of the four chronic conditions of interest, those who selected at least one behavior to change had an adjusted Year 2 ED visit rate that was substantially lower than their counterparts who did not complete an HRA. A similar pattern was observed for enrollees who were not identified as having one of the chronic conditions, but with a smaller decrease for those who selected at least one behavior to change.

Table 7. Influence of Agreeing to Behavior Change on ED Visit Rate in Year 2

	Year 2 Adjusted Rate	95% CI	*P*-value
Chronic Condition Identified in Year 1			≤0.001
Selected behavior to change	**81.25**	[54.13, 122.00]	
No HRA completion	**96.96**	[64.65, 145.40]	
No Chronic Condition Identified in Year 1			
Selected behavior to change	**51.17**	[39.28, 66.66]	0.02
No HRA completion	**52.99**	[40.72, 68.97]	

Adjusted for Year 1 characteristics: gender, age, FPL, race/ethnicity, prosperity region, health plan.
P-value reflects paired t-test comparison of Year 1 vs. Year 2 rate

Outcome Focus Area 2: Healthy Behaviors

Overall, 83.7% of the study population received at least one preventive service over the two-year study period. For individual preventive services, the proportion ranged from 8.4% for vaccines other than flu vaccine to 62.4% for breast cancer screening (Appendix Table A-13). Higher proportions of

preventive

services were observed among women, enrollees 50-64 years, white enrollees and those identified in Year 1 as having one of the four chronic conditions of interest (Appendix Table A-14).

Hypothesis 2a: Receipt of preventive health services among the Healthy Michigan Plan population will increase from the Year 1 baseline.

The proportion of enrollees who received at least one preventive service decreased from 71.5% in Year 1 to 68.5% in Year 2 (Table 8). However, the proportion of enrollees who received two specific preventive services – flu vaccine and preventive dental care, which are recommended annually – demonstrated an increase from Year 1 to Year 2.

Table 8. Proportion of Enrollees Receiving Preventive Services, Year 1 vs. Year 2

	N	Year 1	Year 2	*P*-value
Any Healthy Behavior	*145,978*	***71.5%***	***68.5%***	≤0.001
Preventive Care Visit	145,978	39.8 %	32.9 %	≤0.001
Flu Vaccine	145,978	21.1%	21.3%	0.10
Preventive Dental Care	145,978	24.5%	26.7%	≤0.001

P-value reflects paired t-test comparison of Year 1 vs. Year 2 rate.

Hypothesis 2b: HMP enrollees who make regular primary care visits will have higher rates of general preventive services compared to enrollees who do not have primary care visits.

Overall, 93.4% of enrollees with regular primary care, compared to only 30.1% of enrollees with no primary care, received one of the preventive services included in the Healthy Behavior Incentive Protocol at least once during the study period. Enrollees with regular primary care visits had substantially higher rates of preventive services compared to enrollees who did not have primary care visits (Table 9). This pattern was observed across all preventive services.

Table 9. Proportion of Enrollees Receiving Preventive Services by Primary Care Visit Pattern

	Regular Primary Care	No Primary Care	*P*-value
Any Healthy Behavior	93.4%	30.1%	≤0.001
Preventive Care Visit	64.3%	3.1%	≤0.001
Flu Vaccine	37.4%	5.2%	≤0.001
Other Vaccine	10.6%	1.2%	≤0.001
Breast Cancer Screening	68.8%	5.0%	≤0.001
Cervical Cancer Screening	55.3%	9.7%	≤0.001
Colon Cancer Screening	42.3%	1.9%	≤0.001
Other Screening	52.1%	9.7%	≤0.001
Smoking/Tobacco Use Cessation Assistance	31.9%	2.7%	≤0.001
Preventive Dental Care	40.4%	16.6%	≤0.001

P-value reflects paired t-test comparison of Year 1 vs. Year 2 rate.

In addition, enrollees who had at least one primary care visits in Year 1 or Year 2 (but not both) had lower rates of preventive services compared to enrollees with regular primary care, but higher rates than enrollees with no primary care (Appendix Table A-15).

Hypothesis 2c: HMP enrollees who complete an annual health risk assessment will have higher rates of preventive services compared to enrollees who do not complete a health risk assessment.

Across all measures, enrollees who completed at least one HRA had higher rates of preventive services compared to enrollees who did not complete an HRA (Table 10).

Table 10. Receipt of Any Preventive Service (either year) by HRA Completion

	Completed ≥1 HRA	**No HRA Completion**	*P*-value
Any Healthy Behavior	96.1%	79.2%	≤0.001
Preventive Care Visit	73.8%	47.3%	≤0.001
Flu Vaccine	41.1%	26.3%	≤0.001
Other Vaccine	11.0%	7.5%	≤0.001
Breast Cancer Screening	74.8%	56.1%	≤0.001
Cervical Cancer Screening	57.1%	47.4%	≤0.001
Colon Cancer Screening	46.1%	31.8%	≤0.001
Other Screening	52.7%	41.6%	≤0.001
Smoking/Tobacco Use Cessation Assistance	30.1%	26.4%	≤0.001
Preventive Dental Care	43.8%	32.9%	≤0.001

P-value reflects paired t-test comparison of Year 1 vs. Year 2 rates.

Hypothesis 2d: HMP enrollees who agree to address at least one behavior change will demonstrate improvement in self-reported health status compared to enrollees who do not agree to address behavior change.

Among enrollees who reported their health status in both Year 1 and Year 2 (Appendix Table A-17), there was no difference in improvement in health status between those who agreed to address at least one behavior and those who did not complete an HRA (Table 11).

Table 11. HRA Healthy Behavior Status by Self-Reported Improvement in Health Status

		Health Status Year 1 to Year 2		
HRA Healthy Behavior Status	**N**	**Improved**	**Stayed same**	**Got worse**
Selected behavior to change	9,063	19.5%	60.6%	19.9%
No HRA completion	556	19.6%	58.6%	21.8%

P=0.27 for chi-square comparison between groups.

Hypothesis 2e: HMP enrollees who receive incentives for healthy behaviors will have higher rates of preventive services compared to enrollees who do not receive such incentives.

Enrollees who were eligible for the healthy behavior incentive (completed an HRA and selected a healthy behavior to change, had no behavior that needed to be addressed, or had a serious health condition that precluded the behavior change requirement) had higher rates of preventive services compared to enrollees who did not complete an HRA (Table 13). This pattern was consistent across all preventive services.

Table 12. Receipt of Any Preventive Service (either year) by Healthy Behavior Incentive

	Received Incentive	No HRA Completion	*P*-value
Any Healthy Behavior	96.1%	79.2%	≤0.001
Preventive Care Visit	73.9%	47.3%	≤0.001
Flu Vaccine	41.1%	26.3%	≤0.001
Other Vaccine	11.0%	7.5%	≤0.001
Breast Cancer Screening	74.9%	56.1%	≤0.001
Cervical Cancer Screening	57.1%	47.4%	≤0.001
Colon Cancer Screening	46.1%	31.8%	≤0.001
Other Screening	52.8%	41.6%	≤0.001
Smoking/Tobacco Use Cessation Assistance	30.6%	26.4%	≤0.001
Preventive Dental Care	43.9%	32.9%	≤0.001

P-value reflects chi-square comparison of the Incentive vs. No HRA groups.

Detailed data on receipt of preventive services for each HRA group (selected behavior to change, no behavior to address, not ready for change, and serious condition) are reported in Table A-16.

Additional preventive care measures were calculated for enrollees identified in Year 1 as having diabetes (Appendix Table A-18). Nearly all enrollees with diabetes received hemoglobin A1C testing (96.0%) and LDL-C screening (92.0%) at least once during the study period. Enrollees with regular primary care had higher rates of these diabetes-specific services, compared to enrollees with no primary care. In addition, enrollees who completed an HRA and selected a behavior change had higher rates of these diabetes-specific services compared to enrollees who did not complete an HRA.

Outcome Focus Area 3: Inpatient Utilization

For the overall study population, unadjusted medical and surgical inpatient rates were stable in Year 1 to Year 2, whereas maternity inpatient rates increased from Year 1 to Year 2 (Table 13).

Table 13. Inpatient Rates (per 1,000 Member Months) - Unadjusted

	Year 1	Year 2
Medical	4.77	4.82
Surgical	2.82	2.84
Maternity	0.53	0.66

Higher medical-surgical inpatient rates were observed for women, enrollees older than 35, enrollees with an income 0-35% FPL, and non-Hispanic black enrollees (Appendix Table A-19). Enrollees identified in Year 1 as having one of the four chronic conditions of interest had substantially higher inpatient rates than their counterparts with no chronic condition. Medical-surgical inpatient rates varied by prosperity region, ranging from 5.68 to 9.17 in Year 1 and from 6.09 to 8.89 in Year 2.

Hypothesis 3a: Adjusted hospital admission rates for HMP enrollees will decrease from the Year 1 baseline.

Multivariate analyses revealed that the overall adjusted admission rate for the study population increased form Year 1 to Year 2; however, the pattern differed by chronic condition status (Table 14). Among enrollees identified in Year 1 as having one of the four chronic conditions of interest, the adjusted medical-surgical inpatient rate decreased from 13.83 in Year 1 to 11.73 in Year 2. In contrast, among enrollees with no chronic condition, the medical-surgical inpatient rate increased from 3.14 in Year 1 to 3.80 in Year 2.

Table 14. Medical-Surgical Inpatient Rates (per 1,000 Member Months) - Adjusted

	Year 1 Rate	95% CI	**Year 2 Rate**	95% CI
Overall Population*	**9.16**	[8.63, 9.73]	**9.69**	[9.13, 10.29]
Chronic Condition Identified in Year 1*	**13.83**	[12.68, 15.07]	**11.73**	[10.75, 12.80]
No Chronic Condition in Year 1*	**3.14**	[2.92, 3.38]	**3.80**	[3.54, 4.09]

Multivariate negative binomial regression model, controlling for Year 1 characteristics: gender, age, FPL, race/ethnicity, prosperity region, health plan. *$P \leq 0.001$ for difference from Year 1 to Year 2

As outlined in the CMS Special Terms and Conditions, four condition-specific inpatient rates were generated (Table 15). For asthma and diabetes, discharges rates decreased significantly from Year 1 to Year 2. In contrast, heart failure discharge rates increased significantly from Year 1 to Year 2. The rate for COPD discharges did not change significantly.

Table 15. Condition-Specific Inpatient Rate (Discharges per 100,000 Members)

		Discharges per 100,000 Members		
	N	**Year 1**	**Year 2**	*P*-value
Asthma in Younger Adults Admission Rate	59,650	140.8	77.1	0.002
COPD in Older Adults Admission Rate	81,172	452.1	501.4	0.19
Heart Failure Admission Rate	145,978	99.3	154.1	≤0.001
Diabetes Short-Term Complications Admission Rate	145,978	241.1	192.5	0.01

P-value reflects paired t-test comparison of Year 1 vs. Year 2 rates.

Hypothesis 3b: HMP enrollees who make regular primary care visits will have lower adjusted rates of hospital admissions compared to enrollees who do not have primary care visits.

In multivariate analysis, having regular primary care was associated with lower adjusted inpatient visit rates in Year 2 (Table 16). This pattern was observed for enrollees identified in Year 1 as having one of the four chronic conditions of interest, as well as for enrollees who were not identified as having one of the chronic conditions.

Table 16. Influence of Regular Primary Care on Adjusted Medical-Surgical Inpatient Rates in Year 2

	Year 2 Adjusted Rate	95% CI	*P*-value
Chronic Condition Identified in Year 1			≤0.001
Regular primary care	**11.88**	[10.45, 13.49]	
No primary care	**8.09**	[5.67, 11.55]	
No Chronic Condition Identified in Year 1			
Regular primary care	**4.49**	[4.00, 5.03]	≤0.001
No primary care	**1.14**	[0.97, 1.34]	

Multivariate negative binomial regression model, controlling for Year 1 characteristics: gender, age, FPL, race/ethnicity, prosperity region, health plan. *P*-value reflects difference in inpatient rate from Year 1 to Year 2.

Bivariate analyses demonstrating medical-surgical inpatient rates by primary care visit pattern are reported in Appendix Table A-20.

Hypothesis 3c: HMP enrollees who agree to address at least one behavior change will have lower adjusted admission rates compared to enrollees who do not agree to address behavior change.

The association of agreeing to a behavior change and Year 2 inpatient rates was mixed. Among enrollees identified in Year 1 as having one of the four chronic conditions of interest, those who selected at least one behavior to change had an adjusted Year 2 medical-surgical inpatient rate that was substantially lower than their counterparts who did not complete an HRA (Table 17). In contrast, among enrollees with no chronic condition, the adjusted Year 2 medical-surgical inpatient rate was higher for those who agreed to a behavior change, compared to those who did not complete an HRA.

Table 17. Influence of Healthy Behavior on Adjusted Medical-Surgical Inpatient Rates in Year 2

	Year 2 Adjusted Rate	95% CI	*P*-value
Chronic Condition Identified in Year 1			p≤0.001
Selected behavior to change	**10.47**	[9.11, 12.04]	
No HRA completion	**12.12**	[10.65, 13.79]	
No Chronic Condition in Year 1			
Selected behavior to change	**3.91**	[3.45, 4.44]	p≤0.01
No HRA completion	**3.52**	[3.14, 3.95]	

Multivariate negative binomial regression model, controlling for Year 1 characteristics: gender, age, FPL, race/ethnicity, prosperity region, health plan. *P*-value reflects difference in inpatient rate from Year 1 to Year 2

LIMITATIONS

There are a number of limitations that should be considered when interpreting this report.

First, the study cohort included individuals with 2 years of continuous HMP-MC enrollment, using HEDIS®-based requirements for ≥11 months of enrollment per year. Focusing on a continuously enrolled population allows for examination of the impact of key HMP features over time, such as the emphasis on primary care utilization and the HRA and healthy behavior incentives. However, these results do not reflect the overall HMP population, many of whom ended their HMP enrollment prior to 2 years, or had discontinuous enrollment. As shown in Appendix Table A-1, enrollees who met inclusion criteria in their first year of enrollment but not their second year were more likely to be 19-34 years old, and less likely to have had prior Adult Benefit Waiver coverage.

Second, the analyses for this report utilized specifications from established quality measures (e.g., HEDIS®, PQI, NQF). However, claims-based measures were impacted by the October 2015 change in the diagnosis coding system used for billing and reimbursement, from International Classification of Diseases, Ninth Revision (ICD-9) to International Classification of Diseases, Tenth Revision (ICD-10). Inconsistencies between ICD-9 and ICD-10 have been noted[10] and may have affected the results.

Third, the CMS Special Terms and Conditions specified four chronic conditions of interest. Consistent with HEDIS® methodology, these conditions were identified based on enrollees' utilization of services in Year 1. However, this methodology would not identify enrollees who were newly diagnosed with a condition in Year 2. The consistency of the HEDIS®-based chronic condition methodology is reported in Table A-22. The vast majority of the study population would have the same classification if the HEDIS criteria were applied in Year 1 and in Year 2 (95.3% for asthma, 96.1% for cardiovascular disease, 92.8% for COPD, and 97.0% for diabetes). Nonetheless, over 10,000 enrollees had evidence of one of these chronic conditions in Year 2 but were not identified in Year 1; this group may have different utilization patterns and may warrant further examination.

In addition to the four chronic conditions outlined in the CMS Special Terms and Conditions, enrollees could have a variety of other conditions that require higher-than-average utilization of health services (e.g., liver disease, HIV infection, mental health conditions). Thus, the chronic condition groups in this report represent only a subset of the population of HMP enrollees with chronic illness. However, the HCUP Chronic Condition Indicator, which yielded 89.2% of enrollees with a chronic condition, was determined to be too broad to accurately identify enrollees with chronic conditions that would impact expected utilization of health services.

Fourth, demographic characteristics were based on enrollees' first year of enrollment; enrollees who had a change in income, residence, or health plan could be misclassified for their second year. Table A-21 reports the consistency of these characteristics. Income group was stable, with 96.5% of enrollees in the same category in both Year 1 and 2. Prosperity region also was stable, with 98.6% of enrollees residing in the same region in both years. Health plan enrollment demonstrated less consistency, with 90.7% of enrollees in the same health plan both years; this may reflect January 2016 changes in authorization of health plans for different regions resulting from the periodic rebidding of Medicaid managed care contracts.

[10] Chronic Condition Data Warehouse. CCW White Paper: Impact of Conversion from ICD-9-CM to ICD-10-CM. September 2017. Available at ccw-condition-categories-impact-of-icd9-to-icd10-conversion.pdf

Fifth, the Domain III evaluation plan was designed to emphasize the Health Risk Assessment and healthy behavior selection as a key feature to affect utilization rates. However, only one quarter of enrollees had a completed HRA, with far fewer completing an HRA in both Year 1 and Year 2. Anecdotal evidence suggests that implementation of the HRA process was uneven. As noted in other evaluation reports by our team based on surveys of enrollees and primary care providers, uncertainty about the HRA process was noted by both groups, as well as logistical challenges with submission and verification of completed HRAs at the health plan level. Therefore, results related to HRA completion and healthy behavior selection are not as robust as originally expected.

Finally, the two-year study period provides some insights into utilization patterns, but may not be long enough to appreciate the full impact of HMP features that are designed to increase the use of primary care, encourage greater engagement of enrollees with their health, and promote healthy behavior change.

CONCLUSIONS

This report from Domain III of the Healthy Michigan Plan evaluation demonstrated several notable findings. Among HMP enrollees with continuous HMP-MC enrollment over two years, overall ED visit rates decreased modestly from Year 1 to Year 2, with more substantial decreases observed for enrollees with asthma, cardiovascular disease, COPD and/or diabetes. Lower ED visit rates were observed for enrollees who agreed to address at least one healthy behavior change, compared to those who did not complete a health risk assessment. Enrollees with regular primary care had higher rates of preventive service use than those with no primary care; similarly, enrollees who agreed to address at least one behavior change had higher rates of preventive service use than those who did not complete a health risk assessment. Among enrollees with asthma, cardiovascular disease, COPD and/or diabetes, inpatient rates decreased from Year 1 to Year 2, and were lower for the subset who agreed to address at least one behavior change. In contrast, inpatient rates increased from Year 1 to Year 2 among enrollees with none of the four chronic conditions. These findings demonstrate that HMP features to promote regular primary care and health risk assessments are associated with lower rates of ED and inpatient utilization for HMP enrollees, particularly those with chronic conditions.

Report on Health Behaviors, Utilization, and Health Outcomes in the Healthy Michigan Plan

Healthy Michigan Plan Evaluation Domain III

APPENDIX – Additional Data Tables

October 31, 2018

University of Michigan

Institute for Healthcare Policy & Innovation

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Table A-1. Characteristics of HMP-Managed Care Enrollees by Study Eligibility

	Study Population N=145,978	**Not Eligible in Year 2** N=109,826
Gender *		
Women	**54.2%**	53.5%
Men	**45.8%**	46.5%
Age at Start of Year 1*		
19-34 Years	**35.4%**	49.6%
35-49 Years	**33.0%**	28.8%
50-64 Years	**31.6%**	21.7%
Income (% FPL) at Start of Year 1*		
0 to 35%	**61.8%**	59.6%
>35% to 75%	**12.7%**	12.9%
>75% to <100%	**10.6%**	10.7%
≥100%	**14.8%**	16.7%
Race/Ethnicity*		
Hispanic	**2.8%**	3.7%
Non-Hispanic Black	**24.4%**	26.0%
Non-Hispanic White	**64.1%**	58.8%
Other/Unknown	**8.6%**	11.6%
Prosperity Region at Start of Year 1*		
1: Upper Peninsula	**3.7%**	3.2%
2: Northwest	**2.6%**	2.8%
3: Northeast	**3.2%**	2.7%
4: West	**11.6%**	12.5%
5: East Central	**6.6%**	6.2%
6: East	**11.4%**	11.7%
7: South Central	**4.0%**	4.4%
8: Southwest	**6.8%**	7.5%
9: Southeast	**6.8%**	7.6%
10: Detroit Metro	**43.4%**	41.4%

*p<.0001 #p<.001 for chi-square comparison between groups

Table A-1. Characteristics of HMP-Managed Care Enrollees by Study Eligibility (Continued)

	Study Population N=145,978	**Not Eligible in Year 2** N=109,826
Health Plan at Start of Year 1*		
Plan A	**1.8%**	2.1%
Plan B	**8.1%**	7.8%
Plan C	**6.1%**	6.0%
Plan D	**0.7%**	0.8%
Plan E	**6.3%**	6.1%
Plan F	**12.3%**	11.7%
Plan G	**24.7%**	25.7%
Plan H	**11.7%**	11.5%
Plan I	**1.0%**	1.1%
Plan J	**6.8%**	7.2%
Plan K	**3.5%**	3.9%
Plan L	**13.4%**	13.0%
Plan M	**3.7%**	3.3%
Prior Adult Benefit Waiver Coverage*		
Yes	**16.6%**	9.9%

*≤0.001 for chi-square comparison between groups
Column percentages may not add to 100.0% due to rounding.

Figure A-1. MDHHS Prosperity Regions

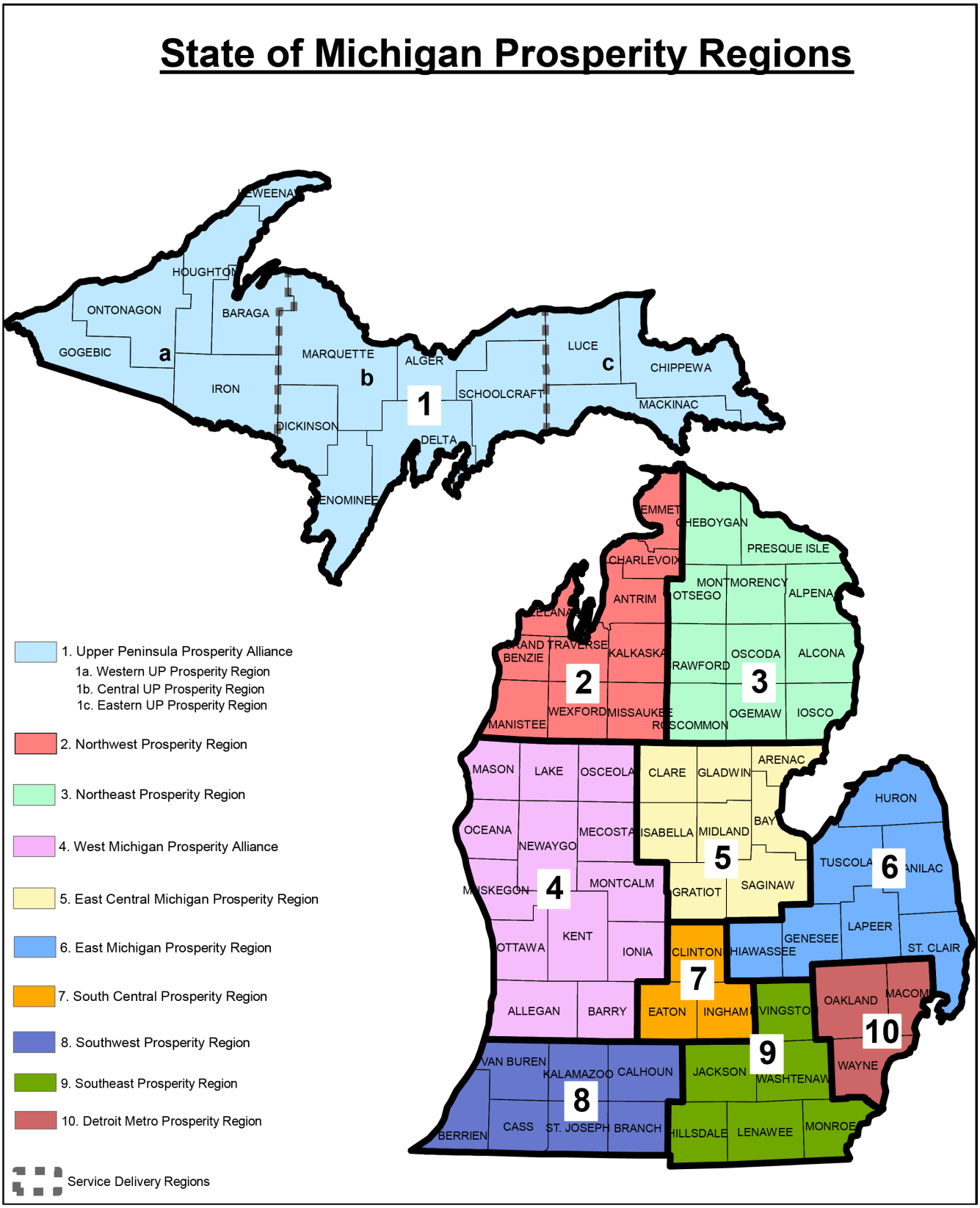

Table A-2. Chronic Condition Status

Chronic Condition Identified in Year 1	**N**	**%**
Asthma	7,354	**5.0%**
Cardiovascular disease	6,074	**4.0%**
Chronic obstructive pulmonary disease (COPD)	12,776	**8.8%**
Diabetes	14,411	**9.9%**
More than one condition	*5,834*	*4.0%*
No condition identified in Year 1	112,067	**76.8%**
HCUP Chronic Condition Indicator		
Any chronic condition	130,257	**89.2%**

Table A-3. HRA Completion by Health Plan at Start of Year 1 (N=145,978)

	Selected behavior to change	No behavior to address	Not ready for change	Serious Condition	No HRA Completion
Overall	**23.6%**	**2.8%**	**0.1%**	**0.1%**	**73.4%**
Plan A	16.2%	2.1%	0.2%	0.2%	81.4%
Plan B	19.2%	2.3%	<0.1%	<0.1%	78.4%
Plan C	23.4%	2.8%	<0.1%	<0.1%	73.7%
Plan D	17.0%	1.1%	<0.1%	<0.1%	81.8%
Plan E	62.1%	5.4%	0.3%	0.2%	32.0%
Plan F	30.1%	4.0%	0.2%	0.1%	65.5%
Plan G	19.7%	2.1%	0.1%	0.1%	78.0%
Plan H	18.8%	2.1%	0.1%	<0.1%	78.9%
Plan I	16.9%	1.5%	0.1%	<0.1%	81.4%
Plan J	26.6%	3.3%	0.2%	0.2%	69.7%
Plan K	19.1%	3.2%	<0.1%	0.1%	77.6%
Plan L	16.4%	2.4%	<0.1%	<0.1%	81.1%
Plan M	19.0%	2.8%	0.4%	0.1%	77.7%

$p \leq 0.001$ for chi-square comparison between plans in the proportion with no HRA completion.
Row percentages may not add to 100.0% due to rounding.

Table A-4. Primary Care Visit Pattern across Year 1 and Year 2

	Proportion of Enrollees with			
	Regular Primary Care	**Year 1 only**	**Year 2 only**	**No Primary Care**
Overall Population	71.7%	10.3%	7.1%	11.0%
Gender*				
Women	79.4%	8.0%	6.0%	6.7%
Men	62.6%	13.0%	8.4%	16.1%
Age at Start of Year 1*				
19-34 Years	61.1%	13.5%	9.6%	15.8%
35-49 Years	75.1%	9.1%	6.5%	9.3%
50-64 Years	79.9%	7.8%	4.9%	7.4%
Income (% FPL) at Start of Year 1*				
0 to 35%	70.3%	10.5%	7.2%	12.0%
>35% to 75%	74.8%	9.8%	6.4%	9.0%
>75% to <100%	72.8%	10.0%	7.2%	9.9%
≥100%	73.6%	10.1%	7.0%	9.3%
Race/Ethnicity*				
Hispanic	70.2%	10.8%	7.8%	11.2%
Non-Hispanic Black	63.2%	11.5%	9.0%	16.3%
Non-Hispanic White	75.2%	9.6%	6.3%	8.9%
Prosperity Region at Start of Year 1*				
1: Upper Peninsula	73.8%	10.5%	5.7%	10.0%
2: Northwest	79.4%	7.8%	5.7%	7.1%
3: Northeast	78.9%	8.6%	5.6%	6.9%
4: West	74.9%	9.8%	6.1%	9.2%
5: East Central	73.6%	9.9%	6.5%	9.9%
6: East	75.7%	9.7%	5.9%	8.8%
7: South Central	70.4%	10.5%	7.7%	11.3%
8: Southwest	72.6%	9.4%	7.5%	10.5%
9: Southeast	72.5%	10.5%	6.8%	10.2%
10: Detroit Metro	68.1%	10.9%	7.9%	13.0%

*$p \leq 0.001$ for chi-square comparison between subgroups.
Row percentages may not add to 100.0% due to rounding.

Table A-4. Primary Care Visit Pattern across Year 1 and Year 2 (Continued)

	Proportion of Enrollees with			
	Regular Primary Care	**Year 1 only**	**Year 2 only**	**No Primary Care**
Health Plan at Start of Year 1*				
Plan A	58.1%	12.0%	9.1%	20.8%
Plan B	65.8%	12.8%	8.3%	13.1%
Plan C	67.9%	10.6%	8.3%	13.1%
Plan D	56.1%	10.4%	11.3%	22.3%
Plan E	78.0%	9.6%	5.1%	7.3%
Plan F	74.4%	11.0%	5.7%	8.9%
Plan G	73.5%	9.1%	7.2%	10.2%
Plan H	69.1%	10.3%	8.1%	12.5%
Plan I	67.6%	9.5%	10.4%	12.5%
Plan J	76.7%	9.9%	5.4%	8.0%
Plan K	67.4%	10.8%	7.9%	13.8%
Plan L	71.1%	10.1%	7.1%	11.7%
Plan M	73.8%	10.5%	5.7%	10.0%
Chronic Condition Identified in Year 1*				
Asthma	90.2%	5.3%	2.4%	2.1%
Cardiovascular disease	92.3%	5.4%	1.1%	1.1%
Chronic obstructive pulmonary disease (COPD)	91.8%	6.0%	1.3%	1.0%
Diabetes	95.2%	3.1%	1.1%	0.5%
More than one condition	*96.2%*	*2.8%*	*0.6%*	*0.4%*
No condition identified in Year 1	65.5%	11.8%	8.7%	14.0%
HRA Healthy Behavior Status				
Selected behavior to change	89.8%	6.8%	2.9%	0.4%
No behavior to address	84.3%	11.2%	3.6%	0.8%
Not ready for change	86.6%	7.4%	5.9%	--
Serious condition	89.7%	7.6%	2.8%	--
No HRA completion	65.3%	11.3%	8.5%	14.8%

*$P \leq 0.001$ for chi-square comparison between groups.
Row percentages may not add to 100.0% due to rounding.

Table A-5. Emergency Department Visit Rate per 1,000 Member Months

	N	Year 1	Year 2
Overall Population	**145,978**	**71.03**	**69.50**
Gender		*	*
Women	79,112	76.00	74.97
Men	66,866	65.15	63.03
Age at Start of Year 1		*	*
19-34 Years	51,713	84.40	81.80
35-49 Years	48,210	78.99	76.91
50-64 Years	46,055	47.70	47.96
Income (% FPL) at Start of Year 1		*	*
0 to 35%	90,231	79.16	77.49
>35% to 75%	18,601	59.89	58.78
>75% to <100%	15,452	57.82	57.02
≥100%	21,654	56.03	54.29
Race/Ethnicity		*	*
Hispanic	4,103	73.39	71.26
Non-Hispanic Black	35,663	88.24	88.32
Non-Hispanic White	93,586	65.88	63.73
Prosperity Region at Start of Year 1		*	*
1: Upper Peninsula	5,387	59.15	57.47
2: Northwest	3,794	57.52	56.90
3: Northeast	4,608	50.51	49.47
4: West	16,971	91.65	85.51
5: East Central	9650	69.83	70.24
6: East	16,571	58.34	58.61
7: South Central	5,876	68.52	64.76
8: Southwest	9,875	88.30	83.43
9: Southeast	9,907	76.80	72.74
10: Detroit Metro	63,334	68.96	68.95

*$P \leq 0.001$ for chi-square comparison of ED rates within subgroup for that study year.

Table A-5. Emergency Department Visit Rate per 1,000 Member Months (Continued)

	N	Year 1	Year 2
Health Plan at Start of Year 1		*	*
Plan A	2,636	81.24	80.50
Plan B	11,820	68.22	66.14
Plan C	8,948	68.07	70.76
Plan D	1,074	78.17	77.50
Plan E	9,166	53.66	52.00
Plan F	17,904	62.14	61.63
Plan G	36,018	78.00	74.77
Plan H	17,109	76.49	74.57
Plan I	1,396	64.12	63.65
Plan J	9,858	80.85	74.60
Plan K	5,144	74.27	76.46
Plan L	19,514	70.59	69.63
Plan M	5,391	59.23	57.48
Chronic Condition Identified in Year 1		*	*
Asthma	7,354	127.60	115.33
Cardiovascular disease	6,074	110.78	101.37
Chronic obstructive pulmonary disease (COPD)	12,776	116.08	105.33
Diabetes	14,411	94.19	89.06
More than one condition	*5,834*	*132.58*	*122.50*
None of the four conditions	112,067	60.88	61.45

* $P \leq 0.001$ for chi-square comparison of ED rates within subgroup for that study year.

Table A-6. High Emergency Department Utilization

a. Number of ED Visits per Year (N=145,978)

Number of ED Visits	**Year 1**	**Year 2**
0	62.7%	62.8%
1-2	27.6%	27.7%
3-4	6.2%	6.0%
≥5 (High ED Utilization)	**3.5%**	**3.4%**
5-9	*2.8%*	*2.8%*
≥10-19	*0.7%*	*0.6%*

Column totals may not add to 100.0% due to rounding.

b. High ED Utilization Across Years

		Year 2	
Year 1	N	High ED Utilizer	Not High Utilizer
High ED Utilizer	5,188	41.0%	59.0%
Not High Utilizer	140,790	2.1%	97.9%

Table A-7. High ED Utilization in Year 1 and Year 2 by Enrollee Characteristics

		Proportion with ≥5 ED Visits in	
	N	**Year 1**	**Year 2**
Overall Population	**145,978**	**3.55%**	**3.44%**
Gender			
Women	79,112	4.0%	3.9%
Men	66,866	3.1%	2.8%
Age at Start of Year 1			
19-34 Years	51,713	4.7%	4.5%
35-49 Years	48,210	4.0%	3.9%
50-64 Years	46,055	1.8%	1.8%
Income (% FPL) at Start of Year 1			
0 to 35%	90,231	4.2%	4.1%
>35% to 75%	18,601	2.7%	2.6%
>75% to <100%	15,452	2.5%	2.4%
≥100%	21,654	2.4%	2.2%
Race/Ethnicity			
Hispanic	4,103	3.5%	3.4%
Non-Hispanic Black	35,663	4.4%	4.5%
Non-Hispanic White	93,586	3.4%	3.2%
Prosperity Region at Start of Year			
1: Upper Peninsula	5,387	3.0%	3.2%
2: Northwest	3,794	2.7%	2.3%
3: Northeast	4,608	2.1%	2.3%
4: West	16,971	5.6%	5.0%
5: East Central	9650	3.6%	3.6%
6: East	16,571	2.9%	2.7%
7: South Central	5,876	3.7%	3.3%
8: Southwest	9,875	5.0%	4.6%
9: Southeast	9,907	4.1%	3.8%
10: Detroit Metro	63,334	3.1%	3.1%

Table A-7. High ED Utilization in Year 1 and Year 2 by Enrollee Characteristics (Continued)

		Proportion with ≥5 ED Visits in	
	N	**Year 1**	**Year 2**
Health Plan at Start of Year 1			
Plan A	2,636	4.2%	4.0%
Plan B	11,820	2.9%	2.9%
Plan C	8,948	2.9%	3.2%
Plan D	1,074	2.4%	2.6%
Plan E	9,166	2.6%	2.3%
Plan F	17,904	3.1%	2.9%
Plan G	36,018	4.0%	3.9%
Plan H	17,109	3.9%	3.9%
Plan I	1,396	3.2%	3.5%
Plan J	9,858	4.6%	4.1%
Plan K	5,144	3.7%	3.5%
Plan L	19,514	3.5%	3.3%
Plan M	5,391	3.0%	3.2%
Chronic Condition Identified in Year 1			
Asthma	7,354	8.5%	7.7%
Cardiovascular disease	6,074	6.4%	5.8%
Chronic obstructive pulmonary disease (COPD)	12,776	7.1%	6.6%
Diabetes	14,411	5.6%	5.1%
More than one condition	*5,834*	*8.6%*	*8.0%*
None of the four conditions	112,067	2.7%	2.8%

Table A-8. Predictors of High ED Utilization (≥5 ED Visits in the Year)

	Year 1		Year 2		Both	
	aOR	**CI**	**aOR**	**CI**	**aOR**	**CI**
Gender						
Women	**1.39***	**[1.31, 1.47]**	**1.52***	**[1.43, 1.62]**	1.59*	[1.46, 1.75]
Men	Ref.		Ref.		Ref.	
Age						
19-34 Years	**4.38***	**[4.01, 4.79]**	**3.76***	**[3.44, 4.11]**	**5.40***	**[4.69, 6.22]**
35-49 Years	**2.69***	**[2.47, 2.92]**	**2.45***	**[2.25, 2.66]**	**3.28***	**[2.86, 3.76]**
50-64 Years	Ref.		Ref.		Ref.	
Income (% FPL)						
0 to 35%	**1.85***	**[1.68, 2.04]**	**1.98***	**[1.79, 2.18]**	**2.30***	**[1.96, 2.69]**
>35% to 75%	**1.18****	**[1.04, 1.33]**	**1.20****	**[1.05, 1.36]**	**1.31****	**[1.06, 1.60]**
>75% to <100%	1.04	[0.91, 1.19]	1.10	[0.96, 1.27]	1.15	[0.92, 1.44]
≥100%	Ref.		Ref.		Ref.	
Race/Ethnicity						
Hispanic	0.96	[0.81, 1.15]	1.02	[0.85, 1.21]	0.79	[0.59, 1.06]
Non-Hispanic Black	**1.47***	**[1.37, 1.58]**	**1.59***	**[1.48, 1.70]**	**1.43***	**[1.28, 1.59]**
Non-Hispanic White	Ref.		Ref.		Ref.	
Prosperity Region						
1: Upper Peninsula	Ref.		Ref.		Ref.	
2: Northwest	0.57	[0.30, 1.08]	1.78	[0.34, 9.34]	0.47	[0.01, 18.25]
3: Northeast	**0.41****	**[0.22, 0.78]**	1.67	[0.32, 8.67]	0.36	[0.01, 13.73]
4: West	1.17	[0.63, 2.15]	3.75	[0.72, 19.49]	1.21	[0.03, 45.98]
5: East Central	0.68	[0.37, 1.27]	2.46	[0.47, 12.75]	0.69	[0.02, 26.20]
6: East	0.54	[0.29, 1.00]	1.82	[0.35, 9.45]	0.50	[0.01, 18.92]
7: South Central	0.72	[0.38, 1.35]	2.11	[0.40, 11.04]	0.60	[0.02, 23.10]
8: Southwest	0.90	[0.49, 1.66]	2.89	[0.56, 15.00]	0.83	[0.02, 31.54]
9: Southeast	0.79	[0.43, 1.46]	2.58	[0.50, 13.42]	0.76	[0.02, 29.03]
10: Detroit Metro	**0.46****	**[0.25, 0.85]**	1.68	[0.32, 8.72]	0.40	[0.01, 15.16]
Health Plan						
Plan A	1.72	[0.91, 3.26]	0.42	[0.08, 2.17]	2.11	[0.06, 80.84]
Plan B	1.35	[0.73, 2.50]	0.35	[0.07, 1.79]	1.29	[0.03, 49.27]
Plan C	1.38	[0.74, 2.57]	0.39	[0.08, 2.03]	1.29	[0.03, 49.06]
Plan D	1.12	[0.54, 2.31]	0.30	[0.06, 1.61]	0.75	[0.02, 30.64]
Plan E	1.14	[0.61, 2.13]	0.28	[0.05, 1.45]	1.05	[0.03, 39.97]
Plan F	1.39	[0.76, 2.57]	0.37	[0.07, 1.92]	1.27	[0.03, 48.17]
Plan G	1.56	[0.85, 2.87]	0.42	[0.08, 2.14]	1.43	[0.04, 54.30]
Plan H	1.58	[0.86, 2.92]	0.42	[0.08, 2.17]	1.54	[0.04, 58.29]
Plan I	1.21	[0.60, 2.44]	0.42	[0.08, 2.22]	1.43	[0.04, 56.00]
Plan J	1.28	[0.69, 2.37]	0.32	[0.06, 1.67]	1.08	[0.03, 40.94]
Plan K	1.84	[0.98, 3.44]	0.43	[0.08,2.26]	1.73	[0.05, 66.14]
Plan L	1.58	[0.86, 2.92]	0.39	[0.08, 2.01]	1.51	[0.04, 57.42]
Plan M	Ref.		Ref.		Ref.	

Separate logistic regression models run for Year 1, Year 2 and both Year 1 and 2, each controlling for the covariates shown.
Adjusted odds ratios, 95% confidence intervals in brackets. *$P \leq 0.001$ ** $P \leq 0.01$

Table A-8. Predictors of High ED Utilization (Continued)

	Year 1		Year 2		Both	
	aOR	**CI**	**aOR**	**CI**	**aOR**	**CI**
Chronic Condition Status						
Asthma	**3.00***	**[2.71, 3.32]**	**2.71***	**[2.45, 3.01]**	**3.56***	**[3.08, 4.12]**
Cardiovascular disease	**3.62***	**[3.29, 4.00]**	**3.06***	**[2.76, 3.39]**	**3.93***	**[3.39, 4.55]**
COPD	**2.41***	**[1.96, 2.98]**	**1.84***	**[1.46, 2.31]**	**2.20***	**[1.55, 3.14]**
Diabetes	**2.16***	**[1.94, 2.41]**	**1.92***	**[1.72, 2.15]**	**2.44***	**[2.08, 2.87]**
More than one condition	**5.40***	**[4.85, 6.01]**	**4.66***	**[4.18, 5.19]**	**7.10***	**[6.12, 8.24]**
None of the four conditions	Ref.		Ref.		Ref.	

Separate logistic regression models run for Year 1, Year 2 and both Year 1 and 2, each controlling for the covariates shown.
Adjusted odds ratios, 95% confidence intervals in brackets. *$P \leq 0.001$ ** $P \leq 0.01$

Table A-9. ED Utilization by Primary Care Pattern – Unadjusted Bivariate Results

	ED Rate (per 1,000 member-months)		High ED Utilization (% with ≥5 ED Visits in Year)	
Primary Care Visit Pattern	**Year 1**	**Year 2**	**Year 1**	**Year 2**
Overall Population				
Regular primary care	79.84	78.09	4.2%	4.1%
Year 1 only	57.90	42.06	2.4%	1.5%
Year 2 only	52.94	72.51	2.2%	3.1%
No primary care	37.53	37.12	1.2%	1.1%
Chronic Condition Identified in Year 1				
Asthma				
Regular primary care	127.97	116.71	8.5%	7.8%
Year 1 only	117.61	89.32	9.2%	5.1%
Year 2 only	127.55	132.42	8.0%	9.7%
No primary care	137.57	102.38	7.9%	6.6%
Cardiovascular disease				
Regular primary care	111.41	102.80	6.5%	5.9%
Year 1 only	106.95	81.84	5.4%	3.6%
Year 2 only	121.21	126.42	8.6%	8.6%
No primary care	66.67	52.63	4.1%	5.5%
COPD				
Regular primary care	116.50	106.29	7.2%	6.7%
Year 1 only	92.61	70.03	4.2%	2.7%
Year 2 only	161.64	174.78	10.4%	12.3%
No primary care	161.51	141.03	8.1%	10.5%
Diabetes				
Regular primary care	93.64	89.24	5.5%	5.2%
Year 1 only	88.51	57.05	6.6%	2.7%
Year 2 only	137.17	155.63	8.4%	9.7%
No primary care	138.19	110.17	7.6%	7.6%

Table A-10. Influence of Primary Care Visit Pattern on Year 2 ED Visit Rate (Adjusted)

	Year 2 Adjusted Rate	95% CI	*P*-value
Chronic Condition Identified in Year 1			≤0.001
Regular primary care	**93.68**	[86.34, 101.60]	
Year 1 only	**61.21**	[54.48, 68.77]	
Year 2 only	**127.80**	[109.10, 149.80]	
No primary care	**87.06**	[72.42, 104.40]	
No Chronic Condition Identified in Year 1			
Regular primary care	**59.39**	[57.16, 61.70]	≤0.001
Year 1 only	**29.53**	[28.07, 31.06]	
Year 2 only	**52.41**	[49.80, 55.15]	
No primary care	**25.68**	[24.44, 26.98]	

Adjusted for Year 1 characteristics: gender, age, FPL, race/ethnicity, prosperity region, health plan

Table A-11. ED Utilization by Healthy Behavior Status – Unadjusted Bivariate Results

	ED Rate (per 1,000 member-months)		High ED Utilization (% with ≥5 ED Visits in Year)	
HRA Healthy Behavior Status	**Year 1**	**Year 2**	**Year 1**	**Year 2**
Overall Population				
Selected behavior to change	63.14	62.86	3.0%	3.0%
No behavior to address	42.69	44.59	1.7%	1.6%
Not ready for change	68.10	73.49	3.0%	5.4%
Serious condition/healthy behavior not required	154.02	122.56	9.0%	9.0%
No HRA completion	74.53	72.50	3.8%	3.7%

Table A-12. Influence of HRA Completion on Year 2 ED Visit Rate (Adjusted)

	Year 2 Adjusted Rate	95% CI	*P*-value
Chronic Condition Identified in Year 1			≤0.001
Selected behavior to change	**81.25**	[54.13, 122.00]	
No behavior to address	**69.86**	[45.43, 107.40]	
Not ready for change	**106.80**	[59.89, 190.50]	
Serious condition/healthy behavior not required	**165.40**	[93.55, 292.50]	
No HRA completion	**96.96**	[64.65, 145.40]	
No Chronic Condition Identified in Year 1			
Selected behavior to change	**51.17**	[39.28, 66.66]	0.02
No behavior to address	**37.03**	[28.20, 48.63]	
Not ready for change	**59.91**	[39.63, 90.56]	
Serious condition/healthy behavior not required	**85.90**	[54.36135.70]	
No HRA completion	**52.99**	[40.72, 68.97]	

Adjusted for Year 1 characteristics: gender, age, FPL, race/ethnicity, prosperity region, health plan

Table A-13. Receipt of Preventive Services

	Eligible Population	Year 1	Year 2	Either Year 1 or 2
Preventive Care Visit	145,978	39.8 %	32.9 %	**54.3%**
Flu Vaccine	145,978	21.1%	21.3%	**30.2%**
Other Vaccine	145,978	4.7%	4.4%	**8.4%**
Breast Cancer Screening	44,612	45.6%	41.2%	**62.4%**
Cervical Cancer Screening	73,721	33.6%	26.0%	**50.3%**
Colon Cancer Screening	46,044	23.9%	16.8%	**36.8%**
Other Screening	145,978	30.4%	27.9%	**44.6%**
Smoking/Tobacco Use Cessation Assistance	36,158	18.6%	18.4%	**28.5%**
Preventive Dental Care	145,978	24.5%	26.7%	**35.8%**
Any Healthy Behavior	*145,978*	***71.5%***	***68.5%***	***83.7%***

Table A-14. Receipt of Any Healthy Behavior (Either Year) by Enrollee Characteristics

	N	% Receiving Any Healthy Behavior	*P*-value
Overall Population	**145,978**	**83.7%**	
Gender			
Women	79,112	90.4%	≤0.001
Men	66,866	75.8%	
Age at Start of Year 1			
19-34 Years	51,713	79.5%	≤0.001
35-49 Years	48,210	83.9%	
50-64 Years	46,055	88.2%	
Income (% FPL) at Start of Year 1			
0 to 35%	90,231	82.4%	≤0.001
>35% to 75%	18,601	86.0%	
>75% to <100%	15,452	85.6%	
≥100%	21,654	85.9%	
Race/Ethnicity			
Hispanic	4,103	82.9%	≤0.001
Non-Hispanic Black	35,663	81.6%	
Non-Hispanic White	93,586	84.4%	
Prosperity Region at Start of Year			
1: Upper Peninsula	5,387	79.1%	≤0.001
2: Northwest	3,794	86.9%	
3: Northeast	4,608	83.4%	
4: West	16,971	84.5%	
5: East Central	9650	82.2%	
6: East	16,571	85.0%	
7: South Central	5,876	83.2%	
8: Southwest	9,875	81.7%	
9: Southeast	9,907	82.5%	
10: Detroit Metro	63,334	84.1%	

Table A-14. Receipt of Any Healthy Behavior (Either Year) by Enrollee Characteristics (Continued)

	N	% Receiving Any Healthy Behavior	*P*-value
Health Plan at Start of Year 1			
Plan A	2,636	75.9%	≤0.001
Plan B	11,820	83.2%	
Plan C	8,948	84.1%	
Plan D	1,074	75.7%	
Plan E	9,166	86.9%	
Plan F	17,904	84.8%	
Plan G	36,018	83.9%	
Plan H	17,109	83.2%	
Plan I	1,396	82.7%	
Plan J	9,858	86.1%	
Plan K	5,144	80.7%	
Plan L	19,514	83.7%	
Plan M	5,391	79.1%	
Chronic Condition Identified in Year 1			≤0.001*
Asthma	7,354	92.3%	
Cardiovascular disease	6,074	92.9%	
Chronic obstructive pulmonary disease (COPD)	12,776	94.4%	
Diabetes	14,411	93.4%	
More than one condition	*5,834*	95.3%	
None of the four conditions	112,067	80.9%	

P-value reflects chi-square comparison of subgroups.

**P*-value reflects chi-square comparison between enrollees with any vs. none of the four conditions.

Table A-15. Receipt of Any Healthy Behavior (Either Year) by Primary Care Pattern

	% Receiving Service among Enrollees with			
	Regular Primary Care	**Year 1 only**	**Year 2 only**	**No Primary Care**
Preventive Care Visit	64.3%	46.6%	44.1%	3.1%
Flu Vaccine	37.4%	16.2%	16.7%	5.2%
Other Vaccine	10.6%	3.8%	4.5%	1.2%
Breast Cancer Screening	68.8%	39.0%	39.3%	5.0%
Cervical Cancer Screening	55.3%	38.1%	40.8%	9.7%
Colon Cancer Screening	42.3%	23.1%	21.0%	1.9%
Other Screening	52.1%	33.5%	38.8%	9.7%
Smoking/Tobacco Use Cessation Assistance	31.9%	16.5%	21.7%	2.7%
Preventive Dental Care	40.4%	30.0%	28.1%	16.6%
Any Healthy Behavior	93.4%	77.6%	77.3%	30.1%

Table A-16. Receipt of Any Preventive Service (Either Year) by HRA Completion

	Selected behavior to change	No behavior to address	Not ready for change	Serious Condition	No HRA Completion
Preventive Care Visit	73.2%	79.8%	66.3%	65.5%	47.3%
Flu Vaccine	41.5%	38.1%	33.7%	40.7%	26.3%
Other Vaccine	11.5%	6.6%	10.4%	15.2%	7.5%
Breast Cancer Screening	74.8%	75.6%	62.3%	74.2%	56.1%
Cervical Cancer Screening	56.8%	59.7%	55.6%	59.5%	47.4%
Colon Cancer Screening	46.4%	43.5%	35.6%	50.8%	31.8%
Other Screening	52.8%	52.8%	44.1%	50.3%	41.6%
Smoking/Tobacco Use Cessation Assistance	31.4%	17.6%	33.9%	39.0%	26.4%
Preventive Dental Care	42.8%	52.5%	36.6%	44.1%	32.9%
Any Healthy Behavior	96.1%	96.4%	95.1%	95.2%	79.2%

Table A-17. Change in Self-Reported Health Status

Reported Health Status (N=10,272)

	Health Status Year 1		Health Status Year 1 to Year 2		
	N	%	Improved	Stayed same	Got worse
Excellent/Very good	2,969	28.9%	--	59.8%	40.2%
Good	3,901	38.0%	20.1%	58.3%	21.6%
Fair/Poor	3,402	33.1%	36.0%	64.0%	--

		Health Status Year 1 to Year 2		
HRA Healthy Behavior Status	N	Improved	Stayed same	Got worse
Selected behavior to change	9,063	19.5%	60.6%	19.9%
No behavior to address	621	19.5%	63.1%	17.4%
Not ready for change	14	*	*	*
Serious condition	18	*	*	*
No HRA completion	556	19.6%	58.6%	21.8%

*data not shown; includes cell sizes <5

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Table A-18. Receipt of Diabetes-Specific Preventive Services

		% Receiving (Either Year)	
	N	**Hemoglobin A1c Testing**	**LDL-C Screening**
Overall Population with Diabetes	14,411	**96.0%**	**92.0%**
Primary Care Visit Pattern			
Regular primary care	13,725	97.0%	93.2%
Year 1 only	452	83.2%	73.2%
Year 2 only	155	76.1%	71.6%
No primary care	79	36.7%	34.2%
HRA Healthy Behavior Status			
Selected behavior to change	4,570	98.0%	95.5%
No behavior to address	177	97.5%	98.5%
Not ready for change	23	100.0%	92.0%
Serious condition	34	100.0%	94.3%
No HRA completion	8,123	94.8%	90.1%

Table A-19. Medical-Surgical Inpatient Rates per 1,000 Member Months (Unadjusted) by Enrollee Characteristics

	N	Year 1	Year 2
Overall Inpatient Rate	**145,978**	**8.12**	**8.32**
Gender			
Women	79,112	8.28	8.46
Men	66,866	7.93	8.16
Age at Start of Year 1			
19-34 Years	51,713	5.24	5.53
35-49 Years	48,210	9.47	9.29
50-64 Years	46,055	9.94	10.43
Income (% FPL) at Start of Year 1			
0 to 35%	90,231	9.13	9.58
>35% to 75%	18,601	6.21	6.63
>75% to <100%	15,452	6.54	5.95
≥100%	21,654	6.65	6.23
Race/Ethnicity			
Hispanic	4,103	7.62	7.53
Non-Hispanic Black	35,663	8.92	9.38
Non-Hispanic White	93,586	7.90	8.07
Prosperity Region at Start of Year 1			
1: Upper Peninsula	5,387	5.68	6.64
2: Northwest	3,794	6.88	6.85
3: Northeast	4,608	6.19	6.09
4: West	16,971	7.46	8.20
5: East Central	9650	7.07	8.05
6: East	16,571	7.95	8.05
7: South Central	5,876	7.92	7.99
8: Southwest	9,875	7.95	7.87
9: Southeast	9,907	9.17	8.76
10: Detroit Metro	63,334	8.80	8.89

Table A-19. Medical-Surgical Inpatient Rates per 1,000 Member Months (Unadjusted) by Enrollee Characteristics (Continued)

	N	Year 1	Year 2
Health Plan at Start of Year 1			
Plan A	2,636	8.38	8.37
Plan B	11,820	9.11	8.34
Plan C	8,948	8.92	9.17
Plan D	1,074	9.08	10.66
Plan E	9,166	6.99	7.55
Plan F	17,904	8.48	8.43
Plan G	36,018	8.04	8.34
Plan H	17,109	7.98	8.13
Plan I	1,396	8.36	6.34
Plan J	9,858	8.14	8.61
Plan K	5,144	9.98	11.84
Plan L	19,514	7.68	7.72
Plan M	5,391	5.71	6.67
Chronic Condition Identified in Year 1			
Asthma	7,354	9.28	10.36
Cardiovascular disease	6,074	36.83	24.23
Chronic obstructive pulmonary disease (COPD)	12,776	25.00	20.11
Diabetes	14,411	20.80	18.95
More than one condition	*5,834*	37.00	28.84
None of the four conditions	112,067	4.82	5.93

Table A-20. Medical-Surgical Inpatient Rates (Unadjusted) by Primary Care Visit Pattern

	Medical-Surgical Inpatient Stays per 1,000 member-months	
Primary Care Visit Pattern	**Year 1**	**Year 2**
Overall Population		
Regular primary care	9.82	9.96
Year 1 only	5.31	3.23
Year 2 only	4.15	8.33
No primary care	2.24	2.35
Chronic Condition Identified in Year 1		
Asthma		
Regular primary care	9.64	10.70
Year 1 only	7.44	4.92
Year 2 only	3.32	12.81
No primary care	5.53	6.64
Cardiovascular disease		
Regular primary care	37.19	25.21
Year 1 only	27.52	7.11
Year 2 only	45.46	41.72
No primary care	43.59	8.99
Chronic obstructive pulmonary disease (COPD)		
Regular primary care	24.96	20.34
Year 1 only	18.52	9.07
Year 2 only	42.97	53.82
No primary care	45.09	22.27
Diabetes		
Regular primary care	20.44	18.98
Year 1 only	23.79	12.60
Year 2 only	39.81	31.77
No primary care	30.59	24.36

Table A-21. Consistency of Enrollee Demographic Characteristics, Year 1 to Year 2

	N Year 1	% in same group Year 2
Income (% FPL)		
0 to 35%	90,231	**97.5%**
>35% to 75%	18,601	**95.3%**
>75% to <100%	15,452	**94.5%**
≥100%	21,654	**94.9%**
Prosperity Region		
1: Upper Peninsula	5,387	**99.1%**
2: Northwest	3,794	**96.5%**
3: Northeast	4,608	**96.8%**
4: West	16,971	**98.5%**
5: East Central	9650	**97.9%**
6: East	16,571	**98.2%**
7: South Central	5,876	**97.3%**
8: Southwest	9,875	**98.3%**
9: Southeast	9,907	**97.4%**
10: Detroit Metro	63,334	**99.3%**
Health Plan		
Plan A	2,636	**84.1%**
Plan B	11,820	**94.0%**
Plan C	8,948	**74.6%**
Plan D	1,074	**82.6%**
Plan E	9,166	**61.2%**
Plan F	17,904	**95.6%**
Plan G	36,018	**96.0%**
Plan H	17,109	**93.1%**
Plan I	1,396	**73.6%**
Plan J	9,858	**93.6%**
Plan K	5,144	**90.7%**
Plan L	19,514	**92.6 %**
Plan M	5,391	**99.0%**

Table A-22. Consistency of HEDIS-Based Chronic Condition Identification, Year 1 to Year 2

Chronic Condition	Year 1 Identification*		Year 2 Identification #		% in same category in Year 2
Asthma					*95.3% overall*
	Yes	7,354	Yes	4,417	60.1%
			No	2,937	39.9%
	No	138,624	Yes	3,886	2.8%
			No	134,738	97.2%
Cardiovascular disease					*96.1% overall*
	Yes	6,074	Yes	3,500	57.6%
			No	2,574	42.4%
	No	139,904	Yes	3,407	2.2%
			No	136,857	97.8%
COPD					*92.8% overall*
	Yes	12,776	Yes	7,968	62.4%
			No	4,808	37.6%
	No	133,202	Yes	5,713	4.3%
			No	127,489	95.7%
Diabetes					*97.0% overall*
	Yes	14,411	Yes	12,828	89.0%
			No	1,583	11.0%
	No	131,567	Yes	2,746	2.1%
			No	128,821	97.9%