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## MassHealth Managed Care HEDIS® 2006: Technical Report

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# Executive Summary

Since 2001, the Center for Health Policy and Research (CHPR) has collaborated with the MassHealth Office of Acute and Ambulatory Care (OAAC) and the MassHealth Behavioral Health program (MHBH) to assess the performance of all MassHealth managed care organizations (MCOs) and the Primary Care Clinician (PCC) Plan, the MassHealth primary care case management program. The results of these assessments, which have been reported in the annual *MassHealth Managed Care HEDIS Report*, provide important information to MassHealth program managers and other stakeholders on the quality of care delivered by MassHealth plans and providers. For HEDIS 2006, CHPR, with the permission of MassHealth, conducted a supplemental analysis of MassHealth HEDIS rates to provide more detailed information on MassHealth HEDIS performance and to clarify the differences between MassHealth plan rates. The results of this analysis, which are presented in this *HEDIS 2006 Technical Report*, identify the member, provider and plan characteristics that influenced MassHealth HEDIS 2006 rates and suggest specific member populations to target for improvement.

As part of the analysis, CHPR requested and received member-level HEDIS data from each of the five MassHealth plans (Boston Medical Center HealthNet Plan (BMCHP), Fallon Community Health Plan (FCHP), Network Health (NH), Neighborhood Health Plan (NHP) and the PCC Plan). CHPR used these data in conjunction with administrative data from the MassHealth Data Warehouse to create independent variables at the member-, provider- and plan-level for each of the clinical and access to care measures reported by MassHealth plans for HEDIS 2006. CHPR then employed a multiple logistic regression model to predict MassHealth HEDIS 2006 rates from the independent variables chosen, such as type of primary care provider or member characteristics such as age, gender, disability and overall illness burden.

## Summary of Results

### *Effect of Member's MassHealth Plan*

The results presented in *MassHealth Managed Care HEDIS 2006 Report*, distributed to MassHealth and the MassHealth plans in October 2006, demonstrated statistically significant differences between the PCC Plan's unadjusted rates and the unadjusted rates of some or all MCOs for most measures (statistical significance was determined by comparing confidence intervals)<sup>1</sup>. CHPR analyzed these results and after controlling for primary care provider type and various member characteristics, found that:

- For the Childhood Immunization measure, the differences between the PCC Plan's unadjusted rates (69.8%) and the unadjusted rates for the MCOs (87.1%, 77.9%, 86.9% and 84.2% for NHP, NH, FCHP and BMCHP, respectively), as reported in the *MassHealth Managed Care HEDIS 2006 Report*, remained significant ( $p < .05$ ) after CHPR controlled for provider type and member characteristics (i.e., PCC Plan membership was associated with a statistically significant *decrease* in the odds that a member met the measure's immunization requirements compared to membership in some or all of the MCOs, depending on the specific measure). The same was observed

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<sup>1</sup> CHPR chose the PCC Plan as its comparison variable for analyzing the effect of a member's health plan within the multiple logistic regression model. CHPR chose to use the PCC Plan as the comparison variable to provide information to MassHealth on previously observed differences between the PCC Plan and the MassHealth managed care organizations. However, if CHPR chose to use one of the MCOs as the comparison variable, only the coefficients of the plan variables would have changed to reflect adjusted differences between that MCO and the other MCOs and PCC Plan. There would be no change in other variables in the model.

for the Adolescent Immunization measure. The differences between the PCC plan's unadjusted rate (60.8%) and the unadjusted rates for the MCOs (76.7%, 71.5%, 89.5% and 84.7% for NHP, NH, FCHP and BMCHP, respectively) remained significant ( $p < .05$ ) after CHPR controlled for provider type and member characteristics.

- For the Well-Child Visits in the First 15 Months of Life measure, the differences between the PCC Plan's unadjusted rate (90.8%) and the unadjusted rates for FHCP, NH and NHP (70.7%, 69.1% and 79.4%), as reported in the *MassHealth Managed Care HEDIS 2006 Report*, remained significant ( $p < .05$ ) after CHPR controlled for provider type and member characteristics (i.e., PCC Plan membership was associated with a statistically significant *increase* in the odds that a member met the measure's requirements compared to FCHP, NH and NHP membership.) In addition, PCC Plan members had significantly higher odds of meeting the measure's requirements compared to BMCHP members ( $p < .05$ ), after the results were adjusted. BMCHP's unadjusted rate was 83.5%.
- For the Well-Child Visit in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Years of Life measure, the difference between the PCC Plan's unadjusted rate (82.8%) and FCHP's unadjusted rate (76.2%), as reported in the *MassHealth Managed Care HEDIS 2006 Report*, remained significant ( $p < .05$ ) after CHPR controlled for provider type and member characteristics (i.e., PCC Plan membership was associated with a statistically significant *increase* in the odds that a member met the measure's well-child visit requirements compared to FCHP membership). The differences between the PCC Plan's rate and the rates of the other MCOs (78.8%, 76.8% and 81.3% for NHP, NH and BMCHP, respectively), as reported in the *MassHealth Managed Care HEDIS 2006 Report*, were not significant after CHPR adjusted for provider type and member characteristics.
- For the other access to care measures (Adolescent Well-Care Visit and the Children and Adolescents' Access to Primary Care Practitioners), some differences between the PCC Plan's unadjusted rates and the unadjusted rates of the MCOs remained significant after CHPR controlled for provider type and various member characteristics while others did not remain significant.
- When six rates of the Comprehensive Diabetes Care measure were adjusted for provider type and member characteristics, CHPR found that:
  - According to the unadjusted rates and confidence intervals reported in the *MassHealth Managed Care HEDIS 2006 Report*, the PCC Plan's HbA1c testing rate (86.4%) was significantly lower than FCHP's unadjusted rate (94.0%). However, this difference did not remain significant when CHPR controlled for provider type and member characteristics. However, PCC Plan members had significantly lower odds of receiving at least one HbA1c test during 2005 compared to NHP members, after the results were adjusted ( $p < .05$ ). The PCC Plan's HbA1c rate remained statistically no different from NH's (85.2%) and FCHP's (94.0%) rates, even after the results were adjusted.
  - The PCC Plan's unadjusted HbA1c control rate (48.7%) was significantly higher than the unadjusted rates for BMCHP, FCHP and NHP (33.8%, 27.2%, and 32.6%) and statistically no different from NH's rate (59.9%), even after CHPR controlled for provider type and member characteristics ( $p < .05$ ). (As the measure was reported, a higher rate meant poorer performance).
  - The PCC Plan's unadjusted eye exam rate (54.3%) was significantly lower than the unadjusted rates for BMCHP, FCHP and NHP (69.8%, 56.3% and 65.5%) and statistically no different from NH's rate (59.9%). This difference remained

- significant when CHPR controlled for provider type and member characteristics ( $p < .05$ ).
- The PCC Plan's nephropathy monitoring rate (57.4%) was significantly lower than BMCHP's rate (70.6%). This difference remained significant when CHPR controlled for provider type and member characteristics ( $p < .05$ ). In addition, PCC Plan members had significantly lower odds of being monitored for nephropathy compared to NHP members (63.7%), when the results were adjusted ( $p < .05$ ). The PCC Plan's nephropathy monitoring rate was statistically no different from NH's and FCHP's rates (60.8%, and 60.9%), even after the results were adjusted.
  - The PCC Plan's unadjusted LDL testing rate (90.5%) was statistically no different than the rates of the MCOs (91.5%, 88.1%, 90.1% and 91.2% for NHP, NH, FCHP and BMCHP, respectively) and the PCC Plan's LDL control rate (48.2%) was significantly lower than the rates for BMCHP, FCHP and NHP (70.6%, 70.2% and 63.5%). The differences for the control measure persisted after CHPR adjusted for provider type and member characteristics. The PCC Plan's LDL control rate was not statistically different from NH's rate (46.2%), even after the results were adjusted.
- For the Use of Appropriate Medication for People with Asthma, some of the differences between the PCC Plan's unadjusted rates and the unadjusted rates of the MCOs, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, were no longer significant after CHPR adjusted for provider type and member characteristics whereas other differences, not previously reported, became significant.

#### *Member's Primary Care Provider Type*

The type of primary care provider that a member was assigned to as of 12/31/05 had a significant effect on the results for several measures after CHPR adjusted for health plan and various member characteristics. The findings were fairly consistent across the measures where provider type had an effect: members assigned to group practices had the highest odds of meeting the requirements for the Well-Child Visits in the First 15 Months of Life, Adolescent Well-Care Visits and Children and Adolescents' Access to Primary Care Practitioners measures (all age groups) compared to members assigned to individual primary care providers and 'other' types of primary care providers. (The 'other' category of provider type includes all provider types other than individual and group providers, including community health centers, hospital outpatient departments, and the remaining 17 provider types found in the study data.)

#### *Overall Illness Burden/Chronic Disability and Payment System (CDPS) Score*

The member characteristic that had the greatest effect on HEDIS rates was members' overall illness burden, measured by CDPS score. With the exception of two measures, higher CDPS score (i.e., higher overall illness burden) was associated with an increase in the odds that a member met the numerator requirements of a measure. The two measures where CDPS score had no effect were the Well-Child Visits in the First 15 Months of Life measure and the LDL control rate of the Comprehensive Diabetes Care measure. The effect of CDPS scores was greatest for the five rates of the Comprehensive Diabetes Care measure (HbA1c testing, HbA1c control, LDL testing, monitoring for nephropathy, and eye exams).

#### *Disability*

Disability, as defined by the MassHealth enrollment disability flag, had a significant effect on HEDIS rates for four measures but the direction of the effect was not consistent. Disability was associated with a decrease in the odds that members aged 12-24 months had at least one visit with a primary care practitioner during 2005. In contrast, disability was associated with a

statistically significant *increase* in the odds that members aged 25 months-6 years and members aged 12-19 years had at least one visit with a primary care practitioner during 2005 and that members with diabetes were monitored for nephropathy ( $p < .05$ ).

#### *Co-occurring substance abuse*

Co-occurring substance abuse, identified through ICD-9 codes, had a significant effect on several measures, including both chronic illness measures (diabetes and asthma). Co-occurring substance abuse significantly *decreased* the odds that:

- Adolescent members aged 12-19 years had at least one visit with a primary care practitioner during 2005
- Members with diabetes had:
  - At least one HbA1c test during 2005
  - Their most recent HbA1c value in 2005 less than or equal to 9.0%<sup>2</sup>
  - At least one LDL test during 2005
  - Their most recent LDL in 2005 controlled to less than 130 mg/dL
  - Screening for diabetic retinal disease in 2005
  - Monitoring for nephropathy in 2005
- Members with persistent asthma filled at least one prescription for a long-term control medication during 2005

#### *Member's gender*

In general, gender did not have a significant effect on MassHealth HEDIS rates. For the three measures where gender did have a significant effect, being male was associated with a statistically significant *decrease* in the odds that a member was compliant with the measure's requirements. Being male was associated with a significant decrease in the odds that members aged 12 to 19 had at least one adolescent well-care visit during 2005 and that members aged 25 months-6 years and members 12-19 years had at least one visit with a primary care practitioner during 2005.

#### *Member's age*

CHPR analyzed member age for only those measures with denominators that included a range of member ages (i.e., age was not analyzed for measures like the Childhood Immunization Status measure, for which all members in the sample were 2 years old during 2005). For the measures where age did have a significant effect, the direction of that effect was not consistent:

- Very young children with persistent asthma (ages 5-9) had higher odds of filling a prescription for a long-term control medication than older children and adolescents (ages 10-19) and adults (ages 18-56).
- Younger age (e.g., 18-35 or 36-45 compared to >55) was associated with a statistically significant decrease in the odds of meeting the numerator requirements for the individual measures included in the Comprehensive Diabetes Care measure (e.g., HbA1c test, HbA1c control, LDL test, LDL control, eye exam, nephropathy monitoring).

#### *Member's participation with DMH*

Whether a member was served by the Massachusetts Department of Mental Health (DMH) in 2005 had no significant effect on any of the HEDIS measures analyzed, after controlling for the other independent variables including overall illness burden. (CHPR has used participation with DMH as a proxy for utilization of mental health services.)

#### *Member's geographical region*

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<sup>2</sup> See the discussion on page 39 for information on why CHPR reversed the direction of this HEDIS measure for the purposes of this analysis.

The MassHealth geographical region corresponding to the member's residential zip code had a significant effect for nearly two-thirds of the measures analyzed. There was little consistency with regard to which regions were associated with compliance (or non-compliance) for measures where geographical region had an effect and the direction of that effect.

## Overall Recommendations for Future Analyses

The results in this *HEDIS Technical Report* reflect CHPR's first attempt at analyzing member-level HEDIS data to better understand MassHealth HEDIS performance. CHPR has included specific recommendations for future analyses within the measure-specific sections of this report. There are, however, some overall recommendations for future analyses:

- Develop an overall framework that addresses the hierarchical levels of the MassHealth system and the interaction between members, providers and plans.
- Identify additional provider and plan-level administrative data (e.g., size of provider's MassHealth panel or practice type) that can be incorporated into the analysis such as the proportion of a provider's patient caseload that are MassHealth members.
- Develop a reliable mechanism to identify providers across PCC Plan and MCO data.
- Conduct additional analyses of member-level variables, specifically:
  - analyze the number of different providers treating a member (e.g., # of providers submitting claims for a member during a specific time period), which has been associated with poorer quality of care in other studies.
  - evaluate the relationship between CDPS scores (and DxCG scores, if available) and types of contacts with the health care system (e.g., overall number of ambulatory care visits for a member).
  - evaluate the effect of member's geographical region to determine whether there are other confounding factors that interact with the geographical region variable or whether other region-level variables (e.g., supply of health centers) effect HEDIS rates.
  - analyze the interaction between age and gender and outcomes.
  - review the definition of the MassHealth disability flag and determine whether an alternative method of identifying members who are disabled would yield different results.
  - Incorporate member's use of care management into the analysis to determine the influence of care management on HEDIS rates.
- Obtain other administrative data that exist but are not currently available to CHPR and incorporate into the analysis. This includes parent and caregiver-level variables for measures assessing health care quality and access for children and adolescents and DxCG scores that correspond to the measurement period of the measures being analyzed. (Note: Data on caseheads were provided to CHPR after this report was drafted. CHPR will analyze the data to determine whether these variables would be useful to future analyses prior to requesting the data again.)
- Consider creating simulation models that would provide information on how a plan's rate would change if certain conditions were met.

## PROJECT BACKGROUND AND METHODS

## Project Background

Since 2001, the Center for Health Policy and Research (CHPR) has collaborated with the MassHealth Office of Acute and Ambulatory Care (OAAC) and the MassHealth Behavioral Health program (MHBH) to assess the performance of all MassHealth managed care organizations<sup>3</sup> (MCOs) and the Primary Care Clinician (PCC) Plan, the MassHealth primary care case management program. CHPR, OAAC and MHBH have conducted this annual assessment by using a subset of HEDIS (Health Plan Employer Data and Information Set) measures. Developed by the National Committee for Quality Assurance (NCQA), HEDIS is the most widely used set of standardized performance measures to measure and report on the quality of care delivered by health care organizations. Through this annual collaborative project, CHPR, OAAC and MHBH have been able to evaluate a broad range of clinical and service areas that are of importance to MassHealth members, policy makers and program staff.

Results from past HEDIS projects have provided important information on the quality of care delivered by MassHealth plans and providers by making comparisons among MassHealth plans and between MassHealth performance and national benchmarks. Although statistically significant differences in rates among the MassHealth plans have been observed, HEDIS rates from past projects were not adjusted to take into account member, provider or plan characteristics. Therefore, for HEDIS 2006, CHPR developed a mechanism to analyze MassHealth HEDIS performance using member-level HEDIS data provided by the plans. This analysis will help MassHealth stakeholders understand the impact of provider and member characteristics on individual plan rates, to make more informed comparisons between plans, and to identify specific member populations to target for quality improvement.

MassHealth approved CHPR's proposal to conduct a supplemental analysis of MassHealth HEDIS 2006 data in November 2005. The results of this analysis, presented in this HEDIS Technical Report, are novel in three important ways. First, since HEDIS data are reported to NCQA and, to our knowledge, to most states in the form of calculated rates, few entities have access to member-level data for multiple plans or for all plans within a state. Second, although HEDIS is the most widely used set of managed care performance measures, there is no widely accepted method to risk-adjust or case-mix HEDIS results. The analyses presented in this report contribute to the knowledge base needed to ultimately develop a reliable method to risk-adjust or case-mix adjust HEDIS rates. Finally, most of the research done to date using member-level HEDIS data from multiple plans has been done on Commercial or Medicare populations. Therefore, the results of this analysis further our understanding of how member, provider and plan characteristics influence Medicaid HEDIS results.

## Methods

This section discusses the methods used to conduct this analysis including a) data collection, b) analytic model, c) dependent and independent variables, d) statistical techniques, and e) limitations of the analysis.

### Data Collection

HEDIS data are aggregate, summary data that are reported as calculated rates (e.g., percentage of children who received at least one well-child visit during the calendar year). However, in order to analyze the factors influencing MassHealth HEDIS results, CHPR needed HEDIS data at the individual member level (i.e., whether an individual member received at least one well-child visit during the calendar year). Although the HEDIS data submitted to NCQA and

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<sup>3</sup> The MassHealth managed care organizations (MCOs) are Boston Medical Center HealthNet Plan (BMCHP), Fallon Community Health Plan (FCHP), Neighborhood Health Plan (NHP) and Network Health (NH).

MassHealth by MassHealth plans include the calculated rates as well as the corresponding numerators, denominators, and upper and lower confidence intervals, MassHealth plans have never been asked to submit member-level information to MassHealth. Therefore, with MassHealth's permission, CHPR asked each MassHealth plan to submit a data file in addition to their official HEDIS 2006 data submission that identified every member who comprised the plan's HEDIS 2006 rates and provided 31 data fields for each member, including four fields that were critical to this analysis:

- Member's Recipient Historical Number (RHN)
- Member's numerator hit status (i.e., indicator of member's compliance with the measure)
- Member's primary care provider
- Provider organization that the primary care provider was associated with (if applicable)

Using the RHNs in these data files, CHPR accessed the MassHealth Data Warehouse to obtain enrollment and eligibility data for each member included in the plans' HEDIS 2006 data submissions. These administrative data were used to create the independent variables for this analysis, including Chronic Illness and Disability Payment System (CDPS) scores for each member (see page 13 for more information on how CDPS scores were calculated and used for this analysis).

#### Analytic Model

CHPR employed a multiple logistic regression model to analyze MassHealth HEDIS 2006 rates. Multiple logistic regression is a statistical technique used to predict the likelihood of a discreet outcome (e.g., whether an event will or will not occur) from two or more explanatory variables. The outcome (or dependent variable) predicted through this analysis was an individual member's compliance with the HEDIS measure being analyzed, also known as the member's "numerator hit status". The explanatory (or independent) variables used in the analysis depended on the specific measure being analyzed. CHPR chose to analyze each measure separately because 1) few members were included in the sample for more than one measure and 2) CHPR wanted the flexibility to include different independent variables in each measure's model. CHPR identified appropriate independent variables at the three levels of the health care system that a HEDIS result can be reported: individual member, provider and health plan. Within this three-level model, CHPR's choice of independent variables was guided by two principles:

- Multicollinearity: It is difficult to get a good estimate of the distinct effect that independent variables have on a dependent variable if two or more independent variables are highly correlated with one another. For example, CHPR could not include both MassHealth geographical regions (e.g., Boston, Metrowest, Central, etc.) and an urban/rural variable because a large proportion of members in the overall sample were from the Boston region and Boston is an urban area. MassHealth Aid Category was also removed from the model because it was correlated with the MassHealth disability flag.
- Availability and quality of data: Limited data are available to describe provider and plan characteristics. For example, information on the number of providers within a practice or the proportion of a provider's patient panel that are Medicaid members would have been useful to this analysis but are not routinely available. Some variables that would have been useful to include in the model, such as race, ethnicity and Federal Poverty Level (FPL), are available but known to be incomplete or unreliable. Other variables, such as casehead RHN, were requested from MassHealth's Information Analysis department but

were not provided to CHPR within the timeframe of this project.<sup>4</sup> Such variables will be earmarked for inclusion in future analyses.

CHPR initially envisioned conducting this analysis utilizing a hierarchical linear model. Hierarchical linear modeling (HLM) is an advanced form of multiple logistic regression that allows variance in outcome variables to be analyzed at multiple hierarchical levels (e.g., patient, provider, provider group, health plan, etc.) HLM initially appeared to be the preferred analytical tool for this analysis because of the hierarchical nature of HEDIS data. After CHPR began its analysis, however, it became apparent that, due to the lack of an identifier for the specific provider serving each member, multiple logistic regression was more appropriate.

Dependent Variables

As stated above, the dependent variable for this analysis was the individual member’s compliance with the HEDIS measure being analyzed or the member’s “numerator hit status”. Numerator hit status is a binary variable that indicates whether the member was or was not compliant with the measure’s numerator requirements. For example, for the diabetes HbA1c screening rate, the denominator is members aged 18-75 with type 1 or type 2 diabetes who meet certain plan enrollment criteria. The numerator requirement is at least one HbA1c test during the measurement year. Therefore, a numerator hit status of ‘1’ indicates that the member met the measure’s numerator requirements (i.e., the member received at least one HbA1c test during the measurement year) and a ‘0’ indicated that the member did not meet the measure’s numerator requirement (i.e., the member did not receive at least one HbA1c test during the measurement year.)

The dependent variables included in this analysis are:

Measure	Dependent variable(s)
Childhood Immunization Status	<ul style="list-style-type: none"> <li>• The member received all immunizations comprising the Combination 2 rate (four diphtheria-tetanus-pertussis, three injectable polio , one measles-mumps-rubella, three H influenza type B, three hepatitis B, and one chicken pox vaccine)</li> <li>• The member received all immunizations comprising the Combination 3 rate (all of the above plus four pneumococcal conjugate vaccines)</li> </ul>
Adolescent Immunization Status	<ul style="list-style-type: none"> <li>• The member received all immunizations comprising the Combination 2 rate (2<sup>nd</sup> dose of measles-mumps-rubella, three hepatitis B and one chicken pox vaccine)</li> </ul>
Well-Child Visits in the First 15 Months of Life	<ul style="list-style-type: none"> <li>• Six or more well-child visits with a primary care practitioner during the first 15 months</li> </ul>

<sup>4</sup> CHPR requested casehead RHNs for all members under the age of 18. CHPR planned on linking the casehead RHNs to enrollment, claims and encounter data to create casehead-level variables such as casehead age, casehead disability status, and casehead CDPS score. CHPR would have used these casehead-level variables as proxies for parent and caregiver characteristics when analyzing the child immunization, well-care and access measures to determine the effect that parent and caregiver characteristics have on the care that children and adolescents received. Previous research has demonstrated that parent and caregiver characteristics such as disability, age and depressive symptoms affect the likelihood that a child was immunized on time or received well-child care (Hyatt and Allen, 2005; Jhanjee, Saxeena, Arora and Gjerdingen, 2004).

	of life
Well-Child Visits in the 3 <sup>rd</sup> , 4 <sup>th</sup> , 5 <sup>th</sup> and 6 <sup>th</sup> Years of Life	<ul style="list-style-type: none"> <li>• At least one well-child visit with a primary care practitioner during 2005</li> </ul>
Adolescents Well-Care Visits	<ul style="list-style-type: none"> <li>• At least one comprehensive well-care visit with a primary care practitioner or OB/GYN during 2005</li> </ul>
Comprehensive Diabetes Care	<ul style="list-style-type: none"> <li>• At least one HbA1c test during 2005</li> <li>• Most recent HbA1c in 2005 was less than or equal to 9.0%*</li> <li>• At least one LDL screening during 2005</li> <li>• Most recent LDL in 2005 was less than 130 mg/dL</li> <li>• Screening for diabetic retinal eye exam during 2005</li> <li>• Monitoring for nephropathy during 2005</li> </ul>
Use of Appropriate Medications for People with Asthma	<ul style="list-style-type: none"> <li>• At least one dispensed prescription for a long-term control medication during 2005</li> </ul>
Children and Adolescents' Access to Primary Care Providers (12-24 month, 25 month-6 year, 7-11 year, and 12-19 year age groups)	<ul style="list-style-type: none"> <li>• At least one visit with any primary care practitioner during 2005</li> </ul>

\* See page 39 for information on why CHPR reversed the direction of this HEDIS measure which is typically reported as >9.0%.

CHPR did not analyze the HEDIS 2006 Use of Service measures as part of this Technical Report (Mental Health Utilization Percentage of Members Using Services, Mental Health Utilization Inpatient Discharges and Average Length of Stay (ALOS), Identification of Alcohol and Other Drug Services, and Chemical Dependency Utilization Inpatient Discharges and ALOS). The HEDIS Use of Service measures are utilization measures that are collected and reported differently than the clinical and access measures analyzed for this report. Therefore, CHPR envisioned conducting separate analyses of these measures at a later date. Since NCQA recently announced plans to retire the Mental Health and Chemical Dependency Inpatient Discharges and ALOS measures, CHPR will confer with MassHealth before beginning any analysis of the HEDIS 2006 Use of Service measures.

### Independent Variables

#### *MassHealth plan*

This independent variable was defined as the name of the health plan that the member was enrolled in as of the measure's anchor date. Due to HEDIS enrollment criteria, members can appear in only one plan's data for a measure, even if a member switched plans during the year. The plans included in the analysis were Boston Medical Center HealthNet Plan (BMCHP), Fallon Community Health Plan (FCHP), Neighborhood Health Plan (NHP), Network Health (NH) and the Primary Care Clinician (PCC) Plan.

#### *Member's primary care provider type*

This independent variable was defined as the type of primary care provider the member was assigned to as of 12/31/05.<sup>5</sup> By employing an anchor date of 12/31/05, CHPR applied the same

<sup>5</sup> CHPR had envisioned analyzing the influence of individual provider groups on MassHealth HEDIS rates. This was not feasible, however, given the problems that CHPR encountered when it attempted to identify unique provider groups across MassHealth plans. CHPR could not identify a unique or universal provider identifier to identify provider groups across MCO and PCC Plan data and attempts to use other data sources as a "link" between the MCO and PCC Plan data also failed.

logic to identifying the primary care provider responsible for the member's care during the measurement period that NCQA applies when identifying the health plan that was accountable for the member's care during that same time period. It should be noted that a member's primary care provider may not have been the provider who delivered the care or services evaluated by the HEDIS measures analyzed as part of this project (e.g., a service may have been delivered by a PCP other than the one assigned to the member as of 12/31/05, a specialist, or another non-PCP provider). However, under a managed care model, primary care providers are responsible for managing all of their patients' health care needs. Therefore, it is reasonable to identify a member's primary care provider (in this case, the provider the member was assigned to as of 12/31/05) as the provider with the most responsibility (and therefore, accountability) for the overall quality of care a member received.

CHPR used two different data sources to identify a provider type for each primary care provider listed in the MassHealth HEDIS data. For the providers listed in the MCO member-level HEDIS data, CHPR linked the Federal Tax ID provided by the MCOs to the Federal Tax IDs included in the PCC Plan Provider file.<sup>6</sup> CHPR could not use the Federal Tax ID to identify the provider type for the providers listed in the PCC Plan's HEDIS data, however, because Federal Tax ID was populated for only 7% of the providers listed in the PCC Plan's file (compared to nearly 100% in the MCOs' data). And, although the PCC Plan's HEDIS data file included a field for Provider ID and Provider ID is a field in the PCC Plan Provider file, the PCC Plan's HEDIS data file was missing Provider IDs for a large number of providers listed. Therefore, for the members in the PCC Plan's member-level HEDIS data, CHPR used eligibility data to identify the member's PCC as of 12/31/05 (the same anchor date used by the MCOs), their Provider ID and the provider's type. Although two different sources were used to identify provider types, both sources used the same definitions of each provider type.<sup>7</sup> During this process, we found that it was possible for an MCO provider to have more than one provider type associated with its Tax ID. To reconcile these cases, CHPR created a hierarchy to assign a single provider type to provider groups with more than one provider type associated with their Tax ID in the PCC Plan Provider file. See Appendix A for the entire hierarchy. CHPR reviewed the provider types associated with more than one Tax ID according to the hierarchy and assigned a single provider type by giving preference to the provider type associated with the highest level of the hierarchy. CHPR's hierarchy yielded three primary categories of provider types--group practice, individual physician, and 'other'. The category of 'other' type of primary care provider was used for any of the 21 provider types listed in Appendix A other than group practice and individual physician (including community health centers). The percentage of providers in a measure's sample that were categorized as 'other' ranged from 20.9% to 39.7%.

### *Member age*

This independent variable was defined as the member's age as of 12/31/05. CHPR calculated each member's age by linking the RHNs provided in the health plan's data with birthdates in the MassHealth enrollment data. There were isolated cases where the age calculated through the enrollment data was outside of the age criteria for the measure (e.g., a member's age of 31 for the childhood immunization measure). CHPR assumed that the MassHealth plans had access to more accurate information on member date of birth when creating their HEDIS samples than

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<sup>6</sup> All MCO members for whom their primary care provider has no tax ID were removed from the applicable measure's data set (<2% of data records had a missing tax ID).

<sup>7</sup> CHPR explored and exhausted other mechanisms for identifying provider types across MCO and PCC Plan data. For example, CHPR attempted to use enrollment data to identify a primary care provider's provider type. This failed because, although the enrollment data lists a provider type for PCC Plan providers, the provider type for MCO providers is listed as only "MCO" in the enrollment data.

CHPR had through the Data Warehouse. Therefore, for all measures except for the Well-Child Visits in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Years of Life measure, CHPR kept in the analysis members whose ages were outside of a measure's criteria. (Because of the narrow range of ages included in the Well-Child Visits in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Years of Life measure, CHPR used member age as a continuous variable instead of a categorical variable. Age was used as a categorical variable for all other measures where age was analyzed. Because CHPR used age as a continuous variable for the Well-Child Visits in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> years of Life measure, keeping members with ages well-outside of the measure's criteria would have distorted the results of the model.)

Member age was not included as an independent variable for measures where all members were the same age during the measurement year (e.g., all members in the Childhood Immunization measure turned two years old during the measurement year). For these measures, the lack of variation in member ages made a member's age irrelevant.

#### *Member's gender*

This independent variable was defined as male or female and was identified by linking each member's RHN with the gender field in the MassHealth enrollment data.

#### *Member's overall illness burden (Chronic Illness and Disability Payment System score)*

This independent variable was defined as the member's Chronic Illness and Disability System (CDPS) score, calculated through claims and encounter data obtained through the Data Warehouse and normalized to the overall MassHealth population that was eligible for the HEDIS measure<sup>8</sup>. CDPS is a diagnostic classification system that uses diagnosis information to predict health care costs. CDPS was originally developed for the purpose of adjusting capitated payments for Medicaid beneficiaries. Based on a database of 4 million Medicaid claims from seven states (mostly in the Midwest<sup>9</sup>), CDPS groups diagnoses into 20 major categories that correspond to either body systems or specify types of illness or disability (Kronick, Gilmer, Dreyfus and Ganiats, 2002). Age and gender are also factored into CDPS scores so even individuals with no diagnostic history are assigned a score.

The CDPS is only one method of controlling for overall illness burden. Other methods, like DxCG, exist and would have been the preferred method to incorporate illness burden into the HEDIS analytical models (DxCG's cost weights are more current and DxCG covers conditions beyond the chronic conditions that CDPS captures, which could yield a better picture of overall illness burden). Although the MassHealth Information Analysis department calculates DxCG scores for its members, updated DxCG scores that corresponded to the HEDIS measurement years analyzed for this project were not available at the time of CHPR's analysis. CHPR will work with MassHealth to gain access to DxCG scores for future analyses.

As mentioned above, the CDPS was developed on beneficiaries from other states. Therefore, CHPR renormalized the scores to the mean of the relevant population (in this case the entire eligible population of a measure or the entire denominator, if a hybrid measure) for ease of interpretation. For the CDPS scores reported in this document, the population norm is 1.0.

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<sup>8</sup> CHPR used either one year or two years of claims and encounter data to calculate a member's CDPS score, depending on the length of the measure's measurement period. For example, CHPR used one year of claims and encounter data to calculate CDPS scores for members in the Comprehensive Diabetes Care measure, which has a measurement period of one year. In contrast, CHPR used two years of claims and encounter data to calculate CDPS scores for members in the Childhood Immunization Status measure, which has a measurement period of up to two years.

<sup>9</sup> Because the cost weights for CDPS were developed on Medicaid claims from Midwest states, CDPS may not be the most appropriate model to predict cost in a New England population. CDPS scores are, however, adequate to use to control for relative illness burden for the study population.

Scores below 1.0 indicate a lower than average illness burden. Scores above 1.0 indicate a higher than average illness burden (e.g., a score of 2.0 means that the person is twice as costly as the population average). The normalized individual CDPS score CHPR calculated as part of this project ranged from 0.09 to 34.61.

#### *Member's co-occurring substance abuse*

This independent variable was defined as the presence of a co-occurring substance abuse disorder during the measurement year, as identified by claims and encounter data. (Data from the Massachusetts Behavioral Health Partnership (MBHP) were also accessed to define co-occurring substance abuse.) See Appendix B for detailed information on the ICD-9 codes used to identify substance abuse. This variable was only analyzed for measures with denominators comprised solely of individuals seven years of age and older.

#### *Member's disability status*

This independent variable was defined as the presence of a disability during the measurement year, as identified by the MassHealth enrollment disability flag. CHPR applied this variable to all measures, regardless of the age of population evaluated by the measure.

#### *Member served by the Massachusetts Department of Mental Health (DMH)*

This independent variable identified members who were served by DMH during the measurement year and was used as a proxy for receiving mental health services. This variable was only analyzed for measures with denominators comprised solely of individuals seven years of age and older (CHPR found few cases of members under the age of seven being served by DMH).

#### *Member's geographical region*

This independent variable was defined as the MassHealth geographical region that corresponded to the member's residential zip code as of 12/31/05. MassHealth regions are Boston, Metrowest, Central, Northeast, Southeast, and Western.

### Statistical Analyses

CHPR used logistic regression techniques (SAS v.9.1) to estimate the probability of compliance with HEDIS as a function of a set of independent variables.

CHPR had to remove some members from the analysis for most HEDIS measures due to missing enrollment data (members had to be removed from the models even if they were missing data for only one independent variable). Therefore, the overall MassHealth denominator used for the analysis differs from the overall MassHealth denominator reported in the *MassHealth Managed Care HEDIS 2006 Report*. The results reported for each measure in the following pages delineate the number of members removed and the reason. The percentage of members from the original HEDIS sample that were removed from the analysis for any given measure was very small (ranging from 0.3% to 1.2% of the original HEDIS sample). Data may be assumed to be missing randomly (i.e., it can be assumed that members with missing enrollment data were no more or less likely to be compliant with a measure than members without missing enrollment data).

The results of the multiple logistic regression models are presented as odds ratios. Odds ratios are often used to illustrate the size of an effect and are defined as the ratio of the odds of an event occurring in one group (e.g., Plan A) to the odds of it occurring in another group (e.g., Plan B). In the context of this analysis, an odds ratio of 1 indicates that HEDIS compliance is equally likely for both plans. An odds ratio greater than 1 (e.g., 1.24) indicates that HEDIS compliance is more likely in Plan A than in Plan B (in this case, members in Plan A have a 1.24

times increase in the odds of meeting the measure's numerator requirements compared to members in Plan B). An odds ratio less than 1 (e.g., 0.81) indicates that HEDIS compliance is less likely in Plan A than in Plan B (i.e., members in Plan A have a decrease in the odds of meeting the measure's numerator requirements compared to Plan B).

CHPR conducted chi-square tests to determine the statistical significance of the odd ratios. A p-value <.05 was used to indicate statistical significance.

The results presented in this report are the results of the final multiple linear regression model. The results of the step-by-step addition of the independent variables to the measure's models appear in Appendix D.

### Limitations

All data analyses have limitations. The limitations of CHPR's analysis of MassHealth HEDIS 2006 data include:

- Some member characteristics that may influence HEDIS rates, such as race, ethnicity and language, could not be included in the model.
- Except for plan name and primary care provider type, no data on plan and provider characteristics were included in the model. Data on plan and provider characteristics are not currently available in the administrative data sources available to CHPR.
- CHPR attributes accountability for a member's overall health care to the type of primary care provider that the member was assigned to as of 12/31/05. MassHealth members may have switched primary care providers during the measurement year or another, non-primary care, provider may have provided the specific services evaluated in a measure.
- All of the providers associated with one plan (Fallon Community Health Plan) were of the same provider type (group practice). The homogeneity of provider type for this plan may have affected the results of this analysis.
- Although plans are instructed to follow the HEDIS specs, deviations occur and cannot be controlled for in the analysis. It is not clear how the choice of data collection methodology (administrative or hybrid, which requires MR review) affects the data. In addition, some plans (or their subcontracted vendors) experience difficulty procuring medical records from provider offices. According to the HEDIS specifications, a member for which a medical record cannot be found is considered non-compliant with the measure (presuming there is not administrative data available to demonstrate the service counted in the numerator occurred). This analysis does not take into account the effect of difficulties procuring medical records because it is impossible to quantify such difficulties at either the plan or individual member level.

### **Organization of this Report**

The results on the following pages are reported by measure. For each measure, CHPR provides information on the:

- definition of the sample
- sample sizes (original HEDIS sample and sample used for analysis)
- dependent variable
- independent variables

- characteristics of the sample used for the analysis
- HEDIS 2006 rates as reported in the *MassHealth Managed Care HEDIS 2006 Report*
- results from the multiple logistic regression (in the form of a table)
- summary of the results (in the form of text)
- interpretation of the results
- recommendations for future analyses of the measure (if applicable).

# RESULTS

## Childhood Immunization Status—Combination Rate 2

**Definition of sample:** Members who turned two years old during 2005, who were enrolled in a MassHealth plan on their second birthday, and were continuously enrolled with that plan during the 12 months prior to their second birthday with no more than one gap in enrollment of up to 45 days.

**Sample size:**

- Reported to NCQA and MassHealth: 1,835 MassHealth members
- Used for analysis: 1,818 members

**Independent variables:**

- MassHealth plan
- Type of primary care provider
- Member's gender
- Member's overall illness burden (CDPS score)
- Member's disability
- Member's geographical region

**Dependent variable:**

- The member received all immunizations comprising the HEDIS Childhood Immunization Combination 2 series by his or her second birthday. The Combination 2 series includes four diphtheria-tetanus-pertussis, three injectable polio, one measles-mumps-rubella, three H influenza type B, three hepatitis B, and one chicken pox vaccine.

**Characteristics of sample used for analysis:**

- 52.9% male
- Mean CDPS score: 1.0 (individual CDPS scores ranged from 0.22 to 16.76)
- 2.0% disabled

Appendix C includes additional data on the characteristics of the analysis sample.

**Table 1. MassHealth Plan HEDIS 2006, Childhood Immunization Status Combination 2 Rates As Reported to NCQA and MassHealth (n=1,835)**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	287	4,026	411	69.8%	65.3%	74.4%
NHP	(H)	358	2,749	411	87.1%	83.7%	90.5%
NH	(H)	320	2,200	411	77.9%	73.7%	82.0%
FCHP	(H)	166	191	191	86.9%	81.9%	92.0%
BMCHP	(H)	346	4,650	411	84.2%	80.5%	87.8%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

## Results of Analysis:

**Table 2. Summary of Multiple Logistic Regression Model Predicting Childhood Immunization Status Combination 2 Rates (n=1,818)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	3.00 (2.04-4.41) *
NH	PCC Plan	1.27 (0.89-1.82)
FCHP	PCC Plan	2.20 (1.24-3.91) *
BMCHP	PCC Plan	2.79 (1.85-4.19) *
Provider type		
Group practice	Other provider	0.95 (0.72-1.25)
Individual physician	Other provider	0.87 (0.45-1.68)
Gender		
Male	Female	0.86 (0.68-1.10)
CDPS score		
0.5-1.0	< 0.5	1.91 (1.43-2.55) *
>1.0	< 0.5	1.55 (1.16-2.07) *
Disabled		
Yes	No	0.81 (0.37-1.79)
Geographical region		
Western	Boston	1.00 (0.62-1.60)
Central	Boston	1.75 (1.08-2.83) *
Northeast	Boston	1.55 (1.02-2.34) *
Metrowest	Boston	1.46 (0.89-2.37)
Southeast	Boston	1.07 (0.68-1.66)

\* p<.05

## Summary of Results:

- The PCC Plan's unadjusted rate for the Childhood Immunization Status Combination 2 measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly lower than the unadjusted rates for BMCHP, FCHP and NHP. These differences remained significant after CHPR adjusted the results for type of primary care provider and member's gender, CDPS score, disability and geographical region (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on Combination 2 rates after CHPR adjusted for member's health plan, gender, CDPS score, disability and geographical region.
- The member characteristics associated with a statistically significant increase or decrease in the odds of receiving the Combination 2 series were CDPS score and geographical region.
  - Higher CDPS score (i.e., higher overall illness burden) was associated with an increase in the odds of receiving the Combination 2 series. CDPS scores between .5 and 1 and CDPS scores >1.0 were associated with a 1.91 times increase and 1.55 times increase, respectively, in the odds of receiving the Combination 2 series (p<.05).

- Residing in the central and northeast regions of Massachusetts was associated with a statistically significant increase in the odds of receiving the Combination 2 immunization series ( $p < .05$ ).
- Gender and disability had no significant effect on Combination 2 rates.

### **Interpretation of Results:**

Higher CDPS score (i.e., higher overall illness burden) was associated with an increase in the odds of receiving the Childhood Immunization Status Combination 2 series. It is reasonable that members with a higher illness burden would have more contacts with the health care system than members with a lower illness burden and, by proxy, more opportunities to receive the Combination 2 immunizations by their second birthday.

Residing in the central and northeast regions of Massachusetts was associated with a statistically significant increase in the odds of receiving the Combination 2 series by the second birthday.

### **Recommendations for Future Analyses of this Measure:**

Shortly after CHPR completed its analysis, NCQA announced plans to retire the Childhood Immunization Status Combination 2 rate from the HEDIS measurement set, beginning with HEDIS 2008. The results of CHPR's analysis were included in this report because they address the interpretation of HEDIS 2006 results. CHPR has not, however, made any recommendations for future analyses of this measure.

## Childhood Immunization Status—Combination Rate 3

**Definition of sample:** Members who turned two years old during 2005, who were enrolled in a MassHealth plan on their 2<sup>nd</sup> birthday, and were continuously enrolled with that plan during the 12 months prior to their 2<sup>nd</sup> birthday with no more than one gap in enrollment of up to 45 days.

**Sample size:**

- Reported to NCQA and MassHealth: 1,835 MassHealth members
- Used for analysis: 1,818 members<sup>10</sup>

**Independent variables:**

- MassHealth plan
- Type of primary care provider
- Member's gender
- Member's overall illness burden (CDPS score)
- Member's disability
- Member's geographical region

**Dependent variable:**

- The member received all immunizations comprising the HEDIS Childhood Immunization Combination 3 series by his or her second birthday. The Combination 3 series includes four diphtheria-tetanus-pertussis, three injectable polio, one measles-mumps-rubella, three H influenza type B, three hepatitis B, one chicken pox vaccine, and four pneumococcal conjugate vaccinations.

**Characteristics of sample used for analysis:**

- 52.9% male
- Mean CDPS score: 1.0 (individual CDPS scores ranged from 0.22 to 16.76)
- 2.0% disabled

Appendix C includes additional data on the characteristics of the analysis sample.

**Table 3. MassHealth Plan HEDIS 2006, Childhood Immunization Status Combination 3 Rates As Reported to NCQA and MassHealth (n=1,835)**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	211	4,026	411	51.3%	46.4%	56.3%
NHP	(H)	280	2,749	411	68.1%	63.5%	72.8%
NH	(H)	253	2,200	411	61.6%	56.7%	66.4%
FCHP	(H)	138	191	191	72.3%	65.6%	78.9%
BMCHP	(H)	273	4,650	411	66.4%	61.7%	71.1%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

<sup>10</sup> 17 members, or 0.9% of the original HEDIS sample, were removed from the analysis (2 members were found to appear twice in the same plan's sample; 9 members had no eligibility data available for any of the independent variables; 6 members were missing data for one independent variable.)

## Results of Analysis:

**Table 4. Summary of Multiple Logistic Regression Model Predicting Childhood Immunization Status Combination 3 Rates (n=1,818)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	2.02 (1.48-2.75) *
NH	PCC Plan	1.47 (1.08-2.02) *
FCHP	PCC Plan	2.31 (1.45-3.67) *
BMCHP	PCC Plan	2.20 (1.56-3.12) *
Provider type		
Group practice	Other provider	1.20 (0.96-1.51)
Individual physician	Other provider	1.00 (0.55-1.84)
Gender		
Male	Female	0.87 (0.71-1.05)
CDPS score		
0.5-1.0	< 0.5	1.67 (1.32-2.10) *
>1.0	< 0.5	1.70 (1.33-2.17) *
Disabled		
Yes	No	1.07 (0.52-2.17)
Geographical region		
Western	Boston	0.73 (0.49-1.09)
Central	Boston	1.03 (0.69-1.54)
Northeast	Boston	1.29 (0.92-1.81)
Metrowest	Boston	1.25 (0.84-1.88)
Southeast	Boston	0.93 (0.64-1.35)

\* p<.05

## Summary of Results:

- The PCC Plan's unadjusted rate for the Childhood Immunization Status Combination 3 measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly lower than the unadjusted rates for the four MCOs. These differences remained significant after CHPR adjusted the results for type of primary care provider and member's gender, CDPS score, disability and geographical region (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on Combination 3 rates after CHPR adjusted for member's health plan, gender, CDPS score, disability and geographical region.
- The only member characteristic associated with a statistically significant increase or decrease in the odds of receiving the Combination 3 series was CDPS score. Higher CDPS score (i.e., higher overall illness burden) was associated with an increase in the odds of receiving the Combination 3 series. CDPS scores between .5 and 1 and CDPS scores >1.0 were associated with a 1.67 times increase and 1.70 times increase, respectively, in the odds of receiving the Combination 3 series (p<.05).
- Gender, disability and geographical region had no significant effect on Combination 3 rates.

## **Interpretation of Results:**

As with the Combination 2 measure, higher CDPS score (i.e., higher overall illness burden) was associated with an increase in the odds of receiving the Combination 3 series. It is reasonable that members with a higher illness burden would have more contacts with the health care system and, by proxy, more opportunities to receive the Combination 3 immunizations by their second birthday. More analysis is needed to fully understand the relationship between illness burden and immunization rates.

## **Recommendations for Future Analyses of this Measure:**

- Conduct analyses to better understand the relationship between higher CDPS scores and number and types of contacts with the health care system.
- Add parent and caregiver-level variables to the analytic model, such as casehead CDPS score, depression and age, to determine the effect of parent and caregiver characteristics on the immunization rates of MassHealth members under the age of two.
- Consider evaluating individual antigens in an effort to determine whether compliance with certain antigens (e.g., chicken pox vaccine or pneumococcal conjugate vaccine) is more problematic than others and to pinpoint the factors that have a significant effect on those antigens.
- Collect more detailed information about each plan's administrative data system and how the system captures immunization information (including the use of immunization registries) to determine whether there are differences that may influence HEDIS rates.
- Obtain information on the number and types of quality improvement activities MassHealth plans employ to improve Childhood Immunization rates (and the timeframes for employing the activities) to determine whether the activities have a significant effect on HEDIS rates. For example, information could be obtained on whether plans distribute current national immunization guidelines (which are the basis for this measure) to providers.

## Adolescent Immunization Status

**Definition of sample:** Members who turned 13 years old during 2005, who were enrolled in a MassHealth plan on their 13<sup>th</sup> birthday, and who were continuously enrolled with that plan during the 12 months prior to their 13<sup>th</sup> birthday with no more than one gap in enrollment of up to 45 days.

**Sample size:**

- Reported to NCQA and MassHealth: 1,784 MassHealth members
- Used for analysis: 1,770 members<sup>11</sup>

**Independent variables:**

- MassHealth plan
- Type of primary care provider
- Member's gender
- Member's overall illness burden (CDPS score)
- Member's co-occurring substance abuse
- Member's disability
- Member served by the Department of Mental Health (DMH)
- Member's geographical region

**Dependent variable:**

- The member received all immunizations comprising the HEDIS Adolescent Immunization Combination series by his or her 13<sup>th</sup> birthday, which includes a second dose of measles-mumps-rubella, three hepatitis B, and one chicken pox vaccine.

**Characteristics of sample used for analysis:**

- 49.3% male
- Mean CDPS score: 1.0 (individual CDPS scores ranged from 0.09 to 14.83)
- 0.4% with co-occurring substance abuse
- 6.1% disabled
- 0.7% served by DMH

Appendix C includes additional data on the characteristics of the analysis sample.

**Table 5. MassHealth Plan HEDIS 2006, Adolescent Immunization Status Rates as Reported to NCQA and MassHealth (N=1,784)**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	250	4,948	411	60.8%	56.0%	65.7%
NHP	(H)	276	2,253	360	76.7%	72.2%	81.2%
NH	(H)	294	1,184	411	71.5%	67.0%	76.0%
FCHP	(H)	171	191	191	89.5%	84.9%	94.1%
BMCHP	(H)	348	2,806	411	84.7%	81.1%	88.3%

Source: *MassHealth Managed Care HEDIS 2006 Report*

<sup>11</sup> 14 members, or 0.8% of the original HEDIS sample, were removed from the analysis due to missing eligibility or enrollment data (1 member had no eligibility data available for any of the independent variables; 13 members were missing data for one independent variable).

Key: (H)=hybrid method, (A)=administrative method

## Results of Analysis:

**Table 6. Summary of Multiple Logistic Regression Model Predicting Adolescent Immunization Status Rates (n=1,770)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	2.23 (1.59-3.14) *
NH	PCC Plan	1.69 (1.21-2.37) *
FCHP	PCC Plan	4.76 (2.59-8.74) *
BMCHP	PCC Plan	2.87 (1.95-4.23) *
Provider type		
Group practice	Other provider	1.21 (0.94-1.56)
Individual physician	Other provider	1,11 (0.58-2.14)
Gender		
Male	Female	0.95 (0.75-1.18)
CDPS score		
0.5-1.0	< 0.5	1.59 (1.16-2.17) *
>1.0	< 0.5	1.40 (1.08-1.82) *
Co-occurring substance abuse		
Yes	No	0.51 (0.10-2.50)
Disabled		
Yes	No	0.67 (0.42-1.05)
Served by DMH		
Yes	No	4.83 (0.59-39.23)
Geographical region		
Western	Boston	1.25 (0.79-1.96)
Central	Boston	1.07 (0.67-1.70)
Northeast	Boston	0.88 (0.60-1.28)
Metrowest	Boston	1.00 (0.62-1.60)
Southeast	Boston	1.17 (0.75-1.81)

\* p<.05

## Summary of Results:

- The PCC Plan's unadjusted rate for the Adolescent Immunization Status measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly lower than the unadjusted rates for all four MCOs. These differences remained significant after CHPR adjusted the results for type of primary care provider and member's gender, CDPS score, co-occurring substance abuse, disability, participation with DMH and geographical region (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on the Adolescent Immunization Status rate after adjusting for member's health plan, gender, CDPS score, co-occurring substance, disability, participation with DMH and geographical region.
- The only member characteristic associated with a statistically significant increase or decrease in the odds of receiving the Adolescent Immunization series was CDPS score. Higher CDPS score (i.e., higher overall illness burden) was associated with an increase in odds of receiving the Adolescent Immunization series. CDPS scores between .5 and

1 and CDPS scores >1.0 were associated with a 1.59 times increase and 1.40 times increase, respectively, in the odds of receiving the Adolescent Immunization series ( $p < .05$ ).

- Gender, co-occurring substance abuse, disability, participation with DMH and geographical region had no significant effect on Adolescent Immunization Status rates.

### **Interpretation of Results:**

Higher CDPS score (i.e., higher overall illness burden) was associated with an increase in the odds of receiving the Adolescent Immunization series. As with the Childhood Immunization measures, it is reasonable that members with a higher illness burden would have more opportunities to receive the Adolescent Immunization series due to frequent contact with the health care system.

Few adolescent members in the sample were identified as having co-occurring substance abuse through claims and encounter data. Although co-occurring substance abuse was associated with a decrease in the odds of receiving the Adolescent Immunization series by the 13<sup>th</sup> birthday, this finding was not statistically significant. Substance abuse is often under-diagnosed in adolescent populations. If the claims and encounter data used for this analysis under-reported the frequency of co-occurring substance abuse in this population, then it is possible that the results understate the influence of substance abuse on adolescent immunization rates.

### **Recommendations for Future Analyses of this Measure:**

Shortly after CHPR completed its analysis, NCQA announced plans to retire this measure from the HEDIS measurement set, beginning with HEDIS 2008, and to introduce a newly designed Adolescent Immunization Status measure for HEDIS 2009. The results of CHPR's analysis were included in this report because they address the interpretation of HEDIS 2006 results. CHPR has not, however, made any recommendations for future analyses for this specific measure.

## Well-Child Visits in the First 15 Months of Life

**Definition of sample:** Members who turned 15 months old during 2005, who were enrolled in a MassHealth plan on the day they turned 15 months old, and who were continuously enrolled with that plan from 31 days of life through 15 months of age with no more than one gap in enrollment of up to 45 days.

**Sample size:**

- Reported to NCQA and MassHealth: 1,562 members
- Used for analysis: 1,543 members<sup>12</sup>

**Independent variables:**

- MassHealth plan
- Type of primary care provider
- Member's gender
- Member's overall illness burden (CDPS score)
- Member's disability
- Member's geographical region

**Dependent variable:**

- Six or more well-child visits with a primary care practitioner during the first 15 months of life

**Characteristics of sample used for analysis:**

- 51.8% male
- Mean CDPS score: 1.0 (individual CDPS scores ranged from 0.10 to 12.52)
- 1.3% disabled

Appendix c includes additional data on the characteristics of the analysis sample.

**Table 7. MassHealth Plan HEDIS 2006, Rate of Members with Six or More Well-Child Visits in the First 15 Months as Reported to NCQA and MassHealth (n=1,562)**

2006	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	236	2,838	260	90.8%	87.1%	94.5%
NHP	(H)	235	2,285	296	79.4%	74.6%	84.2%
NH	(H)	284	1,512	411	69.1%	64.5%	73.7%
FCHP	(H)	130	184	184	70.7%	63.8%	77.5%
BMCHP	(H)	343	3,630	411	83.5%	79.7%	87.2%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

<sup>12</sup> 19 members, or 1/2% of the original HEDIS sample, were removed from the analysis due to missing eligibility or enrollment data (11 members had no eligibility data available for any of the independent variables; 12 members were missing data for one or more independent variables).

## Results of Analysis:

**Table 8. Summary of Multiple Logistic Regression Model Predicting Rate of Members with Six or More Well-Child Visits in the First 15 Months of Life (n=1,543)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	0.46 (0.27-0.79) *
NH	PCC Plan	0.19 (0.11-0.32) *
FCHP	PCC Plan	0.14 (0.07-0.26) *
BMCHP	PCC Plan	0.45 (0.26-0.80) *
Provider type		
Group practice	Other provider	1.51 (1.12-2.05) *
Individual physician	Other provider	1.25 (0.56-2.82)
Gender		
Male	Female	0.96 (0.75-1.24)
CDPS score		
0.5-1.0	< 0.5	1.34 (0.98-1.83)
>1.0	< 0.5	1.13 (0.83-1.54)
Disabled		
Yes	No	0.45 (0.17-1.24)
Geographical region		
Western	Boston	1.88 (1.11-3.19) *
Central	Boston	2.38 (1.45-3.90) *
Northeast	Boston	1.72 (1.09-2.70) *
Metrowest	Boston	1.51 (0.88-2.60)
Southeast	Boston	1.54 (0.92-2.59)

\* p<.05

## Summary of Analysis:

- The PCC Plan's unadjusted rate for the Well-Child Visit in the First 15 Months of Life rate, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly higher than the unadjusted rates for BMCHP, FCHP, NH and NHP. These differences remained significant after CHPR adjusted the results for type of primary care provider and member's gender, CDPS score, disability and geographical region (p<.05). In addition, PCC Plan members had significantly higher odds of receiving six more well-child visits in the first 15 months of life compared to BMCHP members (p<.05), after the results were adjusted.
- The type of primary care provider assigned to the member as of 12/31/05 had a significant effect on the rate of members who received six or more well-child visits in the first 15 months of life after adjusting for member's health plan, gender, CDPS score, disability, and geographical region. Members assigned to group practices had a statistically significant increase in the odds of receiving six or more well-child visits in the first 15 months of life compared to members assigned to individual providers or "other" types of providers (p<.05).
- The only member characteristic associated with a statistically significant increase or decrease in the odds of receiving six or more well-child visits in the first 15 months of life was geographical region. Members residing in the western, central or northeast regions

of Massachusetts were more likely to have received six or more well-child visits in the first 15 months of life than members in the Boston region ( $p < .05$ ).

- Gender, CDPS score, and disability had no significant effect on the rates of members who received six or more well-child visits in the first 15 months of life.

### **Interpretation of Results:**

The Well-Child Visit in the First 15 Months of Life measure was one of six measures where the type of primary care provider assigned to the member as of 12/31/05 had a significant effect (the other measures with this result were the Adolescent Well-Care measure and all four rates of the Children and Adolescents' Access to Primary Care Practitioners measure). In general, members assigned to group practices had higher odds of meeting the requirements of these measures than members assigned to individual primary care providers or 'other' types of primary care providers. Additional analyses should be conducted to understand this finding before recommending that quality improvement activities focus on specific provider types.

Residing in the western, central and northeast regions of Massachusetts was associated with a statistically significant increase in the odds of receiving six or more well-child visits in the first 15 months of life. Results for other measures also demonstrated a significant effect of member's geographical region, but there was little consistency across measures with regard to which regions has a significant effect the independent variable and the direction of that effect.

### **Recommendations for Future Analyses of this Measure:**

- Conduct additional analyses on primary care provide type to better understand differences in well-child visit rates.
- Introduce parent and caregiver-level variables into the model (such as casehead CDPS score, co-occurring depression and age) to determine the effect of parent and caregiver characteristics on well-child visit rates for MassHealth members under the age of 15 months.
- Consider evaluating the individual visit rates (0 visits, 1 visit, 2 visits, 3 visits, 4 visits and 5 visits) to determine whether there are different factors associated with the individual visit rates and to determine whether there is a population that has some level of contact with the system (e.g., 3, 4 or 5 visits) but is most at risk for failing to receive six or more well-child visits in the first 15 months of life.
- Conduct additional analyses on the effect of geographical region to determine whether there are other confounding factors that interact with the effect of the geographical region variable for this measure (e.g., is density of provider network within a region or income disparities within a region confounded with member's geographical region and are these the factors influencing the differences seen in this initial analysis, etc.).

## Well-Child Visits in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Years of Life

**Definition of sample:** Members who were three, four, five or six years old during 2005, who were enrolled as of 12/31/05, and who were continuously enrolled during 2005 with no more than one gap in enrollment of up to 45 days.

**Sample size:**

- Reported to NCQA and MassHealth: 2,012 members
- Use for analysis: 1,997 members<sup>13</sup>

**Independent variables:**

- MassHealth plan
- Type of primary care provider
- Member's gender
- Member's overall illness burden (CDPS score)
- Member's disability
- Member's geographical region

**Dependent variable:**

- At least one well-child visit with a primary care practitioner during 2005

**Characteristics of sample used for analysis:**

- 51.8% male
- Mean CDPS score: 1.0 (individual CDPS scores ranged from 0.12 to 7.84)
- 3.6% disabled

Appendix C includes additional data on the characteristics of the analysis sample.

**Table 9. MassHealth Plan HEDIS 2006, Well-Child Visits in the Third, Fourth, Fifth or Sixth Year of Life Rate as Reported to NCQA and MassHealth (n=2,012)**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	200	15,209	229	87.3%	82.8%	91.9%
NHP	(H)	217	10,536	260	83.5%	78.8%	88.2%
NH	(H)	282	7,188	348	81.0%	76.8%	85.3%
FCHP	(A)	605	764	764	79.2%	76.2%	82.1%
BMCHP	(H)	334	15,272	411	81.3%	77.4%	85.2%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

<sup>13</sup> 15 members, or 0.7% of the original HEDIS sample, were removed from the analysis due to missing eligibility or enrollment data (2 members had ages, calculated through enrollment data obtained by CHPR, that were outside of the measure's criteria (i.e., older than 6); 1 member appeared twice in the PCC Plan's sample; 5 members had no eligibility data available for any of the independent variables; missing eligibility data; 7 members were missing data for one or more independent variables.)

## Results of the Analysis:

**Table 10. Summary of Multiple Logistic Regression Model Predicting Well-Child Visits in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Years of Life Rates (n=1,997)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	0.85 (0.49-1.46)
NH	PCC Plan	0.64 (0.38-1.07)
FCHP	PCC Plan	0.46 (0.25-0.84) *
BMCHP	PCC Plan	0.70 (0.41-1.21)
Provider type		
Group practice	Other provider	1.30 (0.92-1.84)
Individual physician	Other provider	1.75 (0.65-4.73)
Gender		
Male	Female	1.17 (0.89-1.54)
Age	N/A**	0.82 (0.74-0.91) *
CDPS score		
0.5-1.0	< 0.5	1.04 (0.72-1.50)
>1.0	< 0.5	1.43 (1.00-2.05)
Disabled		
Yes	No	1.17 (0.61-2.24)
Geographical region		
Western	Boston	0.76 (0.43-1.35)
Central	Boston	1.06 (0.58-1.95)
Northeast	Boston	0.83 (0.48-1.44)
Metrowest	Boston	0.91 (0.49-1.69)
Southeast	Boston	0.96 (0.53-1.75)

\* p<.05

\*\* Because of the narrow range of member ages included in the denominator of this measure (3-6 years), the age variable was added as a continuous variable. Therefore, there is no comparison group.

## Summary of Results:

- The PCC Plan's unadjusted rate for the Well-Child Visits in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Years of Life measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly higher than FCHP's unadjusted rate. This difference remained significant after CHR adjusted the results for type of primary care provider and member's gender, age, CDPS score, disability and geographical region (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on the well-child visit rate for children aged 3 to 6 years after adjusting for member's health plan, gender, age, CDPS score, disability and geographical region.
- The only member characteristic associated with a statistically significant increase or decrease in the odds of receiving at least one well-child visit in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> or 6<sup>th</sup> years of life was age. Increasing age was associated with a statistically significant *decrease* in the odds that a child had at least once well-child visit during 2005 (p<.05). With every year increase in age, members of that age were 20% less likely to have had at least one well-child visit during 2005 (e.g., 4 year olds in the sample were 20% less likely to have had a visit than 3 year olds, etc.)

- Gender, CPDS score, disability, and geographical region had no significant effect on the odds that children aged 3 to 6 years received at least one well-child visit during 2005.

### **Interpretation of Analysis:**

Member age had a significant effect on the dependent variable, despite the narrow age range for this measure (the older a child, the lower the child's odds that he or she received at least one well-care visit during 2005). Quality improvement activities that focus on the older children in this measure's denominator (e.g., children ages 5 and 6 during the measurement year) might improve performance on this measure, although more analysis is needed to understand whether other factors are also significant predictors of performance on this measure.

### **Recommendations for Future Analyses of this Measure:**

- Conduct additional analyses related to member age and other factors that may contribute to increasing age being associated with lower odds of receiving a well-child visit for this population.
- Introduce parent and caregiver-level variables into the model (such as casehead CDPS score, co-occurring depression and age) to determine the effect of parent and caregiver characteristics on well-child visit rates for MassHealth members aged 3-6 years.

## Adolescent Well-Care Visits

**Definition of sample:** Members who were 12-21 years old during 2005, enrolled in a MassHealth plan as of 12/31/05, and who were continuously enrolled with that plan during 2005 with no more than one gap in enrollment of up to 45 days.

**Sample size:**

- Reported to NCQA and MassHealth: 2,926 members
- Used for analysis: 2,917<sup>14</sup>

**Independent variables:**

- MassHealth plan
- Type of primary care provider
- Member's gender
- Member's overall illness burden (CDPS score)
- Member's co-occurring substance abuse
- Member's disability
- Member served by the Department of Mental Health (DMH)
- Member's geographical region

**Dependent variable:**

- At least one comprehensive well-care visit with a primary care practitioner or OB/GYN during 2005

**Characteristics of sample:**

- 46.9% male
- Mean CDPS score of 1.0 (individual CDPS scores ranged from 0.09 to 11.2)
- 2.3% with co-occurring substance abuse
- 7.9% disabled
- 0.8% served by Department of Mental Health (DMH)

Appendix C includes additional data on the characteristics of the analysis sample.

**Table 11. MassHealth Plan HEDIS 2006, Adolescent Well-Care Visit Rate as Reported to NCQA and MassHealth (n=2,926)**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	237	35,842	388	61.1%	56.1%	66.1%
NHP	(H)	265	17,118	405	65.4%	60.7%	70.2%
NH	(H)	247	9,624	411	60.1%	55.2%	65.0%
FCHP	(A)	697	1,311	1,311	53.2%	50.4%	55.9%
BMCHP	(H)	284	21,147	411	69.1%	64.5%	73.7%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

<sup>14</sup> 9 members, 0.3% of the original HEDIS sample, were removed from the analysis due to missing eligibility or enrollment data (4 members had no eligibility data available for any of the independent variables; missing eligibility data; 5 members were missing data for one or more independent variables).

## Results of the Analysis:

**Table 12. Summary of Multiple Logistic Regression Model Predicting Adolescent Well-Care Visit Rates (n=2,917)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	1.14 (0.83-1.57)
NH	PCC Plan	0.88 (0.64-1.22)
FCHP	PCC Plan	0.60 (0.42-0.85) *
BMCHP	PCC Plan	1.30 (0.92-1.84)
Provider type		
Group practice	Other provider	1.30 (1.05-1.63) *
Individual physician	Other provider	1.12 (0.64-1.95)
Gender		
Male	Female	0.78 (0.67-0.91) *
CDPS score		
0.5-1.0	< 0.5	1.01 (0.84-1.21)
>1.0	< 0.5	1.34 (1.09-1.65) *
Co-occurring substance abuse		
Yes	No	0.73 (0.44-1.20)
Disabled		
Yes	No	0.78 (0.58-1.04)
Served by DMH		
Yes	No	1.30 (0.54-3.13)
Geographical region		
Western	Boston	0.76 (0.51-1.13)
Central	Boston	0.75 (0.51-1.09)
Northeast	Boston	0.69 (0.49-0.98) *
Metrowest	Boston	0.66 (0.44-0.99) *
Southeast	Boston	0.53 (0.36-0.78) *

\* p<.05

## Summary of Results:

- The PCC Plan's unadjusted rate for the Adolescent Well-Care Visit measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly higher than FCHP's unadjusted rate. This difference remained significant after CHPR adjusted the results for type of primary care provider and member's gender, CDPS score, co-occurring substance abuse, disability, participation with DMH and geographical region, (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had a significant effect on the adolescent well-care visit rate after adjusting for member's health plan, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region. Members assigned to primary care group practices had a 1.30 times increase in the odds of receiving at least one adolescent well-care visit during 2005 compared to members assigned to individual primary care providers and "other" types of primary care providers<sup>15</sup> (p<.05).

<sup>15</sup> See page 9 for a definition of 'other'.

- The member characteristics associated with a statistically significant increase or decrease in the odds of receiving at least one adolescent well-care visit during 2005 were gender, CDPS score, and geographical region.
  - Being male was associated with a statistically significant *decrease* in the odds of receiving at least one adolescent well-care visit during 2005 ( $p < .05$ ).
  - CDPS scores  $> 1.0$  were associated with a 1.34 times increase in the odds of receiving at least one adolescent well-care visit during 2005 ( $p < .05$ ).
  - Residing in the northeastern, Metrowest or southeastern regions of Massachusetts was associated with a statistically significant *decrease* in the odds of receiving at least one adolescent well-care visit during 2005 ( $p < .05$ ).
- Co-occurring substance abuse, disability and participation with DMH had no significant effect on adolescent well-care visit rates.

### **Interpretation of Results:**

The Adolescent Well-Care Visit measure was one of six measures where the type of primary care provider assigned to the member as of 12/31/05 had a significant effect (the other measures with this result were the Well-Child Visit in the First 15 Months of Life measure and all rates of the Children and Adolescents' Access to Primary Care Practitioners measure). As noted earlier, additional analysis is needed to fully understand this finding.

Male adolescents had a statistically significantly decrease in the odds of receiving at least one adolescent well-care visit during 2005. Although the effect of this decrease was not great, plans may benefit by focusing quality improvement activities on this group.

Adolescent members with higher CDPS scores compared to the entire sample had an increase in the odds of receiving at least one well-care visit in 2005. This finding, which is similar to that reported for the Well-Child Visit in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Years of Life measure, appears logical when considering that adolescents with higher overall illness burden would likely have more contacts with the health care system and therefore more opportunities to have a visit coded as a well-care visit during 2005.

### **Recommendations for Future Analyses of this Measure:**

- Conduct additional analyses to understand whether male adolescents of certain ages are at greater risk for failing to have a well-care visit. For example, there may be different factors that influence whether a 12-year old male adolescent receives a well-care visit compared to a 19-year old male adolescent.
- Conduct additional analyses on primary care provider type, CDPS scores and region to better understand the effect of these variables on adolescent well-care rates and the relationship of these variables to other potential and existing independent variables.

## Comprehensive Diabetes Care

**Definition of sample:** Members aged 18-65 who were enrolled in a MassHealth managed care plan on 12/3/05, were continuously enrolled with that plan during 2005 with no more than one gap in enrollment of up to 45 days, and who had type 1 or type 2 diabetes.

**Sample size:**

- Reported to NCQA and MassHealth: 1,790 members
- Used for analysis: 1,790 members

**Independent variables:**

- MassHealth plan
- Type of primary care provider
- Member's gender
- Member's age
- Member's overall illness burden (CDPS score)
- Member's co-occurring substance abuse
- Member's disability
- Member served by Department of Mental Health (DMH)
- Member's geographical region

**Dependent variable(s):**

CHPR conducted separate analyses for six different dependent variables using the same sample of MassHealth members:

1. At least one HbA1c test during 2005
2. Last HbA1c in 2005 was less than or equal to 9.0%
3. At least one LDL screening during 2005
4. Last LDL in 2005 controlled to less than 130 mg/dL
5. Screening for diabetic retinopathy during 2005
6. Monitoring for nephropathy during 2005

HEDIS 2006 included two LDL control measures (LDL<130 mg/dL and LDL<100 mg/dL). For this analysis, CHPR chose to analyze the more conservative measure, (LDL<130 mg/dL). Results from the HEDIS LDL<100 mg/dL measure were not analyzed.

**Characteristics of sample used for analysis:**

- 34.1% male
- Mean CDPS score: 1.15 (individual CDPS scores ranged from 0.74-6.52)
- 10.1% with co-occurring substance abuse
- 57.7% disabled
- 3.0% served by the Department of Mental Health (DMH)

Appendix C includes additional data on the characteristics of the analysis sample.

**Table 13. MassHealth Plan HEDIS 2006, Comprehensive Diabetes Care HbA1c Testing Rates as Reported to NCQA and MassHealth (n=1,790)**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	355	11,659	411	86.4%	82.9%	89.8%
NHP	(H)	375	1,054	411	91.2%	88.4%	94.1%
NH	(H)	350	1,105	411	85.2%	81.6%	88.7%
FCHP	(H)	142	155	151	94.0%	89.9%	98.1%
BMCHP	(H)	373	2,793	411	90.8%	87.8%	93.7%

Source: MassHealth Managed Care HEDIS 2006 Report

Key: (H)=hybrid method, (A)=administrative method

**Results of the Analysis:**

**Table 14. Summary of Multiple Logistic Regression Model Predicting HbA1c Testing Rates (n=1,795)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	1.76 (1.03-3.00) *
NH	PCC Plan	0.85 (0.52-1.39)
FCHP	PCC Plan	2.04 (0.85-4.88)
BMCHP	PCC Plan	1.34 (0.79-2.28)
Provider type		
Group practice	Other	1.03 (0.73-1.44)
Individual physician	Other	0.79 (0.35-1.80)
Gender		
Male	Female	1.19 (0.85-1.67)
Age		
Age 18-35	>55	0.44 (0.26-0.76) *
Age 36-45	>55	0.52 (0.32-0.84) *
Age 46-55	>55	0.85 (0.53-1.36)
CDPS score		
0.5-1.0	< 0.5	5.43 (3.56-8.28) *
>1.0	< 0.5	6.93 (4.42-10.88) *
Co-occurring substance abuse		
Yes	No	0.28 (0.18-0.46) *
Disabled		
Yes	No	1.39 (0.93-2.07)
Served by DMH		
Yes	No	0.76 (0.32-1.82)
Geographical region		
Western	Boston	1.30 (0.72-2.37)
Central	Boston	1.10 (0.61-2.00)
Northeast	Boston	0.83 (0.50-1.40)
Metrowest	Boston	1.29 (0.64-2.58)
Southeast	Boston	0.69 (0.40-1.22)

\* p<.05

## Summary of Results:

- The PCC Plan's unadjusted rate for the HbA1c testing rate, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly lower than the unadjusted FCHP's rate. This difference did not remain significant after CHPR adjusted the results for type of primary care provider and member's age, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region. However, PCC Plan members had significantly lower odds of receiving at least one HbA1c test during 2005 compared to NHP members, after the results were adjusted ( $p < .05$ ).
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on HbA1c testing rates after adjusting for member's health plan, age, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region.
- The member characteristics associated with a statistically significant increase or decrease in the odds of receiving at least one HbA1c test during 2005 were CDPS score, age, and co-occurring substance abuse.
  - A higher CDPS score (i.e., higher overall illness burden) was associated with a statistically significant increase in the odds of receiving at least one HbA1c test during 2005. CDPS scores between .5 and 1 were associated with a 6.18 times increase in the odds of receiving at least one HbA1c test during 2005 ( $p < .05$ ). CDPS scores  $> 1.0$  were associated with an 8.59 times increase in the odds of receiving at least one HbA1c test during 2005 ( $p < .05$ ).
  - Age groups 18-35 years and 36-45 years were associated with a statistically significant *decrease* in the odds of receiving at least one HbA1c test during 2005 ( $p < .05$ ).
  - Co-occurring substance abuse was associated with a statistically significant *decrease* in the odds of receiving at least one HbA1c test during 2005 ( $p < .05$ ).
- Gender, disability, participation with DMH, and geographical region had no significant effect on HbA1c testing rates.

**Table 15. MassHealth Plan HEDIS 2006, Comprehensive Diabetes Care Poor HbA1c Control Measure as Reported to NCQA and MassHealth (n=1,795)**

Plan	Data Collect Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	200	11,659	411	48.7%	43.7%	53.6%
NHP	(H)	134	1,054	411	32.6%	27.9%	37.3%
NH	(H)	211	1,105	411	51.3%	46.4%	56.3%
FCHP	(H)	41	155	151	27.2%	19.7%	34.6%
BMCHP	(H)	139	2,793	411	33.8%	29.1%	38.5%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

**Table 16. Summary of Multiple Logistic Regression Model Predicting HbA1c Test Results Less Than or Equal to 9.0% (n=1795)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	2.25 (1.61-3.14) *
NH	PCC Plan	0.82 (0.59-1.13)
FCHP	PCC Plan	1.90 (1.15-3.15) *
BMCHP	PCC Plan	2.08 (1.48-2.93) *
Provider type		
Group practice	Other	0.87 (0.70-1.08)
Individual physician	Other	0.71 (0.41-1.24)
Gender		
Male	Female	1.06 (0.85-1.31)
Age		
Age 18-35	Age>55	0.41 (0.29-0.59) *
Age 36-45	Age>55	0.62 (0.46-0.83) *
Age 46-55	Age>55	0.75 (0.58-0.98) *
CDPS score		
0.5-1	< 0.5	1.56 (1.11-2.18) *
>1	< 0.5	1.60 (1.13-2.25) *
Co-occurring substance abuse		
Yes	No	0.70 (0.50-0.99) *
Disabled		
Yes	No	1.07 (0.83-1.37)
Served by DMH		
Yes	No	1.77 (0.97-3.25)
Geographical region		
Western	Boston	0.90 (0.62-1.29)
Central	Boston	1.41 (0.96-2.08)
Northeast	Boston	0.78 (0.56-1.08)
Metrowest	Boston	0.95 (0.64-1.41)
Southeast	Boston	0.93 (0.63-1.35)

\* p<.05

**NOTE:** CHPR reversed the direction of this variable for the analysis. This measure, as it was reported in the *MassHealth Managed Care HEDIS 2006 Report*, assesses the percentage of members with poor HbA1c control and a lower rate indicates *better* performance. Due to the manner in which the data were provided to CHPR by the MassHealth plans and to be consistent with the other measure's analyzed, CHPR reversed the direction of the HbA1c control dependent variable before adding it to the multiple linear regression model so that a lower rate indicates a negative, not positive, outcome. Therefore, the results presented above and summarized below discuss the increase or decrease in the odds that a member's most recent HbA1c test result that was less than or equal to 9.0% (or **not** in poor control). It is important to note that compliance with this reversed measure should not be referred to as "good" control because good HbA1c control is defined in current clinical guidelines as less than 7.0%..

### Summary of Results:

- The PCC Plan's unadjusted HbA1c control rate, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly higher than the unadjusted rates for

BMCHP, FCHP and NHP (for this result, a higher rate means poor performance). These differences remained significant after CHPR adjusted the results for type of primary care provider and member's age, gender, CDPS score, substance abuse, disability, participation with DMH, and geographical region ( $p < .05$ ).

- The type of primary care provider assigned to a member as of 12/31/05 had no significant effect on HbA1c control rates after CHPR adjusted for member's health plan, age, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH and geographical region.
- The member characteristics that were associated with a statistically significant increase or decrease in the odds of having one's most recent HbA1c test result less than or equal to 9.0% were CDPS score, age, and co-occurring substance abuse:
  - A higher CDPS score (i.e., higher overall illness burden) was associated with a statistically significant increase in the odds that a member had his or her most recent HbA1c test result less than or equal to 9.0%. CDPS scores between .5 and 1 and scores  $> 1.0$  were associated with a 1.56 times and 1.60 times increase in the odds that a member had his or her most recent HbA1c test result less than or equal to 9.0%, respectively ( $p < .05$ ).
  - Age groups 18-35 years, 36-45 years and 46-55 years were associated with a statistically significant decrease in the odds that a member had his or her most recent HbA1c test result less than or equal to 9.0% ( $p < .05$ ).
  - Co-occurring substance abuse was associated with a statistically significant decrease in the odds that a member had his or her HbA1c test result less than or equal to 9.0% ( $p < .05$ ).
  - Gender, disability, participation with DMH and geographical region had not significant effect on whether a member's most recent HbA1c test was less than or equal to 9.0%.

**Table 17. MassHealth Plan HEDIS 2006, Comprehensive Diabetes Care LDL Testing Measure as Reported to NCQA and MassHealth (n=1,795)**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	372	11,659	411	90.5%	87.6%	93.5%
NHP	(H)	376	1,054	411	91.5%	88.7%	94.3%
NH	(H)	362	1,105	411	88.1%	84.8%	91.3%
FCHP	(H)	136	155	151	90.1%	85.0%	95.2%
BMCHP	(H)	375	2,793	411	91.2%	88.4%	94.1%

Source: *MassHealth Managed Care HEDIS 2006 Report*  
 Key: (H)=hybrid method, (A)=administrative method

## Results of the Analysis:

**Table 18. Summary of Multiple Logistic Regression Model Predicting LDL Testing (n=1790)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	1.18 (0.67-2.09)
NH	PCC Plan	0.87 (0.51-1.51)
FCHP	PCC Plan	0.99 (0.45-2.19)
BMCHP	PCC Plan	1.02 (0.57-1.81)
Provider type		
Group practice	Other	0.93 (0.65-1.34)
Individual physician	Other	0.65 (0.27-1.61)
Gender		
Male	Female	1.17 (0.82-1.68)
Age		
Age 18-35	Age>55	0.21 (0.12-0.38) *
Age 36-45	Age>55	0.42 (0.24-0.73) *
Age 46-55	Age>55	0.64 (0.38-1.10)
CDPS score		
0.5-1.0	< 0.5	3.61 (2.25-5.81) *
>1.0	< 0.5	3.49 (2.15-5.65) *
Co-occurring substance abuse		
Yes	No	0.29 (0.18-0.47) *
Disabled		
Yes	No	1.28 (0.85-1.93)
Served by DMH		
Yes	No	0.70 (0.29-1.68)
Geographical region		
Western	Boston	1.13 (0.60-2.13)
Central	Boston	0.79 (0.42-1.50)
Northeast	Boston	0.90 (0.51-1.60)
Metrowest	Boston	1.05 (0.51-2.17)
Southeast	Boston	0.79 (0.43-1.47)

\*p<.05

## Summary of Results:

- The PCC Plan's unadjusted LDL testing rate, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was not significantly different than the unadjusted rates of the four MCOs. There were no differences between the PCC Plan's rate and the rates of the four MCOs after CHPR adjusted the results for type of primary care provider and member's age, gender, CDPS score, substance abuse, disability, participation with DMH and geographical region.
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on LDL testing rates after CHPR adjusted the results for member's health plan, age, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region.

- The member characteristics associated with a statistically significant increase or decrease in the odds of LDL testing were CDPS score, age, and co-occurring substance abuse.
  - A higher CDPS score (i.e., higher overall illness burden) was associated with a statistically significant increase in the odds that a member had at least one LDL test during 2005. CDPS scores between .5 and 1 and scores >1.0 were associated with a 3.61 times and 3.49 times increase in the odds of having at least one LDL test during 2005, respectively (p<.05).
  - Age groups 18-35 years and 36-45 years were associated with a statistically significant *decrease* in the odds that a member had at least one LDL test during 2005 (p<.05).
  - Co-occurring substance abuse was associated with a statistically significant *decrease* in the odds that a member had at least one LDL test during 2005 (p<.05).
- Gender, disability, participation with DMH and geographical region had no effect on LDL testing rates.

**Table 19. MassHealth Plan HEDIS 2006, Comprehensive Diabetes Care LDL Control Measure as Reported to NCQA and MassHealth**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	198	11,659	411	48.2%	43.2%	53.1%
NHP	(H)	261	1,054	411	63.5%	58.7%	68.3%
NH	(H)	190	1,105	411	46.2%	41.3%	51.2%
FCHP	(H)	106	155	151	70.2%	62.6%	77.8%
BMCHP	(H)	290	2,793	411	70.6%	66.0%	75.1%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

## Results of the Analysis:

**Table 20. Summary of Multiple Logistic Regression Model Predicting LDL Control Rates (n=1790)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	2.24 (1.61-3.12) *
NH	PCC Plan	0.95 (0.69-1.31)
FCHP	PCC Plan	2.37 (1.44-3.90) *
BMCHP	PCC Plan	2.70 (1.91-3.82) *
Provider type		
Group practice	Other	1.01 (0.82-1.26)
Individual physician	Other	0.76 (0.44-1.33)
Gender		
Male	Female	1.16 (0.94-1.44)
Age		
Age 18-35	Age>55	0.51 (0.36-0.73) *
Age 36-45	Age>55	0.80 (0.60-1.08)
Age 46-55	Age>55	1.01 (0.77-1.32)
CDPS score		
0.5-1.0	< 0.5	1.29 (0.92-1.81)
>1.0	< 0.5	1.33 (0.94-1.88)
Co-occurring substance abuse		
Yes	No	0.52 (0.37-0.73) *
Disabled		
Yes	No	1.27 (0.99-1.63)
Served by DMH		
Yes	No	1.44 (0.80-2.61)
Geographical region		
Western	Boston	0.94 (0.65-1.37)
Central	Boston	0.92 (0.63-1.35)
Northeast	Boston	0.70 (0.50-0.97) *
Metrowest	Boston	0.89 (0.60-1.32)
Southeast	Boston	0.58 (0.40-0.85) *

\* p<.05

## Summary of Results:

- The PCC Plan's unadjusted LDL control rate, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly lower than the unadjusted rates for BMCHP, FCHP and NHP. These differences remained significant after CHPR adjusted the results for type of primary care provider and member's age, gender, CDPS score, substance abuse, disability, participation with DMH, and geographical region (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on LDL control rates after CHPR adjusted the results for member's health plan, age, gender, CDPS score, co-occurring substance abuse and geographical region.

- The member characteristics associated with a statistically significant increase or decrease in the odds that a member's most recent LDL in 2005 was controlled to less than 130 mg/dL were age, co-occurring substance abuse, and geographical region:
  - Ages 18-35 years was associated with a statistically significant *decrease* in the odds that a member's most recent LDL in 2005 was controlled to less than 130 mg/dL ( $p < .05$ ).
  - Co-occurring substance abuse was associated with a statistically significant *decrease* in the odds that a member's most recent LDL in 2005 was controlled to less than 130 mg/dL ( $p < .05$ ).
  - Residing in the northeastern or southeastern regions of Massachusetts was associated with a statistically significant *decrease* in the odds that a member's most recent LDL in 2005 was controlled to less than 130 mg/dL ( $p < .05$ ).
- Gender, CDPS score, disability and participation with DMH had no significant effect on LDL control rates.

**Table 21. MassHealth Plan HEDIS 2006, Comprehensive Diabetes Care Eye Exam Rates as Reported to NCQA and MassHealth**

Plan	Data Collection Method	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	223	11,659	411	54.3%	49.3%	59.2%
NHP	(H)	269	1,054	411	65.5%	60.7%	70.2%
NH	(H)	246	1,105	411	59.9%	55.0%	64.7%
FCHP	(H)	85	155	151	56.3%	48.0%	64.5%
BMCHP	(H)	287	2,793	411	69.8%	65.3%	74.4%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

## Results of the Analysis:

**Table 22. Summary of Multiple Logistic Regression Model Predicting Eye Exam Rates (n=1,790)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	1.87 (1.34-2.62) *
NH	PCC Plan	1.17 (0.85-1.63)
FCHP	PCC Plan	0.77 (0.48-1.26)
BMCHP	PCC Plan	1.87 (1.32-2.64) *
Provider type		
Group practice	Other	1.16 (0.93-1.44)
Individual physician	Other	0.78 (0.45-1.36)
Gender		
Male	Female	0.91 (0.74-1.13)
Age		
Age 18-35	Age>55	0.40 (0.28-0.58) *
Age 36-45	Age>55	0.61 (0.45-0.83) *
Age 46-55	Age>55	0.76 (0.58-1.00**) *
CDPS score		
0.5-1	Score< 0.5	1.51 (1.08-2.12) *
>1	Score< 0.5	1.79 (1.27-2.53) *
Co-occurring substance abuse		
Yes	No	0.42 (0.30-0.59) *
Disabled		
Yes	No	1.17 (0.91-1.50)
Served by DMH		
Yes	No	1.15 (0.63-2.08)
Geographical region		
Western	Boston	1.51 (1.04-2.19) *
Central	Boston	1.50 (1.02-2.20) *
Northeast	Boston	1.23 (0.88-1.72)
Metrowest	Boston	0.93 (0.63-1.38)
Southeast	Boston	0.87 (0.60-1.27)

\*p<.05

\*\* rounded from 0.998

## Summary of Results:

- The PCC Plan's unadjusted eye exam rate, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly lower than the unadjusted rates for BMCHP and NHP. These results remained significant after CHPR adjusted the results for type of primary care provider and member's age, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH and geographical region (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on eye exam rates after CHPR adjusted the results for member's health plan, age, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region.

- The member characteristics associated with a statistically significant increase or decrease in the odds of receiving an eye exam were CDPS score, age, co-occurring substance abuse, and geographical region:
  - A higher CDPS score (i.e., higher overall illness burden) was associated with a statistically significant increase in the odds that a member received an eye exam. CDPS scores between .5 and 1 and >1.0 were associated with a 1.51 times and 1.79 times increase, respectively, in the odds that a member received an eye exam ( $p < .05$ ).
  - Ages 18-35 years, 36-45 years, and 46-55 years were associated with a statistically significant *decrease* in the odds that a member received an eye exam ( $p < .05$ ).
  - Co-occurring substance abuse was associated with a statistically significant *decrease* in the odds that a member received an eye exam ( $p < .05$ ).
  - Residing in the central or western regions of Massachusetts was associated with a statistically significant increase in the odds that a member received an eye exam ( $p < .05$ ).
- Gender, disability and participation with DMH had no significant effect on eye exam rates.

**Table 23. MassHealth Plan HEDIS 2006, Comprehensive Diabetes Care Monitoring for Nephropathy Rates as Reported to NCQA and MassHealth**

Plan	Data Collection Methods	Num	Elig. Pop.	Den	Rate	LCL	UCL
PCCP	(H)	236	11,659	411	57.4%	52.5%	62.3%
NHP	(H)	262	1,054	411	63.7%	59.0%	68.5%
NH	(H)	250	1,105	411	60.8%	56.0%	65.7%
FCHP	(H)	92	155	151	60.9%	52.8%	69.0%
BMCHP	(H)	290	2,793	411	70.6%	66.0%	75.1%

Source: *MassHealth Managed Care HEDIS 2006 Report*  
 Key: (H)=hybrid method, (A)=administrative method

## Results of the Analysis:

**Table 24. Summary of Multiple Logistic Regression Model Predicting Nephropathy Monitoring Rates (n=1,790)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	1.58 (1.13-2.21) *
NH	PCC Plan	1.33 (0.95-1.86)
FCHP	PCC Plan	1.45 (0.89-2.36)
BMCHP	PCC Plan	1.56 (1.10-2.22) *
Provider type		
Group practice	Other	1.03 (0.83-1.29)
Individual physician	Other	1.01 (0.57-1.79)
Gender		
Male	Female	1.12 (0.90-1.39)
Age		
Age 18-35	Age>55	0.50 (0.35-0.72) *
Age 36-45	Age>55	0.67 (0.49-0.90) *
Age 46-55	Age>55	0.76 (0.58-1.00)
CDPS score		
0.5=<Score<=1	Score< 0.5	2.18 (1.55-3.07) *
Score>1	Score< 0.5	3.15 (2.22-4.46) *
Co-occurring substance abuse		
Yes	No	0.59 (0.42-0.84) *
Disabled		
Yes	No	1.35 (1.05-1.74) *
Served by DMH		
Yes	No	1.16 (0.63-2.13)
Geographical region		
Western	Boston	1.15 (0.78-1.69)
Central	Boston	0.63 (0.43-0.93) *
Northeast	Boston	0.77 (0.54-1.08)
Metrowest	Boston	0.68 (0.45-1.02)
Southeast	Boston	0.47 (0.32-0.69) *

\*p<.05

## Summary of Results:

- The PCC Plan's unadjusted nephropathy monitoring rate, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly lower than the BMCHP's unadjusted rate. This differences remained significant after CHPR adjusted the results for type of primary care provider and member's age, gender, CDPS score, substance abuse, disability, participation with DMH, and geographical region (p<.05). In addition, PCC Plan members had significantly lower odds of being monitored for nephropathy compared to NHP members, when the results were adjusted (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on nephropathy monitoring rates after CHPR adjusted member's

health plan, age, gender, CDPS score, substance abuse co-morbidity, disability, participation with DMH, and geographical region.

- The member characteristics associated with a statistically significant increase or decrease in the odds that a member was monitored for nephropathy during 2005 were CDPS score, age, co-occurring substance abuse and disability.
  - A higher CDPS score (i.e., higher overall illness burden) was associated with an increase in the odds that a member was monitored for nephropathy during 2005. CDPS scores between .5 and 1 were associated with a 2.18 times increase in the odds that a member was monitored for nephropathy during 2005. CDPS scores >1.0 were associated with a 3.15 times increase in the odds that a member was monitored for nephropathy during 2005 ( $p<.05$ ).
  - Members who were disabled had a 1.35 times increase in the odds that they were monitored for nephropathy during 2005 ( $p<.05$ ).
  - Ages 18-35 years and 36-45 years were associated with a statistically significant *decrease* in the odds that a member was monitored for nephropathy during 2005 ( $p<.05$ ).
  - Co-occurring substance abuse diagnosis is associated with a statistically significant *decrease* in the odds that a member was monitored for nephropathy during 2005 ( $p<.05$ ).
  - Residing in the central or southeastern region was associated with a statistically significant *decrease* in the odds that a member was monitored for nephropathy during 2005 ( $p<.05$ ).
- Gender and participation with DMH had no significant effect on nephropathy monitoring rates.

### Interpretation of Results:

- For all measures except for the LDL control measure, a higher CDPS score (i.e., higher overall illness burden) was associated with an increase in the odds that a member was compliant with the numerator. This may be somewhat intuitive for the process measures (whether someone received an HbA1c or LDL test, eye exam, or was monitored for nephropathy) since it is reasonable to expect that individuals with a higher CDPS score would have more contacts with the health care system and possibly more opportunities to receive the tests and exams that are essential to diabetes management.
- Age, particularly younger age (e.g., 18-35), was associated with a statistically significant *decrease* in the odds that a member was compliant with the numerator requirements for the individual rates comprising the Comprehensive Diabetes Care measure compared to older age (e.g., <55). More analysis is needed to understand this finding.
- Co-occurring substance abuse had an effect on every rate of this measure. Members with co-occurring substance abuse had *decreased* odds of receiving the tests and exams necessary for diabetes management and for having their LDL controlled and their HbA1c not in poor control. Based on these results, members with diabetes and co-occurring substance abuse should be targeted for quality improvement activities related to diabetes management.
- Members who were disabled had increased odds of having their most recent LDL in 2005 controlled to less than 130 mg/dL and of receiving monitoring for nephropathy. More analysis is needed to understand this finding.



## Use of Appropriate Medications for People with Asthma

**Definition of sample:** Members aged 5-56 who were enrolled in a MassHealth managed care plan on December 31, 2005, were continuously enrolled with that plan during 2004 and 2005 with no more than one gap in enrollment of up to 45 days, and who had persistent asthma during 2004 and 2005. (This measure is reported by plans in three age stratifications (5-9, 10-17, and 18-56 years) and as a combined rate (5-56 years). CHPR analyzed only the combined rate for this measure.)

### Sample size:

- Reported to NCQA and MassHealth: 11,920 members
- Used for analysis: 11,909 members<sup>16</sup>

### Independent variables:

- MassHealth plan
- Type of primary care provider
- Member's age
- Member's gender
- Member's overall illness burden (CDPS score)
- Member's co-occurring substance abuse
- Member served by Department of Mental Health (DMH)
- Member's geographical region

**Dependent variable:** At least one dispensed prescription for a long-term control medication during 2005 (long-term control medications are defined as inhaled corticosteroids, nedocromil, cromolyn sodium, leukotriene modifiers, or methylxanthines).

### Characteristics of sample:

- 36.6% male
- Mean age: 28.9 years
- Mean CDPS score: 1.0 (individual CDPS scores ranged from 0.06 to 24.92)
- 10.8% had co-occurring substance abuse
- 45.9% disabled
- 3.1% served by the Department of Mental Health (DMH)

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<sup>16</sup> 11 members, or 0.009% of the original sample, were removed from the analysis due to missing eligibility or enrollment data (11 members were missing data for one or more independent variables).

**Table 25. MassHealth Plan HEDIS 2006, Use of Appropriate Medications for People with Asthma Rates (Combined Ages) as Reported to NCQA and MassHealth**

Plans	Data Collection Method	Num	Den	Rate	LCL	UCL
PCCP	(A)	5,780	6,976	82.9%	82.0%	83.7%
NHP	(A)	12,68	1,448	87.6%	85.8%	89.3%
NH	(A)	890	1,037	85.8%	83.7%	88.0%
FCHP	(A)	73	97	75.3%	66.2%	84.4%
BMCHP	(A)	2,108	2,362	89.2%	88.0%	90.5%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

### Results of the Analysis:

**Methodological Note:** The initial analysis of this measure indicated that the age and gender independent variables were interactive variables. That is, there was a statistically significant interaction between a member’s age and a member’s gender that was influencing the results of the multiple logistic regression model for this measure ( $p < .0001$ ). Therefore, CHPR “interacted” these two variables to produce results that explain how a member’s age and their gender together predict (or do not predict) a member’s compliance with this measure. Therefore, unlike the results for other measures presented in this report where CHPR did not interact these two variables, the results for the asthma measure are presented in two tables summarizing the results of the multiple logistic regression model—one table that presents results for male members and one that presents the results for female members.

**Table 26. Summary of Multiple Logistic Regression Model Predicting Use of Appropriate Medication for People with Asthma Rates (n=11,909), Male Members**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	1.12 (0.81-1.54)
NH	PCC Plan	1.63 (1.11-2.37) *
FCHP	PCC Plan	1.54 (0.51-4.68)
BMCHP	PCC Plan	1.22 (0.91-1.62)
Provider type		
Group practice	Other	0.84 (0.68-1.03)
Individual physician	Other	0.76 (0.53-1.08)
Age & gender		
Male		
Age 5-9	Age>40 & Female	4.05 (2.93-5.58) *
Age 10-17	Age>40 & Female	2.69 (2.05-3.54) *
Age 18-24	Age>40 & Female	1.0 (0.70-1.42)
Age 25-40	Age>40 & Female	0.94 (0.71-1.24)
CDPS score		
0.5=<Score<=1	Score< 0.5	1.44 (1.14-1.82) *
Score>1	Score< 0.5	1.33 (1.03-1.70) *
Co-occurring substance abuse		
Yes	No	0.66 (0.50-0.87) *
Disabled		
Yes	No	1.03 (0.82-1.29)
Served by DMH		
Yes	No	0.96 (0.63-1.47)
Geographical region		
Western	Boston	1.52 (1.10-2.10) *
Central	Boston	0.66 (0.47-0.93) *
Northeast	Boston	0.89 (0.66-1.20)
Metrowest	Boston	1.00 (0.71-1.40)
Southeast	Boston	0.88 (0.65-1.18)

\*p<.05

**Table 27. Summary of Multiple Logistic Regression Model Predicting Use of Appropriate Medications for People with Asthma Rates (n=11,909), Female Members**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	1.08 (0.86-1.36)
NH	PCC Plan	1.06 (0.82-1.36)
FCHP	PCC Plan	0.61 (0.34-1.07) *
BMCHP	PCC Plan	1.26 (1.03-1.55) *
Provider type		
Group practice	Other	0.95 (0.82-1.10)
Individual physician	Other	0.82 (0.64-1.05)
Age & gender		
Female		
Age 5-9	Age 40-56 & Male	2.24 (1.65-3.04) *
Age 10-17	Age 40-56 & Male	1.42 (1.12-1.79) *
Age 18-24	Age 40-56 & Male	0.68 (0.52-0.87) *
Age 25-40	Age 40-56 & Male	0.73 (0.62-0.86) *
CDPS score		
0.5-1	< 0.5	1.38 (1.17-1.63) *
>1	< 0.5	1.76 (1.47-2.11) *
Co-occurring substance abuse		
Yes	No	0.70 (0.58-0.85) *
Disabled		
Yes	No	0.99 (0.85-1.16)
Served by DMH		
Yes	No	0.82 (0.58-1.17)
Geographical region		
Western	Boston	1.12 (0.89-1.42)
Central	Boston	0.73 (0.57-0.94) *
Northeast	Boston	0.90 (0.73-1.12)
Metrowest	Boston	0.86 (0.67-1.10)
Southeast	Boston	0.72 (0.58-0.89) *

\*p<.05

### Summary of Results:

- After CHPR adjusted the results for type of primary care provider and member's age, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH and geographical region, PCC Plan male members had significantly *lower* odds of filling a prescription for a long-term asthma control medication compared to NH members (p<.05). PCC Plan female members had significantly *lower* odds of filling a prescription for a long-term asthma control medication compared to BMCHP and FCHP members.
- The type of primary care provider assigned to the member as of 12/31/05 had no significant effect on Use of Appropriate Medications for People with Asthma rates after CHPR adjusted for member's health plan, age and gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region.

- The member characteristic associated with a statistically significant increase or decrease in the odds that members with persistent asthma filled at least one prescription for a long-term control medication was age, gender, CDPS score, and co-occurring substance abuse.
  - Male children aged 5-9 had the highest odds of filling a prescription for a long-term control medication for persistent asthma ( $p < .05$ ) compared to males aged 10-17, 18-24, 25-39 and 40-56 years.
  - Females aged 18-24 and 25-40 had significantly lower odds of filling a prescription for a long-term control medication for persistent asthma compared to females aged 5-9, 10-17 and 40-56 years ( $p < .05$ ).
  - Higher CDPS score (i.e., higher overall illness burden) was associated with a statistically significant increase in the odds of filling a prescription for a long-term asthma control medication. Male and female members with a CPDS score 0.5-1.0 had a 1.44 and 1.38 times increase, respectively, in the odds of filling a long-term control medication for persistent asthma. Male and female members with CDPS scores  $< 1.0$  had a 1.33 and 1.76 times increase, respectively, in the odds of filling a long-term control medication for persistent asthma.
  - Co-occurring substance abuse was associated with a statistically significant decrease in the odds of filling a long-term control medication for persistent asthma for both males and females ( $p < .05$ ).
  - For male members, residing in the western regions of Massachusetts was associated with a statistically significant increase in the odds of filling a prescription for a long-term control medication for persistent asthma ( $p < .05$ ). Residing in the central region was associated with a statistically significant decrease in odds ( $p < .05$ ). For female members, residing in the central or southeastern regions was associated with a statistically significant decrease in the odds of filling a prescription for a long-term control medication for persistent asthma ( $p < .05$ ).
- Neither disability nor participation with DMH had a significant effect on Use of Appropriate Medications for People with Asthma rates.

### Interpretation of Results:

- Plans seeking to improve their Use of Appropriate Medications for People with Asthma rates may want to focus additional effort on females age 18-40. Women of this age range may receive most of their routine health care from GYNs or OB/GYNs; it is unclear if and how that may influence the likelihood that a member with persistent asthma is prescribed at least one long-term control medication during a calendar year.
- Higher CDPS score (i.e., higher overall illness burden) was associated with a statistically significant increase in the odds that a member filled a prescription for a long-term asthma control medication. It is possible that members with higher CDPS scores have more contacts with the health care system and more opportunities to have their persistent asthma managed by the dispensing of a prescription for a long-term control medication.
- Co-occurring substance abuse was associated with a statistically significant *decrease* in the odds that a member filled a prescription for a long-term control medication for persistent asthma for both male and female members. More analysis is needed to

understand why co-occurring substance abuse decreases the odds that a member was filled a prescription and whether co-occurring substance abuse also affects whether a provider *prescribes* asthma control medication.

**Recommendations for Future Analyses of this Measure:**

- Conduct additional analyses to understand the types of providers who treat female members with persistent asthma aged 18-40 and how that impacts whether they receive and fill prescriptions for appropriate medications. The analysis should also look at whether medications prescribed by GYN or OB/GYN providers or clinics (and filled by the patients) are being undercounted by this measure.
- Add parent and caregiver-level variables to the models for children ages 5-18 to see whether parent and caregiver characteristics effect whether a member fills a prescription for asthma control medication.

# Children and Adolescents' Access to Primary Care Practitioners

## (All Age Stratifications)

**Definition of sample:** The sample was defined two ways, depending on the age stratification:

- For the 12-24 month and 25 month-6 year age stratifications: The sample was defined as members who were 12-24 months or 25 months-6 years of age as of 12/31/05, enrolled in a MassHealth plan on 12/31/05, and who were continuously enrolled with that plan during 2005 with no more than one gap in enrollment of up to 45 days.
- For the 7-11 year and 12-19 year age stratifications: The sample was defined as members who were 7-11 years or 12-19 years of age as of 12/31/05, enrolled in a MassHealth plan on 12/31/05, and were continuously enrolled with that plan during 2004 and 2005 with no more than one gap in enrollment of up to 45 days during each year.

**Sample size:**

- Reported to NCQA and MassHealth:
  - 12-24 month age stratification: 15,650 members
  - 25 month-6 year age stratification: 61,070 members
  - 7-11 year age stratification: 38,647 members
  - 12-19 year age stratification: 57,274 members
- Used for analysis:
  - 12-24 month age group: 15,513 members<sup>17</sup>
  - 25 month-6 year age group: 60,686 members<sup>18</sup>
  - 7-11 year age group: 38,475 members<sup>19</sup>
  - 12-19 year age group: 57,089 members<sup>20</sup>

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<sup>17</sup> 137 members, or 0.9% of the original sample reported to MassHealth and NCQA, were removed from the analysis. 1 member was removed due to no RHN, 8 members were removed because their RHN already appeared in a plan's data (we kept only one record per member per plan in the analysis sample, per NCQA specifications), 68 members had no eligibility data available for any of the independent variables, and 57 members were missing data for one or more independent variables). In addition, 3 members originally reported in this age stratification were removed from the sample and added to either the 25-6 year or 12-19 year age stratification for the analysis because the birth date CHPR extracted from the Data Warehouse indicated that the member belonged in those age groups.

<sup>18</sup> 386 members, or 0.6% of the original sample reported to MassHealth and NCQA, were removed from the analysis. 2 members were removed due to no RHN, 17 members were removed because their RHN already appeared in a plan's data, 140 members had no eligibility data available for any of the independent variables, and 227 members were missing data for one or more independent variables). In addition, 2 members originally reported in the 12-25 month age stratification were removed from that age stratification and added to the 25 month-6 year stratification for the analysis because the birth date CHPR extracted from the Data Warehouse indicated that the member belonged in the 25 month-6 year age group.

<sup>19</sup> 172 members, or 0.4% of the original sample reported to MassHealth and NCQA were removed from the analysis. 1 member was removed due to no RHN, 7 members were removed because their RHN already appeared in a plan's data, 17 members had no eligibility data available for any of the independent variables, and 147 members were missing data for one or more independent variables).

<sup>20</sup> 186 members, or 0.3% of the original sample reported to MassHealth and NCQA were removed from the analysis. 1 member was removed due to no RHN, 4 members were removed because their RHN already appeared in a plan's data, 11 members had no eligibility data available for any of the independent variables, and 170 members were missing data for one or more independent variables). In addition, 1 members originally reported in the 12-25 month age stratification was removed from that age stratification and added to the 12-19 year stratification for the analysis because the birth date CHPR extracted from the Data Warehouse indicated that the member belonged in the 12-19 year age group.

**Independent variables:**

- MassHealth plan
- Type of primary care provider
- Member's gender
- Member's overall illness burden (CDPS score)
- Member's co-occurring substance abuse (7-11 year and 12-19 year age stratifications only)
- Member's disability (7-11 year and 12-19 year age stratifications only)
- Member served by Department of Mental Health (DMH) (7-11 year and 12-19 year age stratifications only)
- Member's geographical region

**Dependent variable:**

- At least one visit with any primary care practitioner during 2005<sup>21</sup>

**Characteristics of sample used for analysis:**

	<b>Ages 12-24M</b>	<b>Ages 25M-6Y</b>	<b>Ages 7-11Y</b>	<b>Ages 12-19Y</b>
Male	51.3%	51.4%	51.2%	50.6%
Mean CDPS score	1.25	1.00	0.97	1.0
Minimum CDPS score	0.09	0.08	0.11	0.09
Maximum CDPS score	34.55	33.73	18.08	34.62
Co-occurring substance abuse	N/A	N/A	0.1%	1.8%
Disabled	1.4%	3.9%	9.0%	11.8%
Served by DMH	N/A	N/A	0.6%	1.1%

Appendix C includes additional data on the characteristics of the analysis sample.

**Tables 28-31. MassHealth Plan HEDIS 2006, Children and Adolescents' Access to Primary Care Practitioner Rates as Reported to NCQA and MassHealth**

Table 28. Ages 12-24 Months (n=15,650)

<b>Plan</b>	<b>Data Collection Method</b>	<b>Num</b>	<b>Den</b>	<b>Rate</b>	<b>LCL</b>	<b>UCL</b>
<b>PCCP</b>	(A)	3,967	3,981	99.6%	99.5%	99.8%
<b>NHP</b>	(A)	3,322	3,400	97.7%	97.2%	98.2%
<b>NH</b>	(A)	2,518	2,802	89.9%	88.7%	91.0%
<b>FCHP</b>	(A)	239	244	98.0%	96.0%	99.9%
<b>BMCHP</b>	(A)	5,013	5,223	96.0%	95.4%	96.5%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

<sup>21</sup> Any type of visit counts except for inpatient procedures, emergency department visits, specialist visits, and some mental health (MH) and chemical dependency (CD) visits (see *HEDIS 2006 Volume 2: Technical Specifications* for more information on what types of MH and CD visits are excluded).

## Results of the Analysis:

**Table 32. Summary of Multiple Logistic Regression Model Predicting Children’s Access to Primary Care Practitioners, 12-24 Month Age Group (n=15,513)**

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	0.23 (0.13-0.41) *
NH	PCC Plan	0.02 (0.01-0.03) *
FCHP	PCC Plan	0.02 (0.01-0.07) *
BMCHP	PCC Plan	0.07 (0.04-0.13) *
Provider type		
Group practice	Other provider	1.64 (1.34-2.01) *
Individual physician	Other provider	0.52 (0.30-0.90) *
Gender		
Male	Female	1.07 (0.90-1.28)
CDPS score		
0.5-1.0	< 0.5	3.58 (0.92-13.85)
>1.0	< 0.5	9.49 (2.46-36.65) *
Disabled		
Yes	No	0.78 (0.31-2.01) *
Geographical region		
Western	Boston	10.75 (7.67-15.07) *
Central	Boston	21.01 (14.13-31.23) *
Northeast	Boston	7.42 (5.58-9.86) *
Metrowest	Boston	4.93 (3.45-7.04) *
Southeast	Boston	4.68 (3.33-6.56) *

\* p<.05

### Summary of Results:

- The PCC Plan’s unadjusted rate for the 12-24 month Access to Primary Care Practitioners measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly higher than the unadjusted rates for BMCHP, NH and NHP. These differences remained significant after CHPR adjusted for type of primary care provider, member’s gender, CDPS score, disability, and geographical region (p<.05). In addition, PCC Plan members had increased odds of having at least one visit with a primary care practitioner during 2005 compared to FCHP members (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had a significant effect on whether members 12-24 months of age had at least one visit with a primary care practitioner during 2005 after adjusting for health plan, member’s gender, CDPS score, disability, and geographical region. Members assigned to primary care group practices had a 1.64 times increase in the odds of having at least one visit to a primary care practitioner compared to “other” types of primary care providers (p<.05). Members assigned to individual primary care providers had a statistically significant *decrease* in the odds of having at least one visit to a primary care practitioner during 2005 than members assigned to “other” types of primary care providers (p<.05).
- The member characteristics associated with a statistically significant increase or decrease in the odds that members aged 12-24 months had at least one visit with a

primary care practitioner during 2005 were CDPS score, disability, and geographical region.

- Higher CDPS score (i.e., higher overall illness burden) had a significant effect on the dependent variable. Members aged 12-24 months with CDPS scores >1.0 had a 9.49 times increase in the odds of having at least one visit with a primary care practitioner during 2005 ( $p < .05$ ). Members aged 12-24 months with CDPS scores 0.5-1.0 had a 3.58 times increase in the odds of having at least one visit with a primary care practitioner during 2005, but this result was not statistically significant.
  - Disability was associated with a *decrease* in the odds that members aged 12-24 months had at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
  - Residing in a region other than Boston was associated with a statistically significant increase in the odds that members aged 12-24 months had at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
- Gender had no significant effect on whether members aged 12-24 months had at least one visit with a primary care practitioner during 2005.

Table 29. Ages 25 Months-6 Years (n=61,070)

Plan	Data Collection Method	Num	Den	Rate	LCL	UCL
PCCP	(A)	17,746	17,972	98.7%	98.6%	98.9%
NHP	(A)	12,263	13,163	93.2%	92.7%	93.6%
NH	(A)	8,238	9,389	87.7%	87.1%	88.4%
FCHP	(A)	882	939	93.9%	92.3%	95.5%
BMCHP	(A)	17,869	19,607	91.1%	90.7%	91.5%

Source: *MassHealth Managed Care HEDIS 2006 Report*

Key: (H)=hybrid method, (A)=administrative method

Table 30. Summary of Multiple Logistic Regression Model Predicting Children’s Access to Primary Care Practitioners, 25 Month-6 Year Age Group (n=60,686)

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	0.28 (0.24-0.32) *
NH	PCC Plan	0.08 (0.07-0.09) *
FCHP	PCC Plan	0.09 (0.07-0.13) *
BMCHP	PCC Plan	0.10 (0.09-0.12) *
Provider type		
Group practice	Other provider	2.04 (1.89-2.20) *
Individual physician	Other provider	1.28 (1.01-1.62) *
Gender		
Male	Female	0.82 (0.76-0.89) *
CDPS score		
0.5-1.0	< 0.5	1.47 (1.34-1.62) *
>1.0	< 0.5	4.39 (3.91-4.93) *
Disabled		
Yes	No	1.47 (1.19-1.83) *
Geographical region		
Western	Boston	3.32 (2.96-3.72) *
Central	Boston	3.11 (2.70-3.59) *
Northeast	Boston	2.35 (2.10-2.63) *
Metrowest	Boston	1.94 (1.69-2.22) *
Southeast	Boston	2.91 (2.57-3.29) *

\* p<.05

### Summary of Results:

- The PCC Plan’s unadjusted rate for the 25 month-6 year Access to Primary Care Practitioners measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly higher than the rates for all four MCO. These differences remained significant after CHPR adjusted the results for type of primary care provider, member’s gender, CDPS score, disability, and geographical region (p<.05).
- The type of primary care provider assigned to the member as of 12/31/05 had a significant effect on whether members 25 months-6years of age had at least one visit

with a primary care practitioner during 2005 after adjusting for health plan, gender, CDPS score, disability, geographical region. Members aged 25 months-6 years assigned to primary care group practices had a 2.04 times increase in the odds of having at least one visit to a primary care practitioner compared to “other” types of primary care providers ( $p < .05$ ). Members aged 25 months-6 years assigned to individual primary care providers had a 1.28 times increase in the odds of having at least one visit to a primary care practitioner during 2005 than members assigned to “other” types of primary care providers ( $p < .05$ ).

- The member characteristics associated with a statistically significant increase or decrease in the odds that members aged 25 months-6 years had at least one visit with a primary care practitioner during 2005 were gender, CDPS score, disability, and geographical region:
  - For members aged 25 months-6 years, being male was associated with a statistically significant *decrease* in the odds of receiving at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
  - Higher CDPS score (i.e., higher overall illness burden) had a significant effect on the dependent variable. Members aged 25 months-6 years with CDPS scores 0.5-1.0 had a 1.47 times increase in the odds of having at least one visit with a primary care practitioner during 2005 ( $p < .05$ ). Members aged 25 months-6 years with CDPS scores  $>1.0$  had a 4.39 times increase in the odds of having at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
  - Disability was associated with a 1.47 times increase in the odds that members aged 25 months-6 years had at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
  - Residing in a region other than Boston was associated with a statistically significant increase in the odds that members aged 25 months-6 years had at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).

Table 31. Ages 7-11 Years (n=38,647)

Plan	Data Collection Method	Num	Den	Rate	LCL	UCL
PCCP	(A)	14,834	15,161	97.8%	97.6%	98.1%
NHP	(A)	7,552	7,897	95.6%	95.2%	96.1%
NH	(A)	3,857	4,161	92.7%	91.9%	93.5%
FCHP	(A)	617	632	97.6%	96.4%	98.9%
BMCHP	(A)	10,085	10,796	93.4%	92.9%	93.9%

Source: *MassHealth Managed Care HEDIS 2006 Report*  
 Key: (H)=hybrid method, (A)=administrative method

Table 32. Summary of Multiple Logistic Regression Model Predicting Children’s Access to Primary Care Practitioners, 7-11 Year Age Group (n=38,475)

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	0.81 (0.69-0.96) *
NH	PCC Plan	0.28 (0.23-0.34) *
FCHP	PCC Plan	0.64 (0.37-1.11)
BMCHP	PCC Plan	0.20 (0.17-0.23) *
Provider type		
Group practice	Other provider	2.73 (2.42-3.07) **
Individual physician	Other provider	1.54 (1.14-2.08) **
Gender		
Male	Female	0.95 (0.86-1.05)
CDPS score		
0.5-1.0	< 0.5	3.53 (2.54-4.90) **
>1.0	< 0.5	3.20 (2.78-3.68) **
Co-occurring substance abuse		
Yes	No	0.28 (0.08-0.97) **
Disabled		
Yes	No	1.16 (0.93-1.44)
Served by DMH		
Yes	No	0.84 (0.34-2.10)
Geographical region		
Western	Boston	3.53 (2.96-4.20) **
Central	Boston	1.48 (1.20-1.82) **
Northeast	Boston	1.83 (1.55-2.17) **
Metrowest	Boston	1.68 (1.36-2.06) **
Southeast	Boston	2.20 (1.84-2.64) **

\*p<.01; \*\* p<.05

**Summary of Results:**

- The PCC Plan’s adjusted rate for the 7-11 year Access to Primary Care Practitioners measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly higher than the rates for BMCHP, NH and NHP. These differences remained significant after CHPR adjusted the results for type of primary care provider,

member's gender, CDPS score, co-occurring substance abuse, disability, participation with DMH and geographical region ( $p < .05$ ).

- The type of primary care provider assigned to the member as of 12/31/05 had a significant effect on whether members 7-11 years of age had at least one visit with a primary care practitioner during 2005 after adjusting for health plan, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region. Members aged 7-11 years assigned to primary care group practices had a 2.73 times increase in the odds of having at least one visit to a primary care practitioner during 2005 compared to "other" types of primary care providers ( $p < .05$ ). Members aged 7-11 years assigned to individual primary care providers had a 1.54 times increase in the odds of having at least one visit to a primary care practitioner during 2005 compared to "other" types of primary care providers ( $p < .05$ ).
- The member characteristics associated with a statistically significant increase or decrease in the odds that members aged 7-11 years had at least one visit with a primary care practitioner during 2005 were CDPS score, co-occurring substance abuse, and geographical region.
  - A higher CDPS score (i.e., higher overall illness burden) was associated with a statistically significant increase in the odds of having at least one visit with a primary care practitioner during 2005. Members aged 7-11 years with CDPS scores 0.5-1.0 had a 3.53 times increase in the odds and members aged 7-11 years with CDPS scores  $>1.0$  had a 3.20 increase in the odds of having at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
  - Co-occurring substance abuse was associated with statistically significant *decrease* in the odds that members aged 7-11 years had at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
  - Residing in a region other than Boston was associated with a statistically significant increase in the odds of having at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
- Gender, disability and participation with DMH had no significant effect on whether members aged 7-11 had at least one visit with a primary care practitioner during 2005.

Table 33. Ages 12-19 Years (n=57,274)

Plan	Data Collection Method	Num	Den	Rate	LCL	UCL
PCCP	(A)	24,520	25,546	96.0%	95.7%	96.2%
NHP	(A)	10,774	11,491	93.8%	93.3%	94.2%
NH	(A)	4,928	5,418	91.0%	90.2%	91.7%
FCHP	(A)	847	882	96.0%	94.7%	97.4%
BMCHP	(A)	12,625	13,937	90.6%	90.1%	91.1%

Source: *MassHealth Managed Care HEDIS 2006 Report*  
 Key: (H)=hybrid method, (A)=administrative method

Table 34. Summary of Multiple Logistic Regression Model Predicting Children’s Access to Primary Care Practitioners, 12-19 Year Age Group (n=57,089)

Variable	Comparison group	Odds ratio (95% CI)
Plan		
NHP	PCC Plan	0.83 (0.74-0.93) *
NH	PCC Plan	0.42 (0.37-0.47) *
FCHP	PCC Plan	0.83 (0.58-1.20)
BMCHP	PCC Plan	0.29 (0.26-0.32) *
Provider type		
Group practice	Other provider	1.91 (1.76-2.07) **
Individual physician	Other provider	1.15 (0.97-1.37)
Gender		
Male	Female	0.69 (0.64-0.74) **
CDPS score		
0.5-1.0	< 0.5	1.04 (0.97-1.13)
>1.0	< 0.5	3.03 (2.70-3.41) **
Co-occurring substance abuse		
Yes	No	1.02 (0.72-1.43)
Disabled		
Yes	No	1.18 (1.04-1.34) **
Served by DMH		
Yes	No	1.37 (0.85-2.22)
Geographical region		
Western	Boston	2.06 (1.82-2.32) **
Central	Boston	1.20 (1.04-1.39) **
Northeast	Boston	1.39 (1.24-1.56) **
Metrowest	Boston	1.43 (1.24-1.66) **
Southeast	Boston	1.46 (1.29-1.64) **

\*p<.01; \*\* p<.05

**Summary of results:**

- The PCC Plan’s unadjusted rate for the 12-19 year Access to Primary Care Practitioners measure, as reported in the *MassHealth Managed Care HEDIS 2006 Report*, was significantly higher than the unadjusted rates for BMCHP, NH and NHP. These differences remained after CHPR adjusted the results for type of primary care provider,

member's gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region ( $p < .05$ ).

- The type of primary care provider assigned to the member as of 12/31/05 had a significant effect on whether members 12-19 years of age had at least one visit with a primary care practitioner during 2005 after adjusting for health plan, gender, CDPS score, co-occurring substance abuse, disability, participation with DMH, and geographical region. Members aged 12-19 years assigned to primary care group practices had a 1.91 times increase in the odds of having at least one visit to a primary care practitioner during 2005 compared to "other" types of primary care providers ( $p < .05$ ). Members aged 12-19 years assigned to individual primary care providers had a 1.15 times increase in the odds of having at least one visit to a primary care practitioner during 2005 compared to "other" types of primary care providers, but this result was not statistically significant.
- The member characteristics associated with a statistically significant increase or decrease in the odds that members aged 12-19 years had at least one visit with a primary care practitioner during 2005 were gender, CDPS score, disability, and geographical region:
  - Male members aged 12-19 years had a statistically significant *decrease* in the odds of having at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
  - Members aged 12-19 years with CDPS scores  $> 1.0$  had a 3.03 times increase in the odds of having at least one visit with a primary care practitioner during 2005 ( $p < .05$ ). Members aged 12-19 years with CDPS scores between 0.5 and 1.0 had a 1.04 times increase in the odds of having at least one visit with a primary care practitioner during 2005, but this result was not statistically significant.
  - Disability was associated with statistically significant increase in the odds that members aged 12-19 years had at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
  - Residing in a region other than Boston was associated with a statistically significant increase in the odds of having at least one visit with a primary care practitioner during 2005 ( $p < .05$ ).
- Co-occurring substance abuse and participation with DMH had no significant effect on whether members aged 12-19 had at least one visit with a primary care practitioner during 2005.

### Interpretation of Analysis:

In general, higher CDPS score was associated with an increase in the odds that members aged 12 months to 19 years received at least one visit with a primary care practitioner in 2005. As noted for other measures, it is logical that a member with a higher overall illness burden would have more contacts with the health care system and, by proxy, more opportunities to have at least one visit during the measurement year coded as an ambulatory or preventive care visit.

Disability had a significant effect on the dependent variable for all but one age group (7-11 years). For the 12-24 month age group, disability was associated with a *decrease* in the odds of receiving at least one visit with a primary care practitioner in 2005 whereas disability was associated with an increase in odds for the 25 month-6 year and 12-19 year age groups. More

analysis needs to be conducted to understand the differences in direction of the effect for these age groups.

Geographical region other than Boston was associated with a statistically significant increase in the odds of receiving at least one visit with a primary care practitioner during 2005 for all age groups. CHPR is unable to explain the large magnitude of this effect for the 12-24 month age group (odds ratios ranged from 4.68 for the Southeast region to 21.01 for the Central region). More analysis needs to be conducted to understand the influence of geographical region on this measure and to determine why members residing in Boston had the lowest odds, across all age groups, of having at least one visit with a primary care practitioner during 2005.

Gender was a significant predictor of access to primary care practitioner rates for only the 25 month-6 year and 12-19 year groups, where being male was associated with a *decrease* in the odds of receiving at least one visit with a primary care practitioner during 2005. The influence of gender on the 25 month-6 year age group is perplexing since children of that age are highly dependent on parent and caregivers with regard to accessing the health care system, and there is no reason to believe that parents and caregivers access primary care differently for female children compared to male children. In contrast, it is conceivable that adolescents aged 12-19 have more influence on how they access the health care system and parent and caregiver characteristics would have less effect. CHPR cannot analyze this issue further without the ability to match members to parent and caregiver characteristics available through the MassHealth Data Warehouse.

Substance abuse was evaluated for only the 7-11 and 12-19 year groups. Co-occurring substance abuse was a significant predictor of access to primary care practitioner rates for the 7-11 year group, but not the 12-19 year group. This result appears to be counter-intuitive.

### **Recommendations for Future Analyses of this Measure:**

- Identify additional provider level variables to analyze the impact that providers have on access to primary care practitioner rates and to identify potential barriers to care.
- Conduct additional analyses to understand effect of disability on access to primary care providers for children aged 12-24 months compared to members aged 25 months-6 years . For example, is this an artifact of coding or some other issue (e.g., do children aged 12-24 have contacts with the health care system that are coded in a way that are captured less frequently by this measure than children ages 25 months-6 years)?
- Conduct additional analyses on the effect of geographical region, including an examination of confounding variables that may have led to the large effect of geographical region for the 12-24 month age group.
- Incorporate parent and caregiver-level variables to understand differences in access for males compared to females for the 25 month-6 year and 12-19 year age groups as well as to examine the effect overall that parent and caregiver characteristics have on children and adolescents' access to primary care practitioners.
- Conduct additional analyses to examine the factors that lead to substance abuse predicting access to primary care providers.

## References

Hyatt RR and Allen SM. (2005). Disability as a Family Affair: Parental Disability and Childhood Immunization. *Medical Care*,43(6):600-606.

Jhanjee I, Saxeena D, Arora J and Gjerdingen DK. (2004.) Parents' Health and Demographic Characteristics Predict Noncompliance with Well-Child Visits. *Journal of the American Board of Family Practice*, 17(5):324-331.

Kronick R, Gilmer T, Dreyfus T, Lee L. (2000.) Improving health-based payment for Medicaid beneficiaries: CDPS. *Health Care Financing Review*, 21(3):29-64.

Kronick R, GilmerTP, Dreyfus T and Ganiats TG. CDPS-Medicare: The Chronicl Illness and Disability Payment System Modified to Predict Expenditures for Medicare Beneficiaries. Final Report to CMS, June 24, 2002.

## APPENDIX A:

### Hierarchy Used to Assign a Single Provider Type to MCO Providers with Multiple Provider Types Associated with their Federal Tax ID

1. Group practice (97)
2. Community health center (CHC) (20)
3. Hospital licensed health center (81)
4. Acute outpatient hospital (80)
5. Acute inpatient hospital (70)
6. Chronic inpatient hospital (71)
7. Semi-acute outpatient hospital (75)
8. Semi-acute inpatient hospital (74)
9. Physician (1)
10. Nurse practitioner (17)
11. Psychologist (5)
12. Nurse (61)
13. Psychiatric Inpatient hospital (72)
14. Inpatient psych (73)
15. Chronic outpatient hospital (82)
16. Psychiatric outpatient hospital (83)
17. Ambulatory surgery center (84)
18. Indian Health Services (91)
19. Rehabilitation clinic (24)
20. Renal dialysis center (25)
21. Mental health clinic (26)

## APPENDIX B:

### Algorithm to Identify Co-Occurring Substance Abuse

Data source: TRAPS claims data (invoice 1, 3, 5, 6, 9) and MBHP & MCO data updated on Oct06 were used.

Time period: 01/01/05-12/31/05.

Members who met at least one of the following criteria were identified as having a co-occurring substance abuse diagnosis:

1. At least one diagnosis with an ICD-9 diagnoses code that started as '291', '303', '3050', '5353', '5710', '5711', '5712', '5713', '292', '304', '3052', '3053', '3054', '3055', '3056', '3057', '3058', '3059', '6483' on any inpatient, outpatient, physician or medical services claim.
2. At least one surgical procedure with an ICD-9 procedure code that started as '9445', '9446', '9453', '9454', '9461', '9462', '9463', '9464', '9465', '9466', '9467', '9468', '9469' on any inpatient, outpatient, physician or medical services claim.
3. At least one claim with an HCPCS code as 'H0005', 'H0006', 'H0007', 'H0008', 'H0009', 'H0010', 'H0011', 'H0012', 'H0013', 'H0014', 'H0015', 'H0016', 'H0017', 'H0020', 'H0021', 'H0021', 'H0022', 'H0023', 'H0030', 'H0047', 'H2034', 'H2035', 'H2036', 'S9475', 'T1006', 'T1007', 'T1008', 'T1009', 'T1010', 'T1011', 'T1012', 'X2197', 'X2198', 'X2199', 'X2200', 'X2202', 'X2203', 'X2205', 'X2214', 'X2215', 'X2216', 'X2217', 'X2218', 'X2219', 'X2222', 'X2223', 'X2224', 'X2225', 'X2226', 'X2227', 'X2228', 'X2229', 'X5604', 'X5605', 'X5606', 'X5607', 'ZZ116', 'ZZ126', 'ZZ136', 'ZZ146', 'ZZ156', 'ZZ944', 'ZZ945' on any inpatient, outpatient, physician or medical services claim.
4. At least one of the following medications: Disulfiram (antabuse), Naltrexone (Revia), Acamprostate.

## **APPENDIX C:**

Characteristics of Each Measure's Sample, Total and By Plan

**Table 36. Characteristics of Childhood Immunization Status Sample, Total and by Plan (n=1,818)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	<u>n</u>	<u>(%)</u>	<u>n</u>	<u>(%)</u>	<u>n</u>	<u>(%)</u>	<u>n</u>	<u>(%)</u>	<u>n</u>	<u>(%)</u>	<u>n</u>	<u>(%)</u>
PCP provider type												
Group practice	304	(75.1)	188	(99.5)	205	(50.4)	155	(37.9)	225	(55.2)	1077	(59.2)
Individual physician	2	(0.5)	0	(0.0)	8	(2.0)	0	(0.0)	40	(9.8)	50	(2.8)
Other	99	(24.4)	1	(0.5)	194	(47.7)	254	(62.1)	143	(35.1)	691	(38.0)
Gender												
Male	208	(50.6)	107	(56.6)	216	(53.1)	220	(53.8)	213	(52.2)	961	(52.9)
CDPS score												
< 0.5	132	(32.6)	67	(35.5)	128	(31.5)	147	(35.9)	152	(37.3)	626	(34.4)
0.5 – 1.0	149	(36.8)	59	(31.2)	148	(36.4)	130	(31.8)	146	(35.8)	632	(34.8)
> 1.0	124	(30.6)	63	(33.3)	131	(32.2)	132	(32.3)	110	(27.0)	260	(30.8)
Disabled	5	(1.2)	7	(3.7)	7	(1.7)	2	(0.5)	15	(3.7)	36	(1.2)
Geographical region												
Greater Boston	68	(16.8)	0	(0.0)	38	(9.3)	145	(35.5)	43	(10.5)	294	(16.2)
West	213	(52.6)	1	(0.5)	27	(6.6)	5	(1.2)	30	(7.4)	276	(15.2)
Central	2	(0.5)	179	(94.7)	181	(44.5)	19	(4.7)	51	(12.5)	432	(23.8)
Northeast	7	(1.7)	1	(0.5)	131	(32.2)	133	(32.5)	101	(24.8)	373	(20.5)
Metrowest	8	(2.0)	6	(3.2)	28	(6.9)	66	(16.1)	84	(20.6)	192	(10.6)
Southeast	107	(26.4)	2	(1.1)	2	(0.8)	41	(10.0)	99	(24.3)	251	(13.8)

**Table 37. Characteristics of AIS Sample, Total and by Plan (n=1,770)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	297	(72.8)	188	(99.0)	241	(59.2)	101	(28.2)	223	(54.8)	1,050	(59.3)
Individual physician	5	(1.2)	0	(0.0)	14	(3.4)	0	(0.0)	29	(7.1)	48	(2.7)
Other	106	(26.0)	2	(1.1)	152	(37.4)	257	(71.8)	155	(38.1)	672	(38.0)
Gender												
Male	195	(47.8)	91	(47.9)	192	(47.2)	182	(51.1)	211	(51.9)	872	(49.3)
CDPS score												
< 0.5	182	(44.6)	94	(49.5)	232	(57.0)	188	(52.5)	191	(46.9)	887	(50.1)
0.5 – 1.0	90	(22.1)	45	(23.7)	73	(17.9)	69	(19.3)	75	(18.4)	352	(19.9)
> 1.0	136	(33.3)	51	(26.8)	102	(25.1)	101	(28.2)	141	(34.6)	531	(30.0)
Co-occurring substance abuse												
Disabled	21	(5.2)	11	(5.8)	16	(3.9)	6	(1.7)	53	(13.0)	107	(6.1)
Served by DMH	3	(0.7)	1	(0.5)	2	(0.5)	3	(0.8)	4	(1.0)	13	(0.7)
Geographical region												
Greater Boston	60	(14.7)	0	(0.0)	22	(5.4)	122	(34.1)	55	(13.5)	259	(14.6)
West	224	(54.9)	2	(1.1)	29	(7.1)	9	(2.5)	46	(11.3)	310	(17.5)
Central	1	(0.3)	179	(94.2)	163	(40.1)	25	(7.0)	29	(7.1)	397	(22.4)
Northeast	7	(1.7)	0	(0.0)	160	(39.3)	121	(33.8)	115	(28.3)	403	(22.8)
Metrowest	7	(1.7)	9	(4.7)	33	(8.1)	36	(10.1)	69	(17.0)	154	(8.7)
Southeast	109	(26.7)	0	(0.0)	0	(0.0)	45	(12.6)	93	(22.9)	247	(14.0)

**Table 38. Characteristics of Well Child Visits in the First 15 Months Sample, Total and by Plan (n=1,551)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	327	(80.5)	181	(100.0)	220	(53.9)	120	(40.5)	150	(57.7)	998	(64.4)
Individual physician	8	(1.2)	0	(0.0)	17	(4.2)	0	(0.0)	24	(9.2)	49	(3.2)
Other	71	(17.5)	0	(0.0)	171	(41.9)	176	(59.5)	86	(33.1)	504	(32.5)
Gender												
Male	210	(51.7)	98	(54.1)	219	(53.7)	153	(51.7)	124	(47.7)	804	(51.8)
CDPS score												
< 0.5	131	(32.3)	64	(35.4)	127	(31.1)	97	(32.8)	95	(36.5)	514	(33.1)
0.5 – 1.0	135	(33.3)	61	(33.7)	132	(32.4)	102	(34.5)	86	(33.1)	516	(33.3)
> 1.0	140	(34.5)	56	(30.9)	149	(36.5)	97	(32.8)	79	(30.4)	521	(33.6)
Disabled	9	(2.2)	0	(0.0)	5	(1.2)	2	(0.7)	4	(1.5)	20	(1.3)
Geographical region												
Greater Boston	48	(11.8)	0	(0.0)	39	(9.6)	98	(33.1)	24	(9.2)	209	(13.5)
West	235	(57.9)	4	(2.2)	24	(5.9)	2	(0.7)	16	(6.2)	281	(18.1)
Central	2	(0.5)	169	(93.4)	188	(46.1)	20	(6.8)	33	(12.7)	412	(26.6)
Northeast	2	(0.5)	2	(1.1)	129	(31.6)	90	(30.4)	53	(20.4)	276	(17.8)
Metrowest	15	(3.7)	4	(2.2)	26	(6.4)	44	(14.9)	54	(20.8)	143	(9.2)
Southeast	103	(25.4)	2	(1.1)	1	(0.3)	41	(13.9)	75	(28.9)	222	(14.3)

**Table 39. Characteristics of Well Child Visits in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> Years of Life Sample, Total and by Plan (n=1,999)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	326	(79.9)	749	(98.7)	227	(66.0)	85	(32.9)	148	(64.6)	1,535	(76.8)
Individual physician	7	(1.7)	0	(0.0)	10	(2.7)	0	(0.0)	29	(12.7)	46	(2.3)
Other	75	(18.4)	10	(1.3)	107	(31.1)	174	(67.2)	52	(22.7)	418	(20.9)
Gender												
Male	223	(54.7)	346	(49.5)	174	(50.6)	132	(51.0)	131	(57.2)	1,036	(51.8)
CDPS score												
< 0.5	80	(19.6)	159	(21.0)	68	(19.8)	47	(18.2)	37	(16.2)	391	(19.6)
0.5 – 1.0	198	(48.5)	307	(40.5)	150	(43.6)	127	(49.0)	106	(46.3)	888	(44.4)
> 1.0	130	(31.9)	293	(38.6)	126	(36.6)	85	(28.2)	86	(37.6)	720	(36.0)
Disabled	13	(3.2)	24	(3.2)	14	(4.1)	3	(1.2)	19	(8.3)	73	(3.7)
Geographical region												
Greater Boston	49	(12.0)	1	(0.1)	23	(6.7)	82	(31.7)	24	(10.5)	179	(9.0)
West	237	(58.1)	3	(0.4)	28	(8.1)	5	(1.9)	15	(6.6)	288	(14.4)
Central	1	(0.3)	738	(97.2)	147	(42.7)	19	(7.3)	23	(10.0)	928	(46.4)
Northeast	2	(0.5)	2	(0.3)	115	(33.4)	78	(30.1)	59	(25.8)	266	(12.8)
Metrowest	11	(2.7)	15	(2.0)	29	(8.4)	42	(16.2)	49	(21.4)	146	(7.3)
Southeast	108	(26.5)	0	(0.0)	2	(0.6)	33	(12.7)	59	(25.8)	202	(10.1)

**Table 40. Characteristics of Adolescent Well-Care Sample, Total and by Plan (n=2,917)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	310	(75.6)	1,269	(97.2)	247	(60.4)	121	(29.9)	236	(61.0)	2,183	(74.8)
Individual physician	6	(1.5)	0	(0.0)	11	(2.7)	1	(0.3)	46	(11.9)	64	(2.2)
Other	94	(22.9)	37	(2.8)	151	(36.9)	283	(69.9)	105	(27.1)	670	(23.0)
Gender												
Male	185	(45.1)	614	(47.0)	191	(46.7)	174	(43.0)	204	(52.7)	1,368	(46.9)
CDPS score												
< 0.5	127	(31.0)	414	(31.7)	108	(26.4)	120	(29.6)	134	(34.6)	903	(31.0)
0.5 – 1.0	165	(40.2)	553	(42.3)	181	(44.3)	178	(44.0)	137	(35.4)	1,214	(41.6)
> 1.0	118	(28.8)	339	(26.0)	120	(29.3)	107	(26.4)	116	(30.0)	800	(27.4)
Co-occurring substance abuse												
Disabled	33	(8.1)	88	(6.7)	18	(4.4)	5	(1.2)	85	(22.0)	229	(7.9)
Served by DMH	3	(0.7)	7	(0.5)	1	(0.2)	1	(0.3)	11	(2.8)	23	(0.8)
Geographical region												
Greater Boston	54	(13.2)	2	(0.2)	25	(6.1)	146	(36.1)	63	(16.3)	290	(9.9)
West	238	(58.1)	12	(1.0)	24	(5.9)	8	(2.0)	47	(12.1)	329	(11.3)
Central	1	(0.2)	1,244	(95.3)	159	(38.9)	34	(8.4)	44	(11.4)	1,482	(50.8)
Northeast	4	(1.0)	1	(0.1)	176	(43.0)	118	(29.1)	103	(26.6)	402	(13.8)
Metrowest	7	(1.7)	47	(3.6)	25	(6.1)	56	(13.8)	51	(13.2)	186	(6.4)
Southeast	106	(25.9)	0	(0.0)	0	(0.0)	43	(10.6)	79	(20.4)	228	(7.9)

**Table 41. Characteristics of Children’s Access to Primary Care Providers Sample, Ages 12-24 Months, Total and by Plan (n=15,513)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	3,962	(76.9)	239	(99.2)	1,362	(49.0)	1,289	(38.2)	2,531	(63.9)	9,383	(60.5)
Individual physician	115	(2.2)	0	(0.0)	53	(1.9)	5	(0.2)	432	(10.9)	605	(3.9)
Other	1,077	(20.9)	2	(0.8)	1,367	(49.1)	2,080	(61.7)	999	(25.2)	5,525	(35.6)
Gender												
Male	2,634	(51.1)	121	(50.2)	1,385	(49.8)	1,766	(52.3)	2,056	(51.9)	7,962	(51.3)
CDPS score												
< 0.5	8	(0.2)	2	(0.8)	7	(0.3)	3	(0.1)	13	(0.3)	33	(0.2)
0.5 – 1.0	2,690	(52.2)	129	(53.5)	1,507	(54.2)	1,877	(55.6)	2,301	(58.1)	8,504	(54.8)
> 1.0	2,456	(47.7)	110	(46.6)	1,268	(45.6)	1,494	(44.3)	1,648	(41.6)	6,976	(45.0)
Disabled	87	(1.7)	0	(0.0)	34	(1.2)	12	(0.4)	86	(2.2)	219	(1.4)
Geographical region												
Greater Boston	814	(15.8)	0	(0.0)	244	(8.8)	1,094	(32.4)	512	(12.9)	2,664	(17.2)
West	2,641	(51.2)	3	(1.2)	22	(8.0)	21	(0.6)	223	(5.6)	3,110	(20.1)
Central	16	(0.3)	231	(95.9)	1,079	(38.8)	180	(5.3)	422	(10.7)	1,928	(12.4)
Northeast	58	(1.1)	3	(1.2)	994	(35.7)	1,196	(35.5)	1,078	(27.2)	3,329	(21.5)
Metrowest	143	(2.8)	3	(1.2)	230	(8.3)	509	(15.1)	850	(21.5)	1,735	(11.2)
Southeast	1,482	(28.8)	1	(0.4)	13	(0.5)	374	(11.1)	877	(22.1)	2,747	(17.7)

**Table 42. Characteristics of Children’s Access to Primary Care Providers Sample, Ages 25 Months-6 Years, Total and by Plan (n=60,686)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	14,699	(75.7)	918	(98.6)	5,425	(58.2)	4,425	(33.8)	11,516	(64.4)	36,983	(60.9)
Individual physician	356	(1.8)	0	(0.0)	176	(1.9)	8	(0.1)	1,865	(10.4)	2,405	(4.0)
Other	4,376	(22.5)	13	(1.4)	3,725	(39.9)	8,670	(66.2)	4,514	(25.2)	21,298	(35.1)
Gender												
Male	9,884	(50.9)	467	(50.2)	4,808	(51.6)	6,709	(51.2)	9,336	(52.2)	31,204	(51.4)
CDPS score												
< 0.5	3,107	(16.0)	159	(17.1)	1,453	(15.6)	2,221	(17.0)	3,217	(18.0)	10,157	(16.7)
0.5 – 1.0	9,319	(48.0)	403	(43.3)	4,648	(49.8)	6,462	(49.3)	8,480	(47.4)	29,312	(48.3)
> 1.0	7,005	(36.1)	369	(39.6)	3,225	(34.6)	4,420	(33.7)	6,198	(34.6)	21,217	(35.0)
Disabled	711	(3.7)	30	(3.2)	249	(2.7)	115	(0.9)	1,279	(7.2)	2,384	(3.9)
Served by DMH												
Geographical region												
Greater Boston	3,027	(15.6)	1	(0.1)	643	(6.9)	4,566	(34.9)	2,470	(13.8)	10,707	(17.6)
West	10,181	(52.4)	4	(0.4)	506	(5.4)	153	(1.2)	1,437	(8.0)	12,281	(20.2)
Central	87	(0.5)	902	(96.9)	3,960	(42.5)	812	(6.2)	1,917	(10.7)	7,678	(12.7)
Northeast	186	(1.0)	2	(0.2)	3,411	(36.6)	4,408	(33.6)	4,799	(26.8)	12,806	(21.1)
Metrowest	472	(2.4)	21	(2.3)	777	(8.3)	1,826	(13.9)	3,464	(19.4)	6,560	(10.8)
Southeast	5,478	(28.2)	1	(0.1)	29	(0.3)	1,338	(10.2)	3,808	(35.7)	10,654	(17.6)

**Table 43. Characteristics of Children’s Access to Primary Care Providers Sample, Ages 7-11 Years, Total and by Plan (n=38,475)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	8,338	(77.5)	607	(97.3)	2,589	(62.5)	2,577	(32.7)	9,341	(62.0)	23,452	(61.0)
Individual physician	140	(1.3)	0	(0.0)	86	(2.1)	3	(<0.1)	1,165	(10.7)	1,844	(4.8)
Other	2,278	(21.2)	17	(2.7)	1,465	(35.4)	5,296	(67.2)	4,123	(27.3)	13,179	(34.3)
Gender												
Male	5,418	(50.4)	309	(49.5)	2,064	(49.9)	3,811	(48.4)	8,085	(53.6)	19,687	(51.2)
CDPS score												
< 0.5	6,626	(61.6)	374	(59.9)	2,496	(60.3)	5,157	(65.5)	8,886	(58.9)	23,539	(61.2)
0.5 – 1.0	629	(5.9)	33	(5.3)	277	(6.7)	342	(4.3)	1,113	(7.4)	2,394	(6.2)
> 1.0	3,501	(32.6)	217	(34.8)	1,367	(33.0)	2,377	(30.2)	5,080	(33.7)	12,542	(32.6)
Co-occurring substance abuse	13	(0.1)	0	(0.0)	4	(0.1)	5	(0.1)	18	(0.1)	40	(0.1)
Disabled	785	(7.3)	44	(7.1)	207	(5.0)	116	(1.5)	2,303	(15.3)	3,455	(9.0)
Served by DMH	48	(0.5)	1	(0.2)	8	(0.2)	17	(0.2)	148	(1.0)	222	(0.6)
Geographical region												
Greater Boston	1,346	(12.5)	2	(0.3)	218	(5.3)	3,010	(38.2)	2,423	(16.1)	6,999	(18.2)
West	6,315	(58.7)	4	(0.6)	214	(5.2)	171	(2.2)	1,775	(11.8)	8,479	(22.0)
Central	46	(0.4)	586	(93.9)	1,934	(46.7)	482	(6.1)	1,471	(9.8)	4,519	(11.8)
Northeast	79	(0.7)	0	(0.0)	1,415	(34.2)	2,360	(30.0)	3,826	(25.4)	7,680	(20.0)
Metrowest	210	(2.0)	31	(5.0)	350	(8.5)	1,024	(13.0)	2,508	(16.6)	4,123	(10.7)
Southeast	2,760	(25.7)	1	(0.2)	9	(0.2)	829	(10.5)	3,076	(20.4)	6,675	(17.4)

**Table 44. Characteristics of Children’s Access to Primary Care Providers Sample, Ages 12-19 Years, Total and by Plan (n=57,259)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	10,499	(75.5)	854	(97.2)	3,212	(59.5)	3,295	(28.8)	15,101	(59.3)	32,961	(57.7)
Individual physician	173	(1.2)	0	(0.0)	126	(2.3)	4	(<0.1)	2,850	(11.2)	3,153	(5.5)
Other	3,235	(23.3)	25	(2.8)	2,064	(38.2)	8,155	(71.2)	7,496	(29.5)	20,975	(36.7)
Gender												
Male	6,803	(48.9)	453	(51.5)	2,688	(49.8)	5,436	(47.5)	13,525	(53.2)	28,905	(50.6)
CDPS score												
< 0.5	4,267	(30.7)	264	(30.0)	1,589	(29.4)	3,344	(29.2)	8,441	(33.2)	17,905	(31.4)
0.5 – 1.0	5,911	(42.5)	387	(44.0)	2,321	(43.0)	5,121	(44.7)	9,876	(38.8)	23,616	(41.4)
> 1.0	3,729	(26.8)	228	(25.9)	1,492	(27.6)	2,989	(26.1)	7,130	(28.0)	15,568	(27.3)
Co-occurring substance abuse	201	(1.6)	15	(1.9)	83	(1.6)	143	(1.4)	538	(2.2)	980	(1.8)
Disabled	1,034	(7.4)	59	(6.7)	307	(5.7)	164	(1.4)	5,183	(20.4)	6,747	(11.8)
Served by DMH	66	(0.5)	4	(0.5)	28	(0.5)	40	(0.4)	488	(1.9)	626	(1.1)
Geographical region												
Greater Boston	1,937	(13.9)	2	(0.2)	300	(5.6)	4,514	(39.4)	4,473	(17.6)	11,226	(19.7)
West	8,126	(58.4)	5	(0.6)	272	(5.0)	332	(2.9)	3,523	(13.8)	12,258	(21.5)
Central	37	(0.3)	839	(95.5)	2,416	(44.7)	760	(6.6)	2,415	(9.5)	6,467	(11.3)
Northeast	99	(0.7)	0	(0.0)	1,928	(35.7)	3,235	(28.2)	6317	(24.8)	11,579	(20.3)
Metrowest	267	(1.9)	33	(3.8)	477	(8.8)	1,497	(13.1)	3,743	(14.7)	6,017	(10.5)
Southeast	3,441	(24.7)	0	(0.0)	9	(0.2)	1,116	(9.7)	4,976	(19.6)	9,542	(16.7)

**Table 45. Characteristics of Comprehensive Diabetes Care Sample, Total and by Plan (n=1,790)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	279	(68.1)	144	(96.6)	173	(42.1)	197	(48.2)	224	(54.5)	1017	(56.8)
Individual physician	4	(1.0)	0	(0.0)	10	(2.4)	0	(0.0)	48	(11.7)	62	(3.5)
Other	127	(31.0)	5	(3.4)	228	(55.5)	212	(51.8)	139	(33.8)	711	(39.7)
Gender												
Male	139	(33.9)	53	(35.6)	139	(33.8)	127	(31.1)	153	(32.2)	611	(34.1)
Age												
18-35 years	57	(13.9)	18	(12.1)	62	(15.1)	54	(13.2)	42	(10.2)	233	(13.0)
36-45 years	93	(22.7)	29	(19.5)	113	(27.5)	149	(36.4)	76	(18.5)	460	(25.7)
46-55 years	151	(36.8)	50	(33.6)	119	(29.0)	145	(35.5)	141	(34.3)	606	(33.9)
56+ years	109	(26.6)	52	(34.9)	117	(28.5)	61	(14.9)	152	(37.0)	491	(27.4)
CDPS score												
< 0.5	33	(8.1)	19	(12.8)	43	(10.5)	28	(6.9)	61	(14.8)	184	(10.3)
0.5 – 1.0	169	(41.2)	72	(48.3)	183	(44.5)	177	(43.3)	170	(41.4)	771	(43.1)
> 1.0	208	(50.7)	58	(38.9)	185	(45.0)	204	(49.9)	180	(43.8)	835	(46.7)
Co-occurring substance abuse	55	(13.4)	11	(7.4)	45	(11.0)	25	(6.1)	44	(10.7)	180	(10.1)
Disabled	270	(65.9)	98	(65.8)	240	(58.4)	85	(20.8)	340	(82.7)	1,033	(57.7)
Served by DMH	9	(2.2)	0	(0.0)	11	(2.7)	3	(0.7)	30	(7.3)	53	(3.0)
Geographical region												
Greater Boston	65	(15.9)	0	(0.0)	26	(6.3)	136	(33.3)	102	(24.8)	329	(18.4)
West	253	(61.7)	1	(0.7)	43	(10.5)	9	(2.2)	44	(10.7)	350	(19.6)
Central	1	(0.2)	141	(94.6)	198	(48.2)	22	(5.4)	48	(11.7)	410	(22.9)
Northeast	5	(1.2)	1	(0.7)	97	(23.6)	126	(30.8)	92	(22.4)	321	(17.9)
Metrowest	8	(2.0)	6	(4.0)	46	(11.2)	68	(16.6)	46	(11.2)	174	(9.7)
Southeast	78	(19.0)	0	(0.0)	1	(0.2)	48	(11.7)	79	(19.2)	206	(11.5)

**Table 46. Characteristics of Use of Appropriate Medications for People with Asthma Sample, Total and by Plan (n=11,909)**

Characteristic	BMCHP		FCHP		NH		NHP		PCCP		TOTAL	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
PCP provider type												
Group practice	1,744	(73.9)	95	(97.9)	514	(49.6)	609	(42.1)	3,958	(56.8)	6,920	(58.1)
Individual physician	26	(1.1)	0	(0.0)	49	(4.7)	0	(0.0)	738	(10.6)	813	(6.8)
Other	591	(25.0)	2	(2.1)	473	(45.7)	837	(57.9)	2,273	(32.6)	4,176	(35.1)
Gender												
Male	909	(38.5)	31	(32.0)	397	(38.3)	573	(39.6)	2,454	(35.2)	4,364	(36.7)
Age												
5-9 years	577	(24.4)	14	(14.4)	219	(21.1)	369	(25.5)	888	(12.7)	2,067	(17.4)
10-17 years	584	(24.7)	23	(23.7)	267	(25.8)	507	(35.1)	1,331	(19.1)	2,712	(22.8)
18-24 years	138	(5.8)	6	(6.2)	84	(8.4)	84	(5.8)	403	(5.8)	715	(6.0)
25-40 years	468	(19.8)	28	(28.9)	218	(21.0)	268	(18.5)	1,259	(18.1)	2,241	(18.8)
41-56 years	594	(25.2)	26	(26.8)	248	(23.9)	218	(15.1)	3,088	(74.0)	4,174	(35.1)
CDPS score												
< 0.5	418	(17.7)	25	(25.8)	189	(18.2)	260	(18.0)	1,474	(21.2)	2,366	(19.9)
0.5 – 1.0	1,116	(47.3)	55	(56.7)	498	(48.1)	755	(52.2)	2,951	(42.3)	5,375	(45.1)
> 1.0	827	(35.0)	17	(17.5)	349	(33.7)	431	(29.8)	2,544	(36.5)	4,168	(35.0)
Co-occurring substance abuse												
Disabled	802	(34.0)	21	(21.7)	331	(32.0)	124	(8.6)	4,187	(60.1)	5,465	(45.9)
Served by DMH	19	(0.8)	0	(0.0)	16	(1.5)	9	(0.6)	323	(4.6)	367	(3.1)
Geographical region												
Greater Boston	354	(15.0)	0	(0.0)	87	(8.4)	602	(41.6)	1,436	(20.6)	2,479	(20.8)
West	1,428	(60.5)	0	(0.0)	54	(5.2)	27	(1.9)	1,016	(14.6)	2,525	(21.2)
Central	3	(0.1)	91	(93.8)	514	(49.6)	85	(5.9)	719	(10.3)	1,412	(11.9)
Northeast	15	(0.6)	0	(0.0)	284	(27.4)	319	(22.1)	1,490	(21.4)	2,108	(17.7)
Metrowest	43	(1.8)	6	(6.2)	96	(9.3)	271	(18.7)	855	(12.3)	1,271	(10.7)
Southeast	518	(21.9)	0	(0.0)	1	(0.1)	142	(9.8)	1,453	(20.9)	2,114	(17.8)

## **APPENDIX D:**

Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables

**Table 47. Childhood Immunization Status, Combination Rate 2  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,818)**

		<u>Odds Ratios</u>					
Variable	Comparison Group	(1)	(2)	(3)	(4)	(5)	(6)
1. Plan							
BMCHP	PCC Plan	2.3*	2.2*	2.2*	2.2*	2.2*	2.8*
FCHP	PCC Plan	2.8*	2.7*	2.8*	2.8*	2.8*	2.2*
NH	PCC Plan	1.5*	1.5*	1.5*	1.5*	1.5*	1.3
NHP	PCC Plan	2.9*	2.9*	2.9*	2.9*	2.9*	3.0*
2. Provider type							
Group practice	Other Provider	—	1.0	1.0	1.0	1.0	1.0
Individual physician	Other Provider	—	0.8	0.8	0.9	0.9	0.9
3. Gender							
Male	Female	—	—	0.9	0.9	0.9	0.9
4. CDPS score							
0.5 – 1.0	<.05	—	—	—	1.9*	1.9*	1.9*
> 1.0	<.05	—	—	—	1.6*	1.6*	1.5*
5. Disabled							
Yes	No	—	—	—	—	0.8	0.8
6. Geographical region							
West	Boston	—	—	—	—	—	1.0
Central	Boston	—	—	—	—	—	1.8*
Northeast	Boston	—	—	—	—	—	1.5*
Metrowest	Boston	—	—	—	—	—	1.5
Southeast	Boston	—	—	—	—	—	1.1

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 48. Childhood Immunization Status, Combination Rate 3  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,824)**

		<u>Odds Ratios</u>					
Variable	Comparison Group	(1)	(2)	(3)	(4)	(5)	(6)
1. Plan							
BMCHP	PCC Plan	1.8*	1.7*	1.7*	1.7*	1.7*	2.2*
FCHP	PCC Plan	2.4*	2.2*	2.2*	2.2*	2.2*	2.3*
NH	PCC Plan	1.5*	1.5*	1.5*	1.5*	1.5	1.5*
NHP	PCC Plan	2.0*	2.1*	2.1*	2.1*	2.1*	2.0*
2. Provider type							
Group practice	Other Provider	—	1.2	1.2	1.2	1.2	1.2
Individual physician	Other Provider	—	0.9	1.0	1.0	1.0	1.0
3. Gender							
Male	Female	—	—	0.9	0.9	0.9	0.9
4. CDPS score							
0.5 – 1.0	<.05	—	—	—	1.7*	1.7*	1.7*
> 1.0	<.05	—	—	—	1.7*	1.7*	1.7*
5. Disabled							
Yes	No	—	—	—	—	1.0	1.1
6. Geographical region							
West	Boston	—	—	—	—	—	0.7
Central	Boston	—	—	—	—	—	1.0
Northeast	Boston	—	—	—	—	—	1.3
Metrowest	Boston	—	—	—	—	—	1.3
Southeast	Boston	—	—	—	—	—	0.9

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 49. Adolescent Immunization Status  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,770)**

		<u>Odds Ratios</u>							
Variable	Comparison Group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Plan									
BMCHP	PCC Plan	3.5*	3.4*	3.4*	3.4*	3.3*	3.3*	3.3*	2.9*
FCHP	PCC Plan	5.4*	5.0*	5.0*	5.1*	5.1*	4.9*	4.9*	4.8*
NH	PCC Plan	1.6*	1.6*	1.6*	1.7*	1.7*	1.6*	1.6*	1.7*
NHP	PCC Plan	2.1*	2.2*	2.2*	2.3*	2.2*	2.2*	2.2*	2.2*
2. Provider type									
Group practice	Other Provider	—	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Individual physician	Other Provider	—	1.1	1.1	1.1	1.1	1.1	1.1	1.1
3. Gender									
Male	Female	—	—	0.9	0.9	0.9	0.9	0.9	0.9
4. CDPS score									
0.5 – 1.0	<.05	—	—	—	1.5*	1.6*	1.6*	1.6*	1.6*
> 1.0	<.05	—	—	—	1.4*	1.4*	1.4*	1.4*	1.4*
5. Co-occurring substance abuse									
Yes	No	—	—	—	—	0.5	0.5	0.5	0.5
6. Disabled									
Yes	No	—	—	—	—	—	0.7	0.7	0.7
7. Served by DMH									
Yes	No	—	—	—	—	—	—	4.9	4.8
8. Geographical region									
West	Boston	—	—	—	—	—	—	—	1.2
Central	Boston	—	—	—	—	—	—	—	1.0
Northeast	Boston	—	—	—	—	—	—	—	0.9
Metrowest	Boston	—	—	—	—	—	—	—	1.0
Southeast	Boston	—	—	—	—	—	—	—	1.2

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 50. Well-Child Visits in the First 15 Months of Life  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,551)**

		<u>Odds Ratios</u>					
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)
1. Plan							
BMCHP	PCC Plan	0.5*	0.5*	0.5*	0.5*	0.5*	0.5*
FCHP	PCC Plan	0.2*	0.2*	0.2*	0.2*	0.2*	0.1*
NH	PCC Plan	0.2*	0.2*	0.2*	0.2*	0.2*	0.2*
NHP	PCC Plan	0.4*	0.4*	0.4*	0.4*	0.4*	0.4*
2. Provider type							
Group practice	Other Provider	—	1.7*	1.7*	1.7*	1.7*	1.5*
Individual physician	Other Provider	—	1.3	1.3	1.3	1.3	1.3
3. Gender							
Male	Female	—	—	1.0	1.0	1.0	1.0
4. CDPS score							
0.5 – 1.0	<.05	—	—	—	1.3	1.3	1.3
> 1.0	<.05	—	—	—	1.2	1.2	1.1
5. Disabled							
Yes	No	—	—	—	—	0.5	0.5
6. Geographical region							
West	Boston	—	—	—	—	—	1.9*
Central	Boston	—	—	—	—	—	2.4*
Northeast	Boston	—	—	—	—	—	1.7*
Metrowest	Boston	—	—	—	—	—	1.5
Southeast	Boston	—	—	—	—	—	1.5

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 51. Well-Child Visits in the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> Years of Life  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,997)**

		<u>Odds Ratios</u>						
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Plan								
BMCHP	PCC Plan	0.6*	0.6	0.6	0.6	0.6	0.7	0.7
FCHP	PCC Plan	0.5*	0.5*	0.5*	0.5*	0.5*	0.5*	0.5*
NH	PCC Plan	0.6*	0.7	0.7	0.6	0.6	0.6	0.6
NHP	PCC Plan	0.7	0.8	0.8	0.8	0.8	0.9	0.8
2. Provider type								
Group practice	Other Provider	—	1.2	1.2	1.3	1.3	1.3	1.3
Individual physician	Other Provider	—	1.7	1.7	1.7	1.7	1.7	1.8
3. Gender								
Male	Female	—	—	1.2	1.2	1.2	1.2	1.2
4. Age								
	N/A	—	—	—	0.8*	0.8*	0.8*	0.8*
5. CDPS score								
0.5 – 1.0	<.05	—	—	—	—	1.0	1.0	1.0
> 1.0	<.05	—	—	—	—	1.4	1.4	1.4
6. Disabled								
Yes	No	—	—	—	—	—	1.2	1.2
7. Geographical region								
West	Boston	—	—	—	—	—	—	0.8
Central	Boston	—	—	—	—	—	—	1.1
Northeast	Boston	—	—	—	—	—	—	0.8
Metrowest	Boston	—	—	—	—	—	—	0.9
Southeast	Boston	—	—	—	—	—	—	1.0

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 52. Adolescent Well-Care Visits  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=2,917)**

Odds Ratios

Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Plan									
BMCHP	PCC Plan	1.4*	1.4*	1.4*	1.6*	1.4*	1.3	1.3	1.3
FCHP	PCC Plan	0.7*	0.7*	0.7*	0.7*	0.7*	0.6*	0.6*	0.6*
NH	PCC Plan	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9
NHP	PCC Plan	1.2	1.3	1.3	1.3	1.3	1.2	1.2	1.1
2. Provider type									
Group practice	Other Provider	—	1.2*	1.2*	1.2	1.2	1.2	1.2	1.3*
Individual physician	Other Provider	—	1.1	1.1	1.1	1.1	1.0	1.0	1.1
3. Gender									
Male	Female	—	—	0.8*	0.8*	0.8*	0.8*	0.8*	0.8*
4. CDPS score									
0.5 – 1.0	<.05	—	—	—	1.0	1.0	1.0	1.0	1.0
> 1.0	<.05	—	—	—	1.4*	1.4*	1.3*	1.3*	1.3*
5. Member's co-occurring substance abuse									
Yes	No	—	—	—	—	0.7	0.7	0.7	0.7
6. Disabled									
Yes	No	—	—	—	—	—	0.8	0.8	0.8
7. Served by DMH									
Yes	No	—	—	—	—	—	—	1.3	1.3
8. Geographical region									
West	Boston	—	—	—	—	—	—	—	0.8
Central	Boston	—	—	—	—	—	—	—	0.7
Northeast	Boston	—	—	—	—	—	—	—	0.7*
Metrowest	Boston	—	—	—	—	—	—	—	0.7*
Southeast	Boston	—	—	—	—	—	—	—	0.5*

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 53. Comprehensive Diabetes Care, HbA1c Testing  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,790)**

		<u>Odds Ratios</u>								
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Plan										
BMCHP	PCC Plan	1.5	1.5	1.5	1.7*	1.4	1.5	1.5	1.5	1.3
FCHP	PCC Plan	2.4*	2.5*	2.5*	2.5*	2.4*	2.3*	2.5*	2.5*	2.0
NH	PCC Plan	0.9	0.9	0.9	1.0	0.9	0.9	1.0	1.0	0.9
NHP	PCC Plan	1.6*	1.6*	1.6*	1.9*	1.7*	1.5	1.8*	1.8*	1.8
2. Provider type										
Group practice	Other Provider	—	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Individual physician	Other Provider	—	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8
3. Gender										
Male	Female	—	—	1.0	0.9	1.0	1.2	1.2	1.2	1.2
4. Age										
18-35 years	N/A	—	—	—	0.4*	0.3*	0.4*	0.4*	0.4*	0.4*
36-45 years	N/A	—	—	—	0.5*	0.4*	0.5*	0.5*	0.5*	0.5*
46-55 years	N/A	—	—	—	0.9	0.7	0.8	0.9	0.9	0.9
5. CDPS score										
0.5 – 1.0	<.05	—	—	—	—	5.0*	5.4*	5.6*	5.6*	5.4*
> 1.0	<.05	—	—	—	—	5.0*	6.6*	7.1*	7.1*	6.9*
6. Co-occurring substance abuse										
Yes	No	—	—	—	—	—	0.3*	0.3*	0.3*	0.3*
7. Disabled										
Yes	No	—	—	—	—	—	—	1.4	1.4	1.4
8. Served by DMH										
Yes	No	—	—	—	—	—	—	—	0.8	0.8
9. Geographical region										
West	Boston	—	—	—	—	—	—	—	—	1.3
Central	Boston	—	—	—	—	—	—	—	—	1.1
Northeast	Boston	—	—	—	—	—	—	—	—	0.8
Metrowest	Boston	—	—	—	—	—	—	—	—	1.3
Southeast	Boston	—	—	—	—	—	—	—	—	0.7

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 54. Comprehensive Diabetes Care, Poor HbA1c Control  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,790)**

		<u>Odds Ratios</u>								
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Plan										
BMCHP	PCC Plan	1.8*	1.8*	1.8*	2.0*	1.9*	1.9*	1.9*	2.0*	2.1*
FCHP	PCC Plan	2.5*	2.6*	2.6*	2.6*	2.6*	2.6*	2.7*	2.8*	1.9*
NH	PCC Plan	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8
NHP	PCC Plan	1.9*	1.9*	1.9*	2.1*	2.0*	2.0*	2.1*	2.2*	2.2*
2. Provider type										
Group practice	Other Provider	—	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9
Individual physician	Other Provider	—	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
3. Gender										
Male	Female	—	—	1.0	1.0	1.0	1.0	1.0	1.0	1.1
4. Age										
18-35 years	N/A	—	—	—	0.4*	0.4*	0.4*	0.4*	0.4*	0.4*
36-45 years	N/A	—	—	—	0.6*	0.6*	0.6*	0.6*	0.6*	0.6*
46-55 years	N/A	—	—	—	0.8*	0.7*	0.8*	0.8	0.8*	0.8*
5. CDPS score										
0.5 – 1.0	<.05	—	—	—	—	1.6*	1.6*	1.6*	1.6*	1.6*
> 1.0	<.05	—	—	—	—	1.6*	1.6*	1.7*	1.6*	1.6*
6. Co-occurring substance abuse										
Yes	No	—	—	—	—	—	0.7	0.7*	0.7*	0.7*
7. Disabled										
Yes	No	—	—	—	—	—	—	1.1	1.1	1.1
8. Served by DMH										
Yes	No	—	—	—	—	—	—	—	1.8	1.8
9. Geographical region										
West	Boston	—	—	—	—	—	—	—	—	0.9
Central	Boston	—	—	—	—	—	—	—	—	1.4
Northeast	Boston	—	—	—	—	—	—	—	—	0.8
Metrowest	Boston	—	—	—	—	—	—	—	—	1.0
Southeast	Boston	—	—	—	—	—	—	—	—	0.9

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 55. Comprehensive Diabetes Care, LDL Testing  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,790)**

		<u>Odds Ratios</u>								
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Plan										
BMCHP	PCC Plan	1.1	1.1	1.1	1.2	1.1	1.1	1.2	1.1	1.0
FCHP	PCC Plan	0.9	1.0	1.0	1.0	0.9	0.9	0.9	0.9	1.0
NH	PCC Plan	0.8	0.7	0.7	0.9	0.8	0.8	0.9	0.8	0.9
NHP	PCC Plan	1.1	1.1	1.1	1.3	1.2	1.1	1.2	1.2	1.2
2. Provider type										
Group practice	Other Provider	—	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.9
Individual physician	Other Provider	—	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7
3. Gender										
Male	Female	—	—	1.1	0.9	1.0	1.2	1.2	1.2	1.2
4. Age										
18-35 years	N/A	—	—	—	0.2*	0.2*	0.2*	0.2*	0.2*	0.2*
36-45 years	N/A	—	—	—	0.4*	0.3*	0.4*	0.4*	0.4*	0.4*
46-55 years	N/A	—	—	—	0.6*	0.5*	0.6	0.6	0.6	0.6
5. CDPS score										
0.5 – 1.0	<.05	—	—	—	—	3.3*	3.5*	3.6*	3.6*	3.6*
> 1.0	<.05	—	—	—	—	2.5*	3.3*	3.5*	3.5*	3.5*
6. Co-occurring substance abuse										
Yes	No	—	—	—	—	—	0.3*	0.3*	0.3*	0.3*
7. Disabled										
Yes	No	—	—	—	—	—	—	1.3	1.3	1.3
8. Served by DMH										
Yes	No	—	—	—	—	—	—	—	0.7	0.7
9. Geographical region										
West	Boston	—	—	—	—	—	—	—	—	1.1
Central	Boston	—	—	—	—	—	—	—	—	0.8
Northeast	Boston	—	—	—	—	—	—	—	—	0.9
Metrowest	Boston	—	—	—	—	—	—	—	—	1.0
Southeast	Boston	—	—	—	—	—	—	—	—	0.8

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 56. Comprehensive Diabetes Care, LDL Control (LDL<130 mg/dL)  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,790)**

		<u>Odds Ratios</u>								
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Plan										
BMCHP	PCC Plan	2.6*	2.5*	2.5*	2.7*	2.7*	2.7*	2.8*	2.9*	2.7*
FCHP	PCC Plan	2.6*	2.5*	2.5*	2.6*	2.5*	2.5*	2.6*	2.7*	2.4*
NH	PCC Plan	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0
NHP	PCC Plan	1.9*	1.8*	1.8*	2.0*	2.0*	1.9*	2.2*	2.3*	2.2*
2. Provider type										
Group practice	Other Provider	—	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Individual physician	Other Provider	—	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.8
3. Gender										
Male	Female	—	—	1.1	1.0	1.0	1.1	1.1	1.1	1.2
4. Age										
18-35 years	N/A	—	—	—	0.4*	0.4*	0.4*	0.5*	0.5*	0.5*
36-45 years	N/A	—	—	—	0.7*	0.7*	0.7*	0.8	0.8	0.8
46-55 years	N/A	—	—	—	0.9	0.9	1.0	1.0	1.0	1.0
5. CDPS score										
0.5 – 1.0	<.05	—	—	—	—	1.3	1.3	1.3	1.3	1.3
> 1.0	<.05	—	—	—	—	1.2	1.3	1.4	1.4	1.3
6. Co-occurring substance abuse										
Yes	No	—	—	—	—	—	0.6*	0.5*	0.5*	0.5*
7. Disabled										
Yes	No	—	—	—	—	—	—	1.3*	1.3*	1.3
8. Served by DMH										
Yes	No	—	—	—	—	—	—	—	1.4	1.4
9. Geographical region										
West	Boston	—	—	—	—	—	—	—	—	0.9
Central	Boston	—	—	—	—	—	—	—	—	0.9
Northeast	Boston	—	—	—	—	—	—	—	—	0.7*
Metrowest	Boston	—	—	—	—	—	—	—	—	0.9
Southeast	Boston	—	—	—	—	—	—	—	—	0.6*

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 57. Comprehensive Diabetes Care, Eye Exams**  
**Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,790)**

		<u>Odds Ratios</u>								
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Plan										
BMCHP	PCC Plan	2.0*	1.9*	1.9*	2.0*	2.0*	2.0*	2.1*	2.1*	1.9*
FCHP	PCC Plan	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.8
NH	PCC Plan	1.3	1.3*	1.3	1.4*	1.4*	1.3*	1.4*	1.4*	1.2
NHP	PCC Plan	1.6*	1.6	1.6*	1.8*	1.7*	1.6*	1.8*	1.8*	1.9*
2. Provider type										
Group practice	Other Provider	—	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Individual physician	Other Provider	—	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8
3. Gender										
Male	Female	—	—	0.8	0.8*	0.8	0.9	0.9	0.9	0.9
4. Age										
18-35 years	N/A	—	—	—	0.4*	0.4*	0.4*	0.4*	0.4*	0.4*
36-45 years	N/A	—	—	—	0.6*	0.6*	0.6*	0.6*	0.6*	0.6*
46-55 years	N/A	—	—	—	0.7*	0.7*	0.8*	0.8	0.8	0.8*
5. CDPS score										
0.5 – 1.0	<.05	—	—	—	—	1.5*	1.5*	1.5*	1.5*	1.5*
> 1.0	<.05	—	—	—	—	1.5*	1.8*	1.8*	1.8*	1.8*
6. Co-occurring substance abuse										
Yes	No	—	—	—	—	—	0.4*	0.4*	0.4*	0.4*
7. Disabled										
Yes	No	—	—	—	—	—	—	1.2	1.2	1.2
8. Served by DMH										
Yes	No	—	—	—	—	—	—	—	1.1	1.1
9. Geographical region										
West	Boston	—	—	—	—	—	—	—	—	1.5*
Central	Boston	—	—	—	—	—	—	—	—	1.5*
Northeast	Boston	—	—	—	—	—	—	—	—	1.2
Metrowest	Boston	—	—	—	—	—	—	—	—	0.9
Southeast	Boston	—	—	—	—	—	—	—	—	0.8

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 58. Comprehensive Diabetes Care, Monitoring for Nephropathy  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=1,790)**

		<u>Odds Ratios</u>								
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Plan										
BMCHP	PCC Plan	1.8*	1.8*	1.8*	1.9*	1.8*	1.8*	1.9*	1.9*	1.6*
FCHP	PCC Plan	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.5
NH	PCC Plan	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3
NHP	PCC Plan	1.3	1.3	1.3	1.5*	1.4*	1.4*	1.6*	1.6*	1.6*
2. Provider type										
Group practice	Other Provider	—	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Individual physician	Other Provider	—	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3. Gender										
Male	Female	—	—	1.0	1.0	1.0	1.1	1.1	1.1	1.1
4. Age										
18-35 years	N/A	—	—	—	0.4*	0.4*	0.4*	0.5*	0.5*	0.5*
36-45 years	N/A	—	—	—	0.6*	0.6*	0.6*	0.7*	0.7*	0.7*
46-55 years	N/A	—	—	—	0.7*	0.7*	0.7*	0.8	0.8	0.8
5. CDPS score										
0.5 – 1.0	<.05	—	—	—	—	2.1*	2.1*	2.2*	2.2*	2.2*
> 1.0	<.05	—	—	—	—	2.8*	3.0*	3.2*	3.1*	3.1*
6. Co-occurring substance abuse										
Yes	No	—	—	—	—	—	0.7*	0.6*	0.6*	0.6*
7. Disabled										
Yes	No	—	—	—	—	—	—	1.4*	1.4*	1.4*
8. Served by DMH										
Yes	No	—	—	—	—	—	—	—	1.1	1.2
9. Geographical region										
West	Boston	—	—	—	—	—	—	—	—	1.1
Central	Boston	—	—	—	—	—	—	—	—	0.6*
Northeast	Boston	—	—	—	—	—	—	—	—	0.8
Metrowest	Boston	—	—	—	—	—	—	—	—	0.7
Southeast	Boston	—	—	—	—	—	—	—	—	0.5*

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 59. Use of Appropriate Medications for People with Asthma  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=11,909)**

Variable	Comparison group	Odds Ratios								
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Plan										
BMCHP	PCC Plan	1.7*	1.7*	1.7*	1.5*	1.5*	1.5*	1.5*	1.5*	1.3
FCHP	PCC Plan	0.6*	0.6*	0.6*	0.6*	0.6*	0.6*	0.6*	0.6*	0.8
NH	PCC Plan	1.3	1.3	1.2	1.1	1.1	1.1	1.1	1.1	1.3
NHP	PCC Plan	1.5*	1.4*	1.4*	1.1	1.1	1.1	1.1	1.1	1.1
2. Provider type										
Group practice	Other Provider	—	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Individual physician	Other Provider	—	0.7*	0.7*	0.8*	0.8*	0.8*	0.8*	0.8*	0.8
3. Gender										
Male	Female	—	—	1.1	0.8*	0.8*	0.8*	0.8*	0.8*	0.8*
4. Age										
5-9 years	N/A	—	—	—	3.2*	3.2*	2.9*	3.0*	3.0*	2.9*
10-17 years	N/A	—	—	—	2.0*	2.1*	1.9*	1.9*	1.9*	1.9*
18-24 years	N/A	—	—	—	0.8*	0.8*	0.8*	0.8*	0.8*	0.8*
25-40 years	N/A	—	—	—	0.7*	0.8*	0.8*	0.8*	0.8*	0.8*
5. CDPS score										
0.5 – 1.0	<.05	—	—	—	—	1.3*	1.4*	1.4*	1.4*	1.4*
> 1.0	<.05	—	—	—	—	1.4*	1.6*	1.6*	1.6*	1.6*
6. Co-occurring substance abuse										
Yes	No	—	—	—	—	—	0.7*	0.7*	0.7*	0.7*
7. Disabled										
Yes	No	—	—	—	—	—	—	1.0	1.0	1.0
8. Served by DMH										
Yes	No	—	—	—	—	—	—	—	0.9	0.9
9. Geographical region										
West	Boston	—	—	—	—	—	—	—	—	1.3*
Central	Boston	—	—	—	—	—	—	—	—	0.7*
Northeast	Boston	—	—	—	—	—	—	—	—	0.9
Metrowest	Boston	—	—	—	—	—	—	—	—	0.9
Southeast	Boston	—	—	—	—	—	—	—	—	0.8*

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 60. Children and Adolescents' Access to Primary Care Providers, 12-24 Months**  
**Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=15,570)**

		<u>Odds Ratios</u>					
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)
1. Plan							
BMCHP	PCC Plan	0.1*	0.1*	0.1*	0.1*	0.1*	0.1*
FCHP	PCC Plan	0.2*	0.1*	0.1*	0.1*	0.1*	<0.1*
NH	PCC Plan	<0.1*	<0.1*	<0.1*	<0.1*	<0.1*	<0.1*
NHP	PCC Plan	0.2*	0.2*	0.2*	0.2*	0.2*	0.2*
2. Provider type							
Group practice	Other Provider	—	2.9*	2.9*	2.9*	2.9*	1.6*
Individual physician	Other Provider	—	1.0	1.1	1.1	1.1	0.5*
3. Gender							
Male	Female	—	—	1.1	1.0	1.0	1.0
4. CDPS score							
0.5 – 1.0	<.05	—	—	—	4.2*	3.9*	3.6
> 1.0	<.05	—	—	—	11.1*	10.3*	9.5*
5. Disabled							
Yes	No	—	—	—	—	0.9	0.8
6. Geographical region							
West	Boston	—	—	—	—	—	10.8*
Central	Boston	—	—	—	—	—	21.0*
Northeast	Boston	—	—	—	—	—	7.4*
Metrowest	Boston	—	—	—	—	—	4.9*
Southeast	Boston	—	—	—	—	—	4.7*

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 61. Children and Adolescents' Access to Primary Care Providers, 25 Months-6 Years  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=60,913)**

		<u>Odds Ratios</u>					
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)
1. Plan							
BMCHP	PCC Plan	0.1*	0.1*	0.1*	0.1*	0.1*	0.1*
FCHP	PCC Plan	0.2*	0.1*	0.1*	0.1*	0.1*	0.1*
NH	PCC Plan	0.1*	0.1*	0.1*	0.1*	0.1*	0.1*
NHP	PCC Plan	0.2*	0.2*	0.2*	0.3*	0.3*	0.3*
2. Provider type							
Group practice	Other Provider	—	2.8*	1.8*	2.8*	2.8*	2.0*
Individual physician	Other Provider	—	1.7*	1.7*	1.8*	1.8*	1.3*
3. Gender							
Male	Female	—	—	1.1	0.9*	0.8*	0.8*
4. CDPS score							
0.5 – 1.0	<.05	—	—	—	1.4*	1.4*	1.5*
> 1.0	<.05	—	—	—	4.2*	4.3*	4.4*
5. Disabled							
Yes	No	—	—	—	—	1.5*	1.5*
6. Geographical region							
West	Boston	—	—	—	—	—	3.3*
Central	Boston	—	—	—	—	—	3.1*
Northeast	Boston	—	—	—	—	—	2.4*
Metrowest	Boston	—	—	—	—	—	1.9*
Southeast	Boston	—	—	—	—	—	2.9*

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 62. Children and Adolescents' Access to Primary Care Providers, 7-11 Years  
Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=38,622)**

		<u>Odds Ratios</u>							
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Plan									
BMCHP	PCC Plan	0.3*	0.3*	0.3*	0.3*	0.3*	0.3*	0.3*	0.2*
FCHP	PCC Plan	0.9	0.5*	0.5*	0.5*	0.5*	0.5*	0.5*	0.6
NH	PCC Plan	0.3*	0.3*	0.3*	0.3*	0.3*	0.3*	0.3*	0.3*
NHP	PCC Plan	0.5*	0.7*	0.7*	0.8*	0.8*	0.8*	0.8*	0.8*
2. Provider type									
Group practice	Other Provider	—	3.7*	3.7*	3.7*	3.7*	3.7*	3.7*	2.7*
Individual physician	Other Provider	—	2.0*	2.0*	2.0*	2.1*	2.1*	2.1*	1.5*
3. Gender									
Male	Female	—	—	1.0	1.0	1.0	0.9	0.9	0.9
4. CDPS score									
0.5 – 1.0	<.05	—	—	—	3.7*	3.7*	3.5*	3.5*	3.5*
> 1.0	<.05	—	—	—	3.2*	3.2*	3.2*	3.2*	3.2*
4. Co-occurring substance abuse									
Yes	No	—	—	—	—	0.3*	0.3*	0.3*	0.3*
6. Disabled									
Yes	No	—	—	—	—	—	1.2	1.2	1.2
7. Served by DMH									
Yes	No	—	—	—	—	—	—	0.8	0.8
8. Geographical region									
West	Boston	—	—	—	—	—	—	—	3.5*
Central	Boston	—	—	—	—	—	—	—	1.5*
Northeast	Boston	—	—	—	—	—	—	—	1.8*
Metrowest	Boston	—	—	—	—	—	—	—	1.7*
Southeast	Boston	—	—	—	—	—	—	—	2.2*

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.

**Table 63. Children and Adolescents' Access to Primary Care Providers, 12-19 Years**  
**Summary of Multiple Logistic Regression Models Showing Step-by-Step Addition of Independent Variables (n=57,259)**

		<u>Odds Ratios</u>							
Variable	Comparison group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Plan									
BMCHP	PCC Plan	0.4*	0.3*	0.3*	0.3*	0.3*	0.3*	0.3*	0.3*
FCHP	PCC Plan	1.0	0.7*	0.7*	0.7*	0.7*	0.7	0.7	0.8
NH	PCC Plan	0.4*	0.4*	0.4*	0.4*	0.4*	0.4*	0.4*	0.4*
NHP	PCC Plan	0.6*	0.8*	0.8*	0.8*	0.8*	0.8*	0.8*	0.8*
2. Provider type									
Group practice	Other Provider	—	2.3*	2.3*	2.2*	2.2*	2.2*	2.2*	1.9*
Individual physician	Other Provider	—	1.3*	1.3*	1.3*	1.3*	1.3*	1.3*	1.2
3. Gender									
Male	Female	—	—	0.6*	0.7*	0.7*	0.7*	0.7*	0.7*
4. CDPS score									
0.5 – 1.0	<.05	—	—	—	1.0	1.0	1.0	1.0	1.0
> 1.0	<.05	—	—	—	3.0*	3.0*	3.1*	3.1*	3.0*
5. Co-occurring substance abuse									
Yes	No	—	—	—	—	1.0	1.0	1.0	1.0
6. Disabled									
Yes	No	—	—	—	—	—	1.2*	1.2*	1.2*
7. Served by DMH									
Yes	No	—	—	—	—	—	—	1.4	1.4
8. Geographical region									
West	Boston	—	—	—	—	—	—	—	2.1*
Central	Boston	—	—	—	—	—	—	—	1.2*
Northeast	Boston	—	—	—	—	—	—	—	1.4*
Metrowest	Boston	—	—	—	—	—	—	—	1.4*
Southeast	Boston	—	—	—	—	—	—	—	1.5*

\* p<.05

Note: Odds ratios (ORs) greater than 1.0 indicate that the independent variable is associated with a higher probability that the outcome will occur. For example, an OR of 2.0 for the variable “male” would indicate that the outcome is twice as likely for men as for women. An OR of 0.5 would indicate that the outcome is one-half as likely for men, compared to women.