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Primary Care Activity Level 2022

Preliminary Report by the UMass Chan Analytics Group and MassHealth

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Overview. UMass Chan Medical School has worked with the Massachusetts Executive Office of Health and Human Services (EOHHS) since 2014 to develop risk models for MassHealth to account for how social determinants of health (SDH) and medical complexity jointly predict total health care cost.[i] The Primary Care Activity Level (PCAL) framework was originally developed by Ash and Ellis in 2012 to calculate risk-adjusted bundled payments for comprehensive primary care in a commercially insured population.[ii] It was designed to recognize patient differences in the expected cost of all services that primary care practitioners (PCPs) *should be providing*. Payments based on PCAL are higher for medically and/or socially complex patients than for less complex ones.

In 2023 MassHealth is implementing a Primary Care Capitation program for Accountable Care Organization (ACO) primary care (PC) practices, which extends value-based payment to the provider level. Complex patients need more PC services to manage their needs than less complex patients do, yet such differences in patient complexity are not adequately reflected in fee-for-service reimbursements for primary care procedures. Here we present the development of a PCAL model that can be used to adjust primary care capitation payments based on the health status of each member; the model has been fit to MassHealth-specific data and in consideration of the state's policy goals.

Outcome: Primary Care Activity Level (PCAL). The key idea underlying PCAL is that *a properly resourced primary care practice needs more money to care for more complex patients than for "simpler" ones. Complex patients tend to use other services* – and their primary care teams should be helping to manage and coordinate their care with other providers, as well as providing preventive services that reduce the need for specialty care and avoid at least some of the crises that lead to acute hospitalizations and ED visits.

Methods. We first used existing (2019) data to construct a PCAL *outcome* for each patient, as a proxy for the costs that a comprehensive primary care practice would have incurred to address each patient's various needs. We then built a model to predict that outcome. Proposed payments are based on *predicted* PCAL, which is a function of patient characteristics – and not the services they use.

We calculate the PCAL outcome by summing fractions of costs from five service categories: primary care (100%), specialty care (6%), inpatient hospital care (6%), emergency department (ED) (30%), and pharmacy (9%). The fraction of each category taken was largely consistent with those used in the original PCAL project (developed in 2012) with two exceptions: 1) we increased the fraction of ED costs contributing to PCAL because of the relatively greater importance of ED visits in a Medicaid population versus a commercially insured population, and 2) we decreased the fraction of pharmacy costs contributing to PCAL to account for the disproportionately faster increase in pharmacy costs relative to other healthcare costs over the past decade. In all analyses, we used price-normalized costs from MassHealth's actuaries, top-coded and bottom-coded for individuals within each type of service category. For example, we did not allow the total dollars counted towards PCAL from the inpatient hospital category to be less than 0 or more than $6,000 (which is 6% of a top-coded value of $100,000 for hospital spending) for any individual. Trimming extreme values makes prediction models more robust.

Data sources and population studied. We used MassHealth administrative data from calendar year 2019 which includes enrollment, eligibility, provider, claims, and encounter records from the MassHealth data warehouse. Due to atypical utilization patterns at the start of the COVID pandemic we did not develop the model on 2020 data, and 2021 data only became available at the end of the project period. Analyses were conducted with data from all MassHealth members present for at least 6 months in 2019, who were managed care eligible (ACO, MCO, or PCC Plan) and less than 65 years of age as of December 31, 2019 (See **Table 1** for descriptive statistics).

Modeling approach. We began with the variables currently used to predict the total cost of care (TCOC) in MassHealth's SDH risk adjustment model to adjust ACO and MCO capitation rates and set TCOC benchmarks. We modified the model to better tailor it to primary care, improve model fit, and address health equity. We evaluated model performance using R^2 and by examining observed to expected (O:E) ratios – where O and E are observed and model-predicted (expected) average values – for policy-relevant subgroups of patients. These subgroups are defined by their risk factors and by the practices in which they are enrolled. Members were attributed to practices using MassHealth's attribution algorithm.

Results. The modeling population included 1,014,625 unique managed care eligible members enrolled for at least 6 months during 2019 with characteristics as described in **Table 1**. We first used the exact predictors in the SDH v3.2 model (that MassHealth uses to make total cost of care payments to health plans) to predict the PCAL outcome described above. The SDH v3.2 predictors are outlined in **Table 2;** not shown are 20 age-sex categories that were included to accurately predict for these demographically defined subgroups. The SDH v3.2 variables explained 68.1% of the variance in the PCAL outcome. We then refined this model (SDH vPCAL), increasing the R^2 to 69.6%, by: 1) adding additional terms to recognize the decreasing contribution to PCAL of increases in the DxCG and RxCG relative risk scores (RRS) for larger values of these scores; 2) expanding the behavioral health comorbidities to explicitly recognize

more substance use disorders (SUD, opioid and other substance use disorders) and childhood psychopathology (SED, severe emotional disorder); and 3) setting the coefficient of (NSS7+) * DxCG to be $5, where NSS7 is the neighborhood stress score that MassHealth has been using in risk modeling since 2016. For example, this term will add $10 to the predicted cost of a member with DxCG risk score of 5 who lives in a neighborhood with NSS7 = 2 (**Table 2**). All variables in the SDHv3.2 model are described in detail in Alcusky et al., 2023[i].

The SDH vPCAL model predicted PCAL well for the subpopulations that we commonly examine for goodness of fit, such as those defined by the patient characteristics of Table 1. This "examination" consists of calculating observed-to-expected (O:E) ratios by dividing a group's actual (observed) PCAL value by its model-predicted (expected) PCAL value. When O:E exceeds 1.0 for a group of members, these members had higher PCAL costs than expected, and when O:E is less than 1.0, lower PCAL costs. All expected predicted values are within 10% of observed PCAL values for each subgroup, including by rating category; most are within 5%.

Summary. The proposed Primary Care Activity Level model is designed to help guide payments from MassHealth to primary care practices so that practices that care for more complex patents receive more money per patient. The PCAL model presented here performs well at determining these relative payments.

Table 1: Characteristics of MassHealth Members, Age 0-64, enrolled for at least 183 days in CY2019

	Total	
	N = 1,014,625	
Age (mean/SD)	25.9	18.4
	N	**%**
Age 18 years and younger	512,955	46.9
Female	579,891	53.1
Housing Problems		
None	972,242	89.0
Unstable Housing	99,495	9.1
Homeless	21,010	1.9
Disability Status		
DMS Client	6,919	0.6
DDS (not DMS) Client	19,441	1.8
Other Disability	108,791	10.0
None	957,596	87.6
Behavioral Health Comorbidity		
Serious Mental Illness	145,440	13.3
Opioid Use Disorder	55,516	5.1
Other Substance Use Disorder	48,011	4.4
Severe Emotional Disorder (children)	38,381	3.5
	Mean	**SD**
Neighborhood Stress Score (NSS7)	0.00	1.0
RxCG (Model-86) Score	0.99	2.1
DxCG (Model-88) Score	1.00	2.1

Notes: Disability status indicates MassHealth eligibility as client of the Department of Mental Health (DMH), Department of Developmental Services (DDS), or entitled to Medicaid due to disability ("Other disability"). DxCG is the v4.2 concurrent Model 88 risk score and RxCG is the v4.2 concurrent Model 86 risk score, both normalized to have mean = 1 in the MassHealth population. Housing problems = 3 or more addresses or homelessness = ICD10 code of homeless during 2019. Neighborhood Stress Score (NSS7) is standardized to have mean 0 and SD = 1 in the MassHealth population.

Table 2: Model Coefficients for Predicting PCAL in CY2019

SDH v3.2 R^2 = 68.1%		SDH vPCAL R^2 = 69.6%	
Variable	Coefficient	Variable	Coefficient
Intercept	342	Intercept	272
RxCG RRS	157	RxCG RRS	292
		RxCG-spline-5	-230
DxCG RRS	419	DxCG RRS	471
		DxCG-spline-5	-81
		DxCG-spline-20	-157
SMI only	322	SMI	133
OUD only	578	OUD	407
SMI+OUD	843	OTHER SUD	60
		SED	263
DMS Client	1118	DMS Client	1001
DDS (not DMS)	745	DDS (not DMS)	661
Other Disabled	142	Other Disabled	74
(NSS7+) * DxCG	-3	(NSS7+) * DxCG	5
Rural Area	1	Rural Area	11
Housing Problem * DxCG * BH	9	Housing Problem * DxCG * BH	12

Disability terms refer to the percentage of the year members were in each category (range 0-1). RxCG (Model 86) and DxCG (Model 88) are risk scores predicting total medical acuity using pharmacy and diagnostic groups, respectively. Splines were included at 5 (RxCG and DxCG) and 20 (DxCG only) to account for non-linear shape of the association curve. SMI: severe mental illness, OUD: opioid use disorder, OTHER SUD: SUD other than alcohol or opioids, SED: severe emotional disorder in children. NSS7+ scores = NSS7 when it is positive, or 0 when it is not.. Housing problems were defined as either homelessness (ICD10) or unstable housing (>3 addresses in one year) and multiplied by DxCG and an indicator for having any behavioral disorder. Average annualized PCAL = $985. When used, PCAL predictions are multiplied by a constant to make their average equal to the state-specified average annual per-person primary care budget.

[i] Alcusky MJ, Mick EO, Allison JJ, Kiefe CI, Sabatino MJ, Eanet FE, Ash AS. Paying for Medical and Social Complexity in Massachusetts Medicaid. *JAMA Netw Open.* 2023;6(9):e2332173. doi:10.1001/jamanetworkopen.2023.32173.

[ii] Ash AS, Ellis RP. Risk-adjusted payment and performance assessment for primary care. *Med Care*. 2012;50(8):643-653. doi:10.1097/MLR.0b013e3182549c74.