MEDICAL CARE COORDINATION SERVICES FOR PERSONS LIVING WITH HIV IN LOS ANGELES COUNTY:

A Robust Strategy to Strengthen the HIV Care Continuum

Division of HIV and STD Programs

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TABLE OF CONTENTS

TABLE OF FIGURES

EXECUTIVE SUMMARY

To improve health outcomes of people living with HIV and reduce the spread of HIV, the Los Angeles County Department of Public Health's Division of HIV and STD Programs and the Los Angeles County Commission on HIV jointly developed and implemented the Medical Care Coordination (MCC) Program. MCC is an integrated service model that addresses patients' unmet medical and non-medical support needs (i.e., mental health, substance abuse, and housing) through coordinated case management activities to support continuous engagement in care and adherence to antiretroviral therapy. MCC services are delivered by multidisciplinary teams (nurse, social worker, caseworker) co-located in 35 safety net HIV clinics in LAC. Patient acuity is assessed at enrollment and guides service intensity.

This document serves as the first comprehensive report on the implementation and evaluation of this locally developed program to improve retention in HIV care and viral suppression among patients enrolled from January through December 2013. Major findings include:

- **Key vulnerable populations in LAC are receiving MCC.** A total of 1,204 patients were enrolled in MCC services in 2013. Nearly half of the patients were Latino (49%), 26% were black and 22% were white. The majority were male (85%) with 13% female and 2% transgender (male-to female). The average age was 40 (standard deviation=11.4). Over three-quarters (75%) of patients were living at or below the federal poverty level. Fifteen percent (15%) reported homelessness in the past 6 months, 9% were currently homeless and 38% had a history of incarceration.

- **Acuity severity and service needs of key vulnerable populations are being successfully identified**. Of the 1,204 patients assessed, 221 (18%) were low acuity, 621 (52%) were moderate, 357 (30%) were high and 5 (<1%) were severe acuity. Significantly higher proportions of patients who were transgender, aged 25-44 years, living at or below the Federal Poverty Level, previously incarcerated and recently homeless were high/severe acuity ($p<0.05$). The most common domains of identified need were health status (69%), antiretroviral therapy adherence (68%), sexual risk behaviors (43%), financial stability (42%), and access to HIV care (29%).

- **Patients in MCC received the services they needed.** Fidelity to the MCC Service Guidelines was demonstrated by acuity-driven service delivery and identified need for receipt of key brief interventions among patients with identified need. Higher acuity patients received significantly more MCC service hours than lower acuity patients ($p<0.05$). Among patients with identified need in the domains of health status, antiretroviral therapy access, and sexual risk behaviors, 79-89% received the corresponding brief interventions.

- **Retention in HIV care and viral suppression improved significantly.** MCC was effective at increasing the proportion of patients retained in care and virally suppressed after 12 months**.** The proportion of patients with suppressed HIV viral loads (<200 copies/mL) increased from 31% before MCC enrollment to 64% after MCC enrollment – an improvement of more than 100% ($p<0.05$). Similarly, the proportion of patients retained in HIV care before MCC was 59%, compared to 83% of patients after enrollment in MCC- an improvement of 41% ($p<0.05$). The largest improvements in viral suppression and retention in care in the 12 months before and after MCC were observed among patients who were high/severe acuity, aged 16-24 years, men who acquired HIV through sex with a man (MSM), temporarily housed and uninsured.

The first-year evaluation findings presented in this report demonstrate that the MCC program significantly increased viral suppression and retention in care among PLWH who are at risk for poor health outcomes in a real-world setting. Improvements in the main health outcomes were also observed across all patient demographic characteristics and key determinants of health to include patients who were aged 16-24, transgender, uninsured and high/severe acuities. In addition, the proportion of patients who were retained in HIV care and were virally suppressed after 12 months in MCC surpassed the 2014 National HIV AIDS Strategy benchmarks for 64% of persons with HIV to be in continuous medical care and for 55% to be virally suppressed [1]. Finally, not only did patients experience direct health benefits while in MCC, but because HIV treatment makes them less infectious, they were also less likely to transmit HIV to others, helping to realize the public health benefits of HIV treatment as prevention [2, 3, 4].

These results have clear implications for MCC as an effective strategy to improve health outcomes of PLWH, strengthen the HIV care continuum, and meet the updated targets of the National HIV/AIDS Strategy in LAC [1]. Policy makers and public health officials should strongly consider adoption of this model as they seek to improve the lives of persons living with HIV and reduce forward transmission.

Companion documents, including the Medical Care Coordination Service Guidelines and assessment tool, are available at ph.lacounty.gov/dhsp/mcc.

INTRODUCTION

This document serves as the first comprehensive report on the implementation of Los Angeles County (LAC) Medical Care Coordination (MCC) program and is intended to provide community members, policy makers, and staff at public, private, and community public health programs with the tools necessary to understand, evaluate and design similar interventions. The main objectives of this report are to:

- Review the context and rationale for the MCC program
- Outline the key service components of MCC
- Describe the characteristics and needs of patients enrolled in MCC
- Evaluate process and outcome measures for MCC
- Recommend ongoing service improvement efforts

Companion documents, including the MCC Service Guidelines and Assessment tool, are available at ph.lacounty.gov/dhsp/mcc.

BACKGROUND

The current treatment guidelines for the management of human immunodeficiency virus (HIV) disease require that infected persons are in continuous care (i.e., see their doctor at least twice a year) and take their HIV medication as prescribed to keep the amount of HIV virus in their bodies low (suppressed to less than 200 copies/mL) [5]. The successful management of HIV results in better health and longer lives for people living with HIV (PLWH) [3, 6, 2]. It also helps to reduce the number of new HIV infections since people with HIV who are retained in care and who have suppressed viral loads are less likely to spread it to their partners [7, 2, 8].

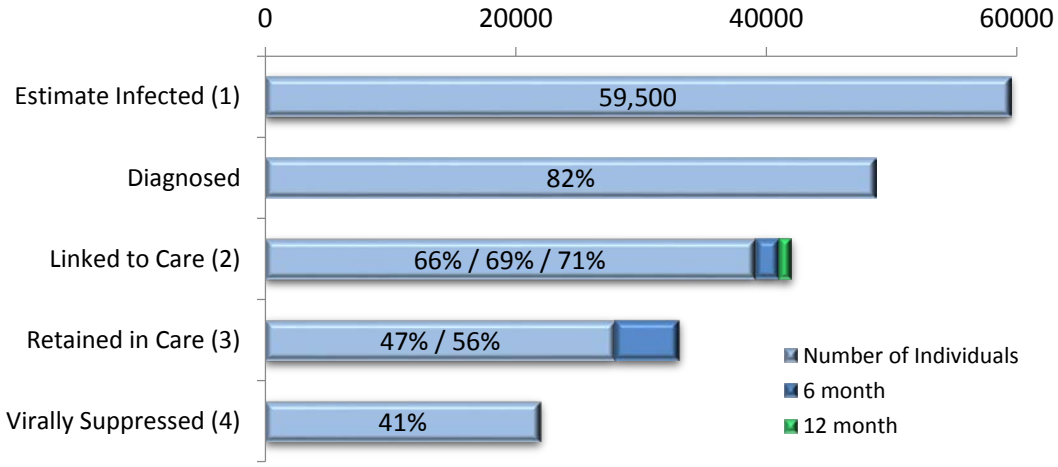
The individual and public health benefits of achieving viral suppression among PLWH, however, are not yet fully realized. In the United States in 2011, there were an estimated 1 million persons diagnosed and living with HIV [9]. Of these, approximately 50% persons were retained in care for HIV and 35% were virally suppressed [9, 10]. In a model using 2009 national HIV/AIDS Reporting System (HARS) data, the Centers for Disease Control and Prevention estimated that PLWH who had not attended a medical care visit the past year accounted for 61% of HIV transmissions, while those PLWH who had attended a medical care visit and had suppressed viral load accounted for only 2.5% of HIV transmissions [8].

Lower levels of retention in care and viral suppression are reported among populations disproportionately affected by HIV that include those who are younger, Black or Latino, have less education, or are lower income [11, 12, 13, 14, 15]. In addition, for many PLWH, unmet behavioral health, medical, socioeconomic and competing life needs can interfere with and serve as barriers to accessing continuous HIV care and medication [16, 15].

To improve HIV health outcomes and reduce HIV transmission, the White House issued the first-ever National HIV/AIDS Strategy (NHAS) in 2010 [17, 1]. This strategic plan outlines three primary goals: 1) reduce new HIV infections; 2) increase access to care and optimize health outcomes for people living with HIV; and, 3) reduce HIV-related health disparities based on gender, race/ethnicity and sexual identity [17]. Annual benchmarks were established to meet these goals for 90% of PLWH to be retained in care and 80% to achieve viral load suppression by 2020.

In LAC in 2011, there were estimated to be 59,500 PLWH, 48,790 (82%) of which had been diagnosed with and were aware of their HIV status (Figure 1). Of these, fewer than half (47%) had been retained in continuous care; and 41% had low enough HIV virus levels (suppressed) to reduce risk of forward transmission [4, 10, 14, 8].

Figure 1: HIV Care Continuum for Estimated Persons Living with HIV in Los Angeles County, 2011



Source: HIV Surveillance and MMP Data, 2011

(1) Estimate of PLWH in LAC for 2011 includes 18.1% PLWH that CDC estimates are unaware of status.

(2) Linked to care within (a) 3 months, (b) 6 months and (c) 12 months of HIV diagnosis. Denominator is estimated number HIV diagnosed in 2011, plus 18.1% unaware (n=2,263).

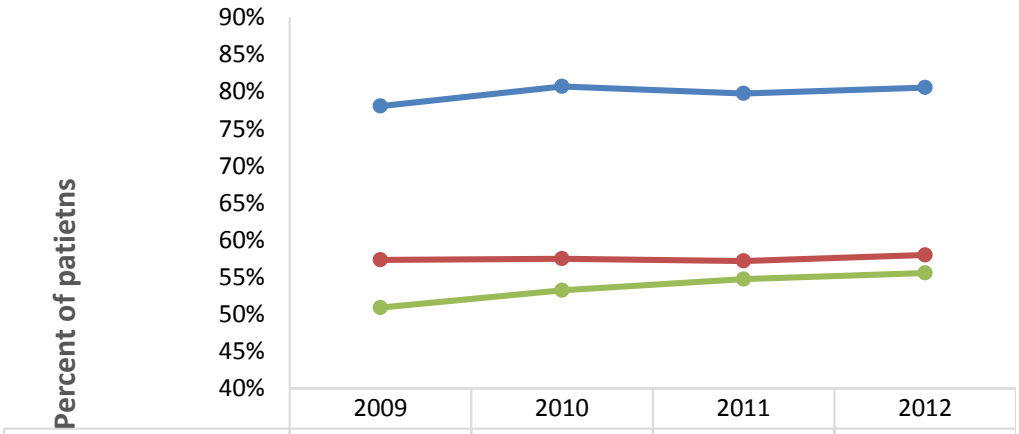
(3) Retained in Care: (a) PLWH with ≥2 Viral Load reported at least 3 months apart and (b) PLWH with at least one Viral Load reported in last 12 months.

(4) Viral suppression defined as VL <200.

Figure 2 shows the proportions of persons aged 18 and older in LAC diagnosed within each year who were linked to HIV care within 90 days of their HIV diagnosis and the proportions of PLWH aged 18 and older who were retained in HIV care and had suppressed HIV virus from 2010-2012 [10, 14]. While there were some improvements in viral suppression over time, there was almost no change in the proportion of patients retained in HIV care.

The data in Figures 1 and 2 demonstrate that in 2012 many HIV-positive persons in LAC were not in regular medical care or taking the medications needed to optimize their health and make them less infectious [18]. In addition, these data indicate that improved efforts are needed in LAC to meet the NHAS targets by 2020 [1].

Figure 2: HIV Linkage, Retention and Viral Suppression among Persons Diagnosed with HIV in Los Angeles County, 2009-2012



	2009	2010	2011	2012
1. Linkage to Care	78%	81%	80%	81%
2. Retained in Care	57%	57%	57%	58%
3. Viral Suppression	51%	53%	55%	56%

Source: HIV Surveillance, 2014

(1) Linkage to Care: Persons with ≥1 viral load, CD4 or genotype test ≤3 months of their HIV diagnosis among persons aged 18+ diagnosed with HIV in each calendar year reported through 12/31/2013.

(2) Retained in Care: Persons with ≥2 viral load, CD4 or genotype tests ≥ 3 months apart among PLWH aged 18+ living in LAC in each calendar year reported through 12/31/2013.

(3) Viral Suppression: Persons with most recent viral load <200 copies/ml among all PLWH aged ≥18 living in LAC in each calendar year reported through 12/31/2013.

LOS ANGELES COUNTY RESPONSE

To improve the health of PLWH and reduce the spread of HIV, the LAC Department of Public Health's Division of HIV and STD Programs (DHSP) and the LAC Commission on HIV (COH) jointly developed the Medical Care Coordination (MCC) Program. DHSP is the designated official administrative agency for the LAC Department of Public Health to develop and coordinate the jurisdictional response to HIV and STDs. As such, DHSP is responsible for developing and maintaining a comprehensive continuum of prevention, care and treatment programs for people at risk for or living with HIV and STDs in LAC. The COH is the federally mandated HIV planning council in LAC comprised of community stakeholders and charged with planning and allocating for funding for prevention and treatment services for HIV and STDs in LAC.

Since 1990, federal funding of medical care and support services for underserved people living with HIV has been provided through the Ryan White HIV/AIDS Program (RWHAP) administered by the Health Resources and Services Administration (HRSA). In 2006, HRSA mandated further integration of medical care with psychosocial service provision [19]. The COH addressed this expectation in 2009 with the development of Standards of Care for MCC which are a synthesis of evidence-based approaches utilized in the management of HIV and other chronic illnesses, including case management, disease management and integrated treatment models as well as stakeholder input and expert opinion [20].

In 2012, the COH allocated over $9 million in RWHAP funds for DHSP to contract with 20 medical home agencies -- which operate 35 safety net HIV clinics across the county -- to deliver this new and innovative LAC-based program. These agencies and their HIV clinics provided medical care to approximately 38% of the 46,216 PLWH in LAC in 2012 [21, 22].

In the MCC model, behavioral interventions and support services are integrated with medical care to fully respond to patients' needs, and to promote treatment adherence and health outcomes [23]. MCC services are delivered by multidisciplinary teams consisting of a nurse, social worker and case worker that are co-located at Ryan White medical homes to work closely with medical providers. The MCC team assesses patients to understand their unique needs and delivers targeted interventions to address those needs in order to improve their use of medical care and adherence to HIV medication.

THE MEDICAL CARE COORDINATION (MCC) PROGRAM

MCC SERVICE MODEL

The MCC program is an integrated service model that addresses patients' unmet medical and non-medical support needs (i.e., mental health, substance abuse, and housing) through coordinated case management activities to support retention in care and adherence to antiretroviral therapy. The MCC program requires that Ryan White HIV medical homes:

1) Screen their HIV patient population every six months to identify those at risk for poor health outcomes;
2) Enroll identified patients in the MCC program;
3) Assess the medical and psychosocial needs of identified patients and determine patient acuity;
4) Develop and implement an integrated care plan that is patient-centered;
5) Deliver targeted, brief interventions based on identified need; and,
6) Re-assess and deliver services until patients can manage their own care.

MCC services are delivered by multidisciplinary teams who are housed at the HIV medical home, and the teams work with medical care providers to coordinate patient care. Each team consists of three members: 1) the Medical Care Manager (MCM) who is a registered nurse; 2) the Patient Care Manager (PCM) who is a Master's level social worker; and, 3) the Bachelor's-level Case Worker (CW).

MCC Goals and Objectives

The goals of the MCC program are to:

1) Increase retention in HIV care;
2) Improve adherence to antiretroviral therapy;
3) Promote referral and linkage to support services; and
4) Reduce HIV transmission.

The program goals will be achieved by meeting the following key objectives:

1) To identify and provide care coordination services to patients at risk for poor health outcomes;
2) To assess patients to determine acuity and identify need;
3) To deliver integrated medical and non-medical support services based on patient acuity;
4) To provide brief interventions, including engagement in HIV, antiretroviral therapy adherence and sexual risk reduction, to patients with identified need;

5) To refer and link patients to appropriate support services in the continuum of care, including mental health, housing and addiction treatment;
6) To retain patients in HIV care through care coordination activities;
7) To increase the proportion of patients with viral load suppressed to less than 200 copies/mL; and
8) To reduce patient acuity over time.

Eligibility for MCC

MCC services are available to all HIV-positive patients at the 20 contracted agencies who are age 13 and older and reside in LAC, regardless of their insurance status. Patients are determined to need MCC by their primary medical care provider or through a biannual screening process to ensure that those who are at highest risk for poor outcomes are identified and served.

At the initial clinic visit and every six months thereafter, HIV medical home staff screen patients for MCC service need. Patients are identified as needing MCC if they meet one or more of the following criteria:

1) Are newly diagnosed (diagnosed with HIV in the past six months);
2) Are not in consistent HIV care (have not seen an HIV medical provider in 7 months or more);
3) Are not receiving antiretroviral therapy (ART) despite meeting current clinical guidelines for treatment;
4) Are on ART but do not have suppressed viral load (greater than 200 copies/mL); or
5) Are recently diagnosed with an STD (in the past 6 months).

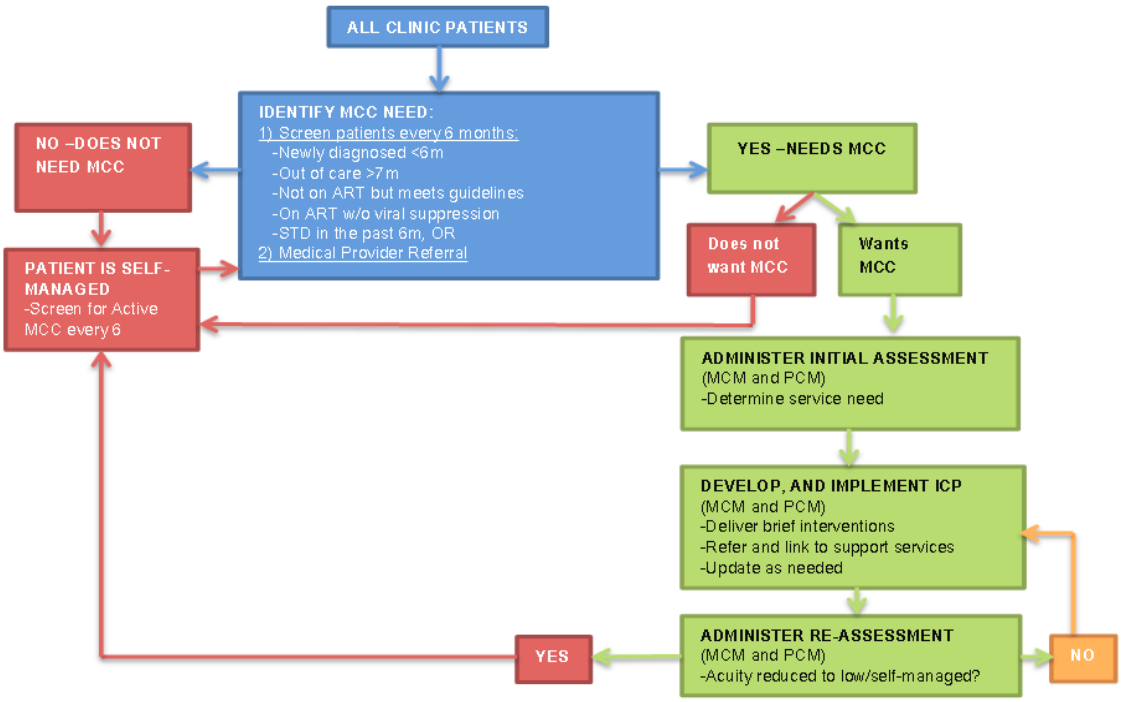
Patients who meet any of the screening criteria or who are referred by their HIV care provider are offered and enrolled in MCC services. Patients who do not meet any of the high-risk criteria may receive a more limited form of case management from the MCC team as needed, including referrals to support services; these patients will continue to be screened every six months to monitor for changes in their health status.

MCC Service Components

The key service components of MCC include assessment, integrated care planning, delivery of brief interventions, and reassessment (Figure 3). The nurse and the social worker jointly conduct a comprehensive assessment to identify medical and psychosocial need and to calculate patient acuity level. MCC service delivery is tailored to the patient's acuity, or level of need, which ranges from low to moderate, high and severe. Details on acuity determination are described further in the report.

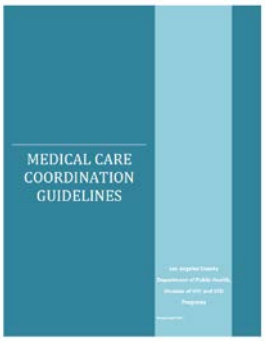
Based on needs identified in the assessment and the calculated acuity level, the MCC team and the patient develop an Integrated Care Plan (ICP) that consists of specific goals related to needs identified in the assessment and the actions required to meet these goals. Based on the goals in the ICP, the MCC team delivers brief interventions, refers and links to support services, monitors patient progress, case conferences with the clinical care team and re-assesses patient need. The intention of these activities is to reduce patient acuity levels over all and in specific domains over time. While the expected duration for receipt of MCC services is 12 months, patients with persistently high acuity levels may receive MCC services for a longer duration.

Figure 3: MCC Program Processes



SERVICE GUIDELINES

To ensure uniform implementation across agencies, DHSP developed the MCC Service Guidelines to function as the standard protocol for MCC service delivery [24]. The MCC Service Guidelines are based on Standards of Care for Medical Care Coordination developed by the COH. These standards were informed through an extensive review of the HIV, chronic disease, behavioral health and case management literature to identify evidence-based interventions that would be applicable to the MCC patient population. The MCC Service Guidelines operationalized these standards and are intended to serve as a resource for MCC staff and supervisors and as the foundation for the training developed by DHSP for MCC teams.



The success of the program relies on the MCC team's ability to educate patients and support behavioral changes that will lead to improved health outcomes. It is, therefore, important for the MCC team to apply behavior change theory to the service delivery process and to enhance patient motivation to adopt protective health behaviors through effective counseling styles. To achieve this, MCC is grounded in the Transtheoretical Model (TTM), a stage-based theory of health behavior change, and emphasizes the use of motivational interviewing techniques to facilitate that behavior change [25, 26]. The TTM (more commonly known as the "Stages of Change") model is well-established in the behavioral health literature as the theoretical foundation not only interventions for HIV but also for STD prevention, smoking, and substance addiction [27, 28, 29]. Similarly, motivational interviewing techniques have had demonstrated success across a range of health behaviors including ART medication adherence, care coordination and risk reduction [30, 27, 31].

MCC AGENCIES

In 2012, there were 20 medical home agencies providing RWHAP-funded medical care to approximately 17,670 PLWH in LAC [22]. The majority of clinic patients was Latino (50%) and Black (22%). Approximately 86% of patients were male, 12% were female and 2% were transgender. Most patients were uninsured (65%) and had low-income with 68% living at or below the federal poverty level (FPL). Starting in December 2012, these agencies were provided additional funding to implement MCC services. Among the 20 agencies, 19 were community-based agencies with 26 HIV clinics and 1 was a county agency with 9 HIV clinics.

While the integration of the MCC program into existing clinic services was individual to each clinic site, the implementation of MCC service delivery was standardized across agencies using several strategies. First, DHSP service delivery is guided by the comprehensive MCC Service Guidelines and the assessment tool that supports uniform evaluation of patient needs. Second, DHSP developed a four-day mandatory training for MCC team members and administrators to support fidelity to the service guidelines across all agencies. The training was designed to orient new providers to the MCC Service Guidelines and the expectations for service delivery. The format of the training was a mix of didactic lecture, modeling, group activities, and skills-building exercises with an observed role-play evaluation conducted at the end. Key components of the training included:

- An overview of the MCC program
- Collaborative patient assessment and integrated care planning
- Delivery of brief interventions to address antiretroviral adherence, engagement in HIV care and risk reduction, and
- Techniques such as strengths-based counseling and Motivational Interviewing.

Third, the MCC teams were trained on data reporting using the HIV Casewatch system. HIV Casewatch is the DHSP data reporting system for RWHAP-funded services. Finally, agency performance and service fidelity was tracked by DHSP contract managers through agencies' monthly data reports and annual contract monitoring.

MCC TEAMS

MCC services are delivered by a team of three providers. This includes a Medical Case Manager (nurse), Patient Case Manager (social worker), and Case Worker who work together to address patient need through service delivery and coordination. The expectation is that the MCC team holds regular case conferences with the medical providers to support service coordination. Clinical supervision of the MCC teams is the responsibility of the agencies and is generally performed by a nurse and/or licensed clinical social worker.

In 2013, there were 122 MCC provider positions funded by DHSP consisting of 37 nurses, 37 social workers, 35 case workers and 13 supervisor and/or administrative staff. The program is staffed for the implementation of 35 full MCC teams and 2 partial teams consisting of a nurse and a social worker.

Staffing allocation for each agency was determined based on the estimated active MCC caseload. A full MCC team was projected to serve an annual caseload of approximately 167 MCC patients. The patient caseload was estimated for each agency using historical data from previous case management programs and clinic population.

ASSESSMENT AND SERVICE DELIVERY

The determination of acuity is a key component of MCC and is used to identify service need, guide the intensity (frequency) of service delivery and track improvement. Acuity is calculated based on patient responses in the comprehensive MCC Assessment. The assessment is a standardized tool used by all MCC teams across the 20 agencies. The tool consists of validated measures, when available, and items developed internally by DHSP subject matter experts to identify patients' needs in 12 key domains that are associated with or impact retention in HIV care and/or viral suppression [32, 33, 34, 35, 36, 37, 38, 39]. The assessment tool and the summary of the measures are included in the report appendix.

The assessment is completed by the nurse and the social worker with the patient at the initial visit and at follow-up. The Health Status domain is intended to be abstracted from the patient medical record and then verified with the patient at the time of assessment completion. All other domains rely on self-reported information from the patient at the time the assessment is completed.

Guided by extensive literature review and expert opinion, key items in each domain of the assessment associated with poor health outcomes were identified and assigned scores specific to responses on those items [40, 41]. These scores are used to calculate overall acuity and domain-specific acuity and correspond to acuity levels of low, moderate, high and severe. Patients are considered to have identified need within a domain if the domain-specific acuity is high or severe.

The domains of Health Status, Mental Health, Substance Use, and Housing were identified as being most strongly associated with poor health outcomes. To account for this, the scores for these domains were weighted more heavily. No acuity is calculated for the Transportation domain as it was determined that need for this domain would be high for all patients. Table 1 lists the assessment domains and corresponding acuity scores as well as the ranges for the overall acuity scores.

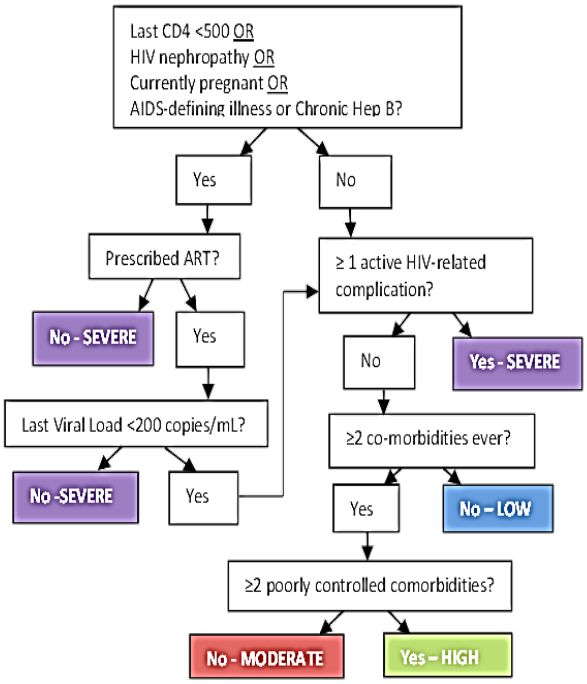
Table 1: Acuity Scores by Assessment Domain

	ACUITY SCORES			
DOMAIN	***Low***	***Moderate***	***High***	***Severe***
Health Status	**1**	**4**	**9**	**16**
Quality of Life	1	2	3	4
ART Access and Adherence	1	2	3	4
Medical Access, Linkage and Retention	1	2	3	4
Housing	**1**	**4**	**9**	**16**
Financial	1	2	3	4
Legal/End of Life Needs	1	2	3	4
Transportation	--	--	--	--
Support System and Relationships	1	2	3	4
Risk Behaviors	1	2	3	4
Alcohol/Drug Use and Addiction	**1**	**4**	**9**	**16**
Mental Health	**1**	**4**	**9**	**16**
OVERALL ACUITY	**12-24**	**24-42**	**43-75**	**75-132**

For each domain, an "acuity decision tree" was created to map assessment responses to acuity scores. The acuity tree illustrated in Figure 4 below is one example of how key questions identified as related to relevant health outcomes for the "Health Status" domain shape the acuity determination. Within the "Health Status" domain, severe and high acuity patients should receive the "engagement in care" brief intervention while moderate acuity

patients are monitored for changes in acuity and along with low acuity patients receive positive reinforcement for maintaining their health status. Please refer to the report appendix for detailed acuity tree scoring by domain.

Figure 4: Acuity Tree Example for the Health Status Domain



The acuity scores are calculated when the assessment is entered into the HIV Casewatch data system. The result is a summary of the domain-specific and overall acuity levels as shown below in Figure 5. This summary allows the MCC team to have a quick profile of the patient's acuity for service plan development that includes the delivery of brief interventions and referrals to support services.

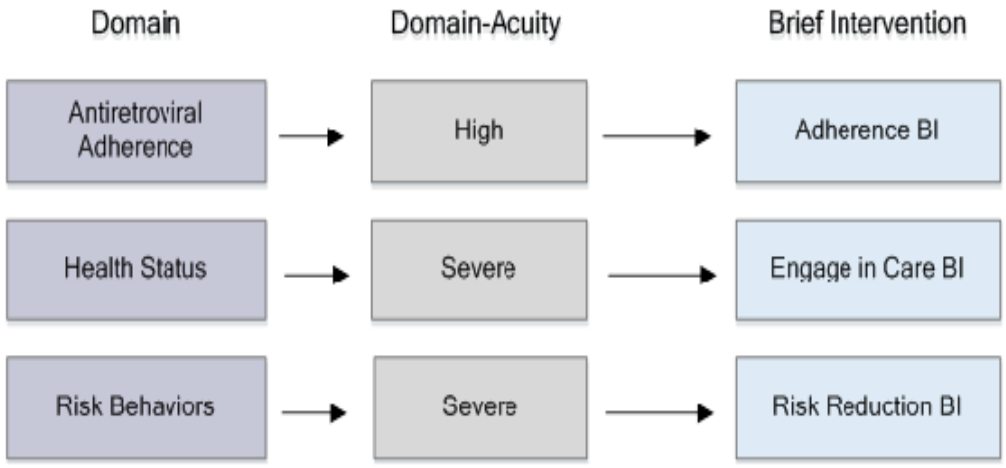
Figure 5: Example of MCC Acuity Summary in HIV Casewatch

Client	Patient, Test	Case #	123456
Date Assessment Started	9/15/12	Client Acuity Level Effective Date	9/16/12
Acuity		Domain	
	Moderate	Health Status	
	Self -Managed	Quality of Life	
	Severe	Antiretroviral Access and Adherence	
	Moderate	Medical Access, Linkage and Retention	
	Severe	Housing	
	Severe	Financial	
	Moderate	Legal/End of Life Needs	
	High	Support Systems	
	Self- Managed	Risk Behaviors	
	Self-Managed	Alcohol/Drug Use	
	Moderate	Mental Health	
Overall Acuity Score	50	Overall Acuity Level	High

Based on patient acuity level and needs identified in the assessment, the MCC team and the patient develop the ICP. The MCC team then deliver brief interventions (BIs), refer and link patients to support services, monitor patient progress, case conference with the clinical care team and re-assess patient need.

BIs are defined activities intended to facilitate and support health behavior change. They consist of evidence-based best practices and interventions to support engagement in HIV care, ART adherence, and sexual risk reduction [16, 42, 43, 44, 45]. The BIs are tools for the MCC teams to help patients increase their capacity for self-care and reduce acuity. While all patients may receive brief interventions, MCC teams are specifically directed to deliver brief interventions to those patients with identified need (high or severe domain-specific acuity) in the assessment domains of ART Access and Adherence, Health Status and Risk Behaviors (Figure 6).

Figure 6: Example of Brief Interventions Based on Assessment and Acuity Levels



Referral and linkage to relevant support services are other tools the MCC teams use to reduce barriers and promote health behaviors related to HIV care and ART adherence [46, 47]. These include mental health services, substance use disorder treatment, and housing services. Like the BIs, all MCC patients may be referred to support services, however MCC teams are required to refer and link patients with identified need in the assessment domains of Mental Health and Alcohol/Drug Use and Addiction.

EVALUATION METHODS

The evaluation of the MCC program is integrated into the program design. The assessment and service data elements reported in HIV Casewatch were selected to have utility to the MCC teams as well as to inform the evaluation. Outcome data is obtained by matching HIV laboratory data reported in the LAC HIV/AIDS Reporting System (eHARS) which includes all HIV viral load, CD4 count and genotype tests performed in LAC, with HIV Casewatch data. This allows us to characterize retention in care and viral suppression before enrollment in MCC and to track changes in these outcomes over time after enrollment. The intentional inclusion of the evaluation into the program provides sustained monitoring and evaluation using existing resources.

The first-year evaluation focuses on the implementation of MCC and examines its effectiveness to improve retention of patients in HIV care and viral suppression. The implementation evaluation examines how well the program has been put into action and fidelity to the service guidelines during that process. This includes program administration, program reach, and service delivery. The effectiveness of the MCC program was evaluated using a

pre-and-post study design to compare retention in care and viral suppression in the 12 months before and after enrollment in the program. Additionally, to monitor progress towards meeting the NHAS targets among MCC patients, we use 2014 benchmarks of 64% for persons with HIV to be in continuous medical care, and 55% to be virally suppressed [1].

The evaluation is limited to those patients enrolled in MCC from January 1, 2013 through December 31, 2013. Enrollment was defined as having had an initial assessment reported in the HIV Casewatch system during the evaluation period. Among the 1,204 patients enrolled in 2013, 100% were matched with eHARS data.

Outcomes at 12 months were calculated using eHARS data using definitions consistent with NHAS indicators [1]. Viral suppression was defined as having viral load test value less than 200 copies/mL. We limited viral load tests to the last 6 months of the 12-month period before and after MCC enrollment (yes/no). Patients who did not have a viral load test within the measurement period were conservatively classified as not being virally suppressed. Retention in care was calculated as 2 or more viral load, CD4 or genotype tests in the 12-month period at least 90 days apart [48].

Differences in average (mean) values were compared using ANOVA tests. Chi-square techniques were used to test for differences between and across acuity levels. The chi-square test for trend was used to identify significant increases or decreases in key patient characteristics by acuity level such as the proportion of patients with a history of incarceration by acuity level. The results of this test were used to validate the overall and domain-specific acuity scoring methods – a significant result suggests the scoring method was appropriate. Finally, generalized estimating regression modeling was used to determine the effect of MCC on retention in HIV care and viral suppression before and after enrollment in MCC for the full sample and stratified by key patient characteristics [49]. This statistical technique accounts for the fact that the multiple measurements from a single person over time (before and after MCC) are more similar to each other than are measurements from two different people at a single time point. All analyses were performed using Statistical Analysis Software (SAS) version 9.3.

EVALUATION RESULTS

This initial evaluation report describes program implementation in the first year and presents data on patient characteristics, assessment domains, service delivery and 12-month outcomes for the 1,204 patients enrolled in MCC services from January 1, 2013 through December 31, 2013. These data were reported in HIV Casewatch as of July 31, 2014 by 19 of the 20 MCC agencies.

PROGRAM IMPLEMENTATION

Staffing and Training

Of the 122 MCC staff positions funded by DHSP, 110 (90%) were filled in 2013. A total of 32 (86%) of the 37 MCC teams were fully staffed. The 12 vacant positions were primarily at county clinic sites and due to delays in the hiring process. During 2013, 6 MCC agencies had 11 positions with staff turnover.

From the start of the MCC service contracts in November 2012 through the end of 2013, DHSP provided a total of 10 four-day MCC programmatic trainings attended by 123 participants. Attendees were primarily MCC providers but also included clinic administrators overseeing MCC programs.

In addition to the programmatic training, DHSP sponsored 22 one-day data reporting trainings for MCC providers. These trainings were required for MCC staff at the agencies to enter and track client data in HIV Casewatch, the DHSP data management system. Trainings were developed and executed in partnership with Automated Case Management Systems (ACMS), the vendor for HIV Casewatch. A total of 131 MCC staff, including MCC team members and administrators, attended HIV Casewatch trainings from November 2012 through December 2013.

Motivational Interviewing and Treatment Adherence Training

As part of on-going skills enhancement for MCC providers, DHSP sponsored two *Motivational Interviewing and Treatment Adherence* trainings held in October and November 2013. The training was a two-day course required for the MCC MCMs and optional for the PCMs. The trainings were facilitated by Kathy P. Goggin, Psy.D, Director of Health Services and Outcomes Research at Children's Mercy Hospitals and Clinics. A total of 40 MCC staff attended the trainings.

The purpose of the training was to increase exposure to motivational interviewing techniques and to train providers on the treatment adherence intervention required for patients with an identified need for adherence support. DHSP offered continuing education units (CEUs) for the nursing participants during this training. Additionally, the training built capacity within DHSP to provide similar types of trainings in the future.

Provider Meetings

DHSP hosted five MCC provider meetings from November 2012 to August 2013. These consisted of three in-persons and two teleconference meetings. These meetings supported the MCC agencies in the transition from legacy medical and non-medical case management programs to the MCC program. Meetings addressed program implementation updates, frequently asked questions (FAQs) and provider concerns. Implementation updates largely clarified administrative issues, such as the process for data collection and management, monthly report submission, invoicing, service documentation requirements, and opportunities for staff training. FAQs emphasized service delivery expectations outlined in the MCC Service Guidelines (distributed to agencies in November 2012).

These included the process for screening patients, MCC provider roles and responsibilities, required intensity of services by acuity, and how patient acuity was assessed and calculated.

The August 2013 meeting primarily focused on integration of MCC services in the medical homes and facilitated a meet-and-greet with HIV testing service providers who may refer newly diagnosed patients to MCC clinic staff.

Monitoring and Technical Assistance

DHSP Contract Managers provided modified monitoring and technical assistance to MCC providers both prior to and during the initial implementation of the program to ensure fidelity to the service guidelines and to troubleshoot agency concerns. In 2012 DHSP Contract Managers conducted transitional evaluations with 15 MCC providers who had legacy medical and non-medical case management contracts. These evaluations were designed

to assist providers in effectively transitioning clients from the older case management service and to anticipate the integration of MCC services in their medical homes.

Starting in March 2013, DHSP Contract Managers initiated implementation monitoring activities with all funded MCC agencies. These activities consisted of an evaluation of how the service was being implemented, the integration of the service into the medical home and the provision of technical assistance. The DHSP Contract Managers continued to provide MCC implementation support during fiscal year 2013-14. By the end of June 2014, DHSP Contract Managers completed an implementation evaluation for all funded agencies.

DHSP Contract Managers and ACMS staff also supported agencies on an as-needed basis to answer questions related to program design, service delivery, HIV Casewatch data reporting and contract administration.

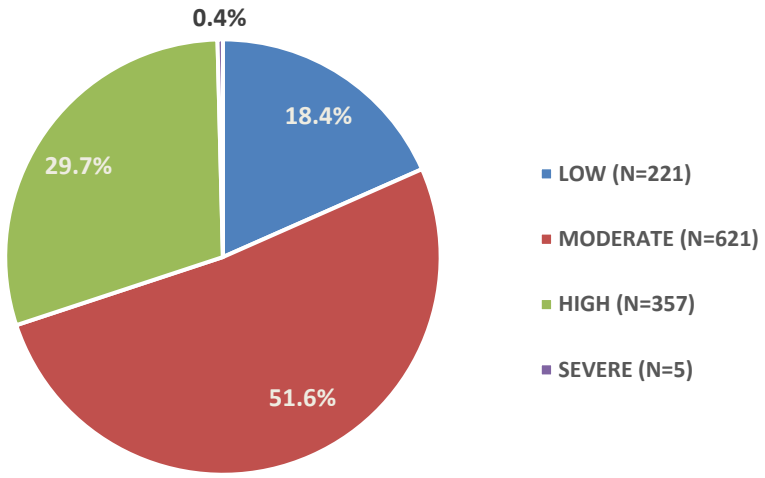
Characteristics of Patients Enrolled in MCC

From January 1, 2013-December 31, 2013, 1,204 patients were enrolled in MCC (defined as having an initial assessment completed in 2013). Patient acuity and socio-demographic characteristics are presented below in Figure 7 and Table 2. The purpose of Table 2 is to describe overall patient characteristics and to identify differences in characteristics within specific patient groups (row %) and across acuity levels (column %).

Patient Acuity at Enrollment

Figure 7 illustrates the proportion of patients by acuity level at MCC enrollment. Of the 1,204 patients enrolled, 221 (18%) were low acuity, 621 (52%) were moderate acuity, 357 (30%) were high acuity and 5 (0.4%) were severe acuity.

Figure 7: MCC Patients by Acuity Level at Enrollment (N=1,204), 2013



Source: DHSP, Casewatch, Years 22-23, MCC Assessment, Jan-Dec 2013

Due to their small number, severe acuity patients have been combined with high acuity patients in the further analyses.

Age at Enrollment

The average age of patients at MCC enrollment was 40 years and ranged between 16 and 80 years old. The median age of 41 years was younger than the median age of 48 years reported among PLWH in LAC in 2013 [50]. As presented below in Table 2, there were no significant differences in mean age at enrollment by acuity level.

Most patients enrolled in were between the ages of 25-44 years (53%), followed by 36% aged 45-64, 9% aged 16-24, and 2% aged 65 and older. As shown in Table 2, there were significant differences in the distribution of patients by age group (column %) across acuity levels (X^2 $p<0.05$), but trend test was non-significant indicating that the proportion of patients in a specific age group did not increase significantly as acuity severity increased (trend $p>0.05$). The highest proportion of high/severe acuity patients was seen among patients aged 25-44 (58%; row%), followed by 35% among those aged 45-64, 7% among those aged 16-24 years old and 1% among those aged 65 and older (Table 2).

Both across the US and in LAC, younger PLWH are less likely to be adherent to ART medications, virally suppressed, or retained in care compared to older PLWH [15, 14, 21]. The MCC patient population represents a younger group of PLWH than in LAC overall. This suggests that MCC teams are successfully engaging younger PLWH in services.

Sex at Birth and Gender

The majority of patients by sex at birth were male (87%). Similarly, among patients by gender the majority were male (85%), 13% were female, and 2% were transgender. Among the transgender patients, all identified as transgender women (male-to-female). The distributions of patients by sex at birth and by gender are similar to distributions reported in 2013 among PLWH in LAC and receiving medical and support services in the RWHAP in LAC [51, 50].

No significant differences were seen by acuity among patients by sex at birth or gender (Table 2, column %). Although a test for trend by acuity was non-significant, the proportion of transgender patients increased as acuity severity increased. Among transgender, 52% were high/severe acuity compared to 30% males and 25% of females with high/severe acuity (Table 2, row %).

Compared to non-transgender PLWH, transgender PLWH have been demonstrated in the literature to have worse access and lower adherence to ART medications in addition to lower rates of viral suppression and retention in HIV care [52, 21]. The large proportion of transgender patients who are high/severe acuity suggests that the medical and support service needs of these patients are being captured in the assessment and provides the MCC team the opportunity to address issues that contribute to these disparities through acuity-driven service delivery.

Table 2: Socio-demographic Characteristics of MCC Patients by Acuity Level (n=1,204), 2013

Characteristics	Total (n=1,204)	Acuity Level		
		Low (n=221)	Moderate (n=621)	High/Severe (n=362)
Age*				
16-24 years (row %)	113 (9%)	22%	57%	21%
(column %)		11%	10%	7%
25-44 years (row %)	639 (53%)	17%	50%	33%
(column %)		50%	51%	58%
45-64 years (row %)	433 (36%)	18%	53%	29%
(column %)		35%	37%	35%
65 years and older (row %)	19 (2%)	37%	53%	11%
(column %)		3%	2%	1%
Mean (SD)	40 (11.4)	40 (12.1)	41 (11.5)	40 (10.7)
Sex at birth*				
Male (row %)	1049 (87%)	21%	55%	24%
(column %)		15%	14%	10%
Female (row %)	155 (13%)	18%	51%	31%
(column %)		85%	86%	90%
Gender*				
Male (row %)	1019 (85%)	18%	51%	30%
(column %)		84%	84%	85%
Female (row %)	160 (13%)	21%	54%	25%
(column %)		15%	14%	11%
Transgender (row %)	25 (2%)	8%	40%	52%
(column %)		1%	2%	4%
Race/ethnicity				
Black (row %)	311 (26%)	17%	50%	32%
(column %)		24%	25%	28%
White (row %)	263 (22%)	21%	48%	31%
(column %)		25%	20%	23%
Latino (row %)	586 (49%)	18%	53%	29%
(column %)		48%	50%	46%
Other (row %)	44 (4%)	6%	59%	27%
(column %)		3%	4%	3%

Income distribution*,**				
below FPL (row %)	904 (75%)	17%	48%	35%
(column %)		71%	70%	86%
100-200% of FPL (row %)	211 (18%)	20%	61%	19%
(column %)		19%	21%	11%
above 200% of FPL (row %)	89 (7%)	22%	66%	11%
(column %)		9%	10%	3%
Insurance status*,**				
Insured (row %)	178 (15%)	11%	49%	40%
(column %)		9%	14%	20%
Uninsured (row %)	1,026 (85%)	20%	52%	28%
(column %)		91%	86%	80%

* X^2 p <0.05

** Trend p <0.05

Race/Ethnicity

Nearly half of patients enrolled in MCC were Latino (49%) followed by Black (26%), White (22%) and 4% were other race/ethnicities (Table 2). Patients of other race/ethnicities were combined because of small numbers and included: Asians (n=33), Native Hawaiians/Pacific Islanders (n=5), Native Americans/Alaska natives (n=4), patients with more than once race (n=1), and patients of unknown race (n=3). There were no significant differences in racial/ethnic groups across acuity level (Table 2, column %)). Similarly, the distribution of patients by acuity did not differ significantly within racial/ethnic group (Table 2, row%).

A higher proportion of patients in MCC were Black (26%) compared to the proportions of Blacks reported in LAC eHARS (20%) or receiving RWHAP services (22%) in LAC in 2013 [50, 51]. This is important because in LAC, eHARS data indicate that compared to Whites, Blacks living with HIV are less likely to be engaged in HIV medical care or virally suppressed [21]. The higher proportion of Blacks in MCC compared to LAC or the RWHAP suggests that this vulnerable population is being effectively engaged in MCC services.

Income Level

The majority of MCC patients (75%) was living at or below the federal poverty level (FPL) at enrollment, followed by 18% at 100%-200% of FPL, and 7% above 200% of FPL. The proportion of MCC patients living at or below FPL is higher compared to the 67% of RWHAP clients and the 18% of LAC residents living at or below FPL in 2013 [51, 53].

There were significant differences in income across acuity level, as shown in Table 2 (column %), with 86% of patients of high/severe acuity patients were living at or below FPL, compared to 71% for low and 70% for moderate acuity patients (trend p-value <0.0001). There were also significant differences in acuity within income levels (Table 2, row %), as 35% of patients living at or below FPL were high/severe acuity, compared to 19% of those living at 100%-200% of FPL, and 7% above 200% of FPL (χ^2 p<0.05). These data demonstrate that a higher

proportion of low-income PLWH are being identified and enrolled in MCC compared to RWHAP clients. In addition, because of their higher acuity, MCC teams are directed to provide more intensive services to them. The high proportion of low income patients in MCC is important because lower socio-economic status has been associated with poor viral suppression and retention in HIV care [54, 15].

Insurance Status

Insurance status was defined using data on RWHAP-funded medical visit data reported in Casewatch. Patients with any medical visit paid for by the RWHAP in the 12 months following MCC enrollment were considered uninsured. Among the 1,204 patients enrolled in MCC, 85% were uninsured (Table 2). This proportion is higher than 51% of uninsured clients (≥1 RWHAP-funded medical visit) among the 18,134 clients served in all RWHAP agencies in 2013 [51].

As shown in Table 2, while 80% of high/severe acuity patients were uninsured (column %), a lower proportion of uninsured patients were high/severe acuity (29%; row %) compared to insured patients (40%; χ^2 $p<0.05$). MCC services are available to all medical patients in RWHAP clinics in LAC regardless of how their medical care is paid for or their insurance status.

Key Initial Assessment Findings

The assessment is completed jointly by the nurse and the social worker together with the patient at time of enrollment in MCC. The highlights from the initial MCC assessment are presented below. The detailed assessment data in tables by domain is available for review in the report appendix.

HIV History and Disease Status

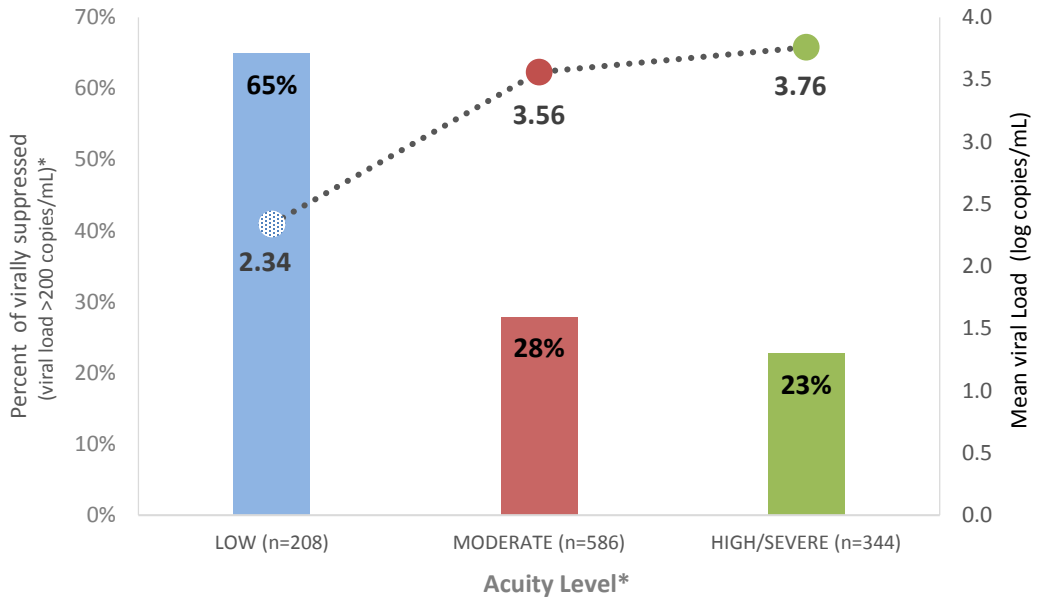
HIV Viral Load and Viral Suppression

In general, the range of values for viral load measures is very wide - from less than 50 copies/mL to over 10 million copies/mL. To make this wide range more manageable, viral load is often reported as log copies (expressed to the power of 10). Using this convention, a viral load less than 50 copies/mL is equivalent to 1.7 log copies/mL while a viral load of 10 million copies/mL is equal 7.0 log copies/mL [55]. Viral suppression of less than 200 copies/mL corresponds to 2.3 log copies/mL.

Among the 1,204 MCC patients, 1,138 (95%) had a viral load test reported in eHARS in the six months before enrollment in MCC. Among the 66 patients without viral load test, 18% were low acuity, 52% moderate and 30% high/severe acuity patients. The average time since last viral load test within the past six months was 0.9 months (median=0.6 months) with no significant differences in time across acuity levels.

Mean log viral load for these 1,138 patients in the six months prior to enrollment was 3.4 log copies/mL (standard deviation [SD] =1.55) and 376 (33%) had viral load suppressed to less than 200 copies/mL). Figure 8 below shows the mean viral load in past six months in log copies/mL and proportion of patients with viral suppression by acuity level. Mean log viral load and viral suppression differed significantly by acuity level (ANOVA $p<0.05$; trend $p<0.0001$). Across all acuities the mean log viral load exceeded the 2.3 log copies threshold for viral suppression.

Figure 8: Viral Suppression and Mean Log Viral Load in the Past 6 Months prior Enrollment by Acuity Level (n=1138), 2013



*ANOVA p<0.05; trend p<0.0001

Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Among the 66 patients with no viral load test in the six months prior to enrollment, viral load was assumed to be greater than 200 copies/mL. Following this approach, 31% of the full sample of 1,204 patients were estimated to be virally suppressed (<200 copies/mL) at enrollment. The proportion of patients virally suppressed at enrollment varied significantly by acuity level with 63% of low, 25% of moderate and 19% of high/severe patients estimated to have viral load less than 200 copies/mL (trend p<0.0001).

The proportion of MCC patients with suppressed viral load (31%) is much lower than the proportions of PLWH with viral suppression reported among RWHAP clients in 2013 (80%). It is also lower than what was reported in 2013 in eHARS among all PLWH (55%). This suggests that patients identified and enrolled in MCC may not have had access to ART or that they were unable to adhere consistently to their ART regimens.

CD4 Cell Count

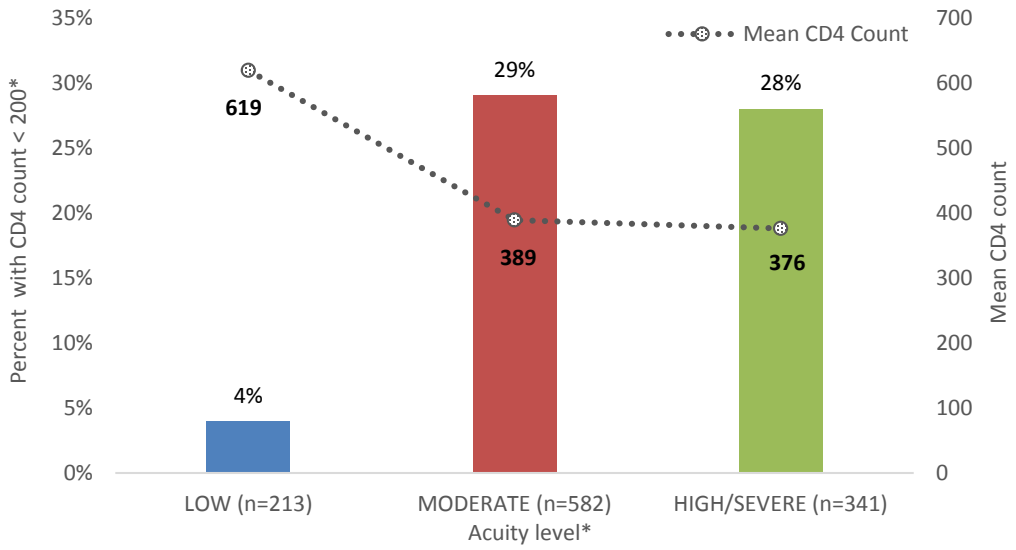
CD4 count values indicate HIV disease progression and how well the immune system is functioning [56]. A healthy CD4 count for PLWH is above 500 cells mm^3, while CD4 counts below 200 cells mm^3 indicate progression to AIDS.

CD4 count test results within the past 6 months were reported in HARS for 1,136 (94%) of 1,204 patients at enrollment. The average time since CD4 test in the past 6 months was 0.9 months (median=0.7 months) with no significant differences in time across acuity levels. The availability of CD4 test results did not differ significantly by acuity level.

The average CD4 count in the past 6 months was 428 cells/mm^3 with range from 1 to 1,858 (median=397 cells/mm^3). The majority of patients (40%) had a CD4 count between 200-500 cells/mm^3, followed by 36% with CD4 count above 500 cells/mm^3, and 24% with CD4 count below 200 cells/mm^3.

Differences in average CD4 count across acuity levels among MCC patients at enrollment are shown in Figure 9, with significantly lower average CD4 count values among moderate and high/severe patients compared to low acuity (ANOVA p-value <0.0001). Similarly, there were significant differences in the distribution of CD4 count categories by acuity level, with the proportion of patients with CD4 counts less than 200 significantly higher among moderate and high/severe acuity patients, compared to low acuity patients (trend p<0.0001).

Figure 9: Proportion of Patients with CD4 Count Less Than 200 and Mean CD4 Count in the Past 6 Months prior Enrollment by Acuity, 2013



*ANOVA and Trend p -value < 0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

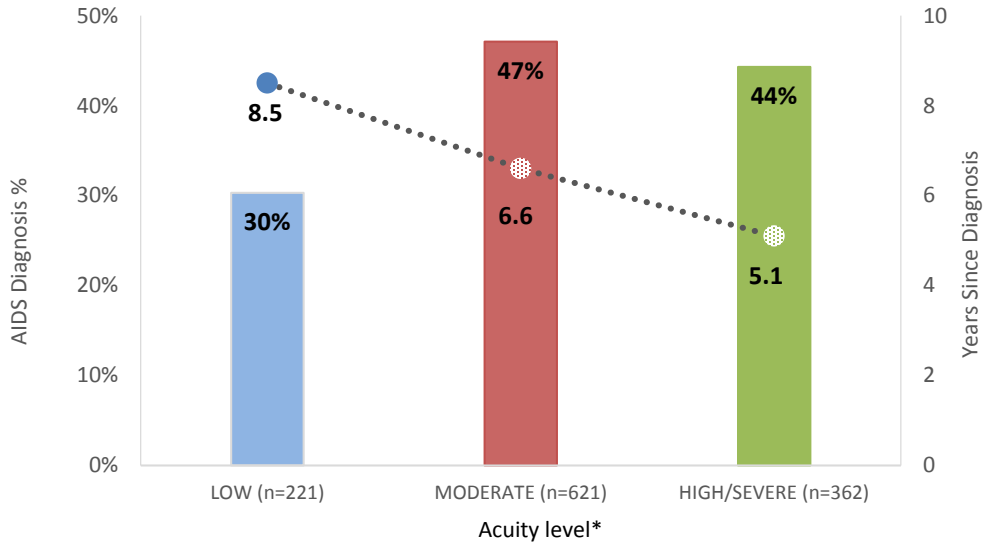
HIV History and AIDS Status

HIV history, disease status and comorbidities were abstracted from patient medical records. Overall, MCC patients had been living with HIV on average for 5.6 years (median=3.2) at time of enrollment. There were no significant differences in time since HIV diagnosis across acuity levels.

Of the 1,204 patients enrolled, 520 (43%) had an AIDS diagnosis. Among those diagnosed with AIDS, the average time since their AIDS diagnosis was 6.4 years (median=4.7). The 43% of MCC patients with an AIDS diagnosis is consistent with the 42% reported among RWHAP clients in 2013, but lower than the 58% reported among PLWH in LAC in 2013 [50, 51]. This may be a function of MCC patients being younger than PLWH in LAC or that MCC patients are more likely to be in HIV care, and therefore less likely to have progressed to AIDS.

Figure 10 below illustrates the proportion of patients with an AIDS diagnosis and the trend line indicates average (mean) years since their AIDS diagnosis by acuity level. The proportion of patients with an AIDS diagnosis differs significantly and increases by acuity level (trend p<0.001). There are significant differences in mean years since AIDS diagnosis across acuity levels; mean years range on average from 5.1 years for high/severe acuity to 6.6 years for moderate acuity and 8.5 years for low acuity patients (p-value < 0.05 for all pairwise comparisons of acuity levels).

Figure 10: Proportion of AIDS Diagnosis and Mean Years since AIDS Diagnoses at Enrollment by Acuity Level (n=1,204), 2013



Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

These data suggest that patients with a more recent AIDS diagnosis may be struggling with additional co-morbidities and/or psychosocial issues compared to patients who have had to manage an AIDS diagnosis for longer periods of time. It could also reflect selective mortality where those patients in the high/severe acuity group less likely to survive for a long period after receiving an AIDS diagnosis.

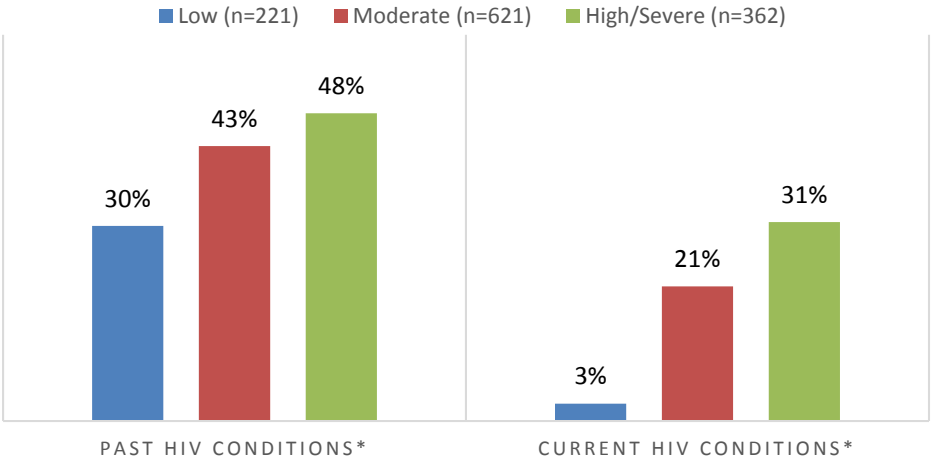
Comorbid Clinical Conditions

Prevalence of selected past and current or poorly controlled co-occurring conditions were abstracted from patient medical records by the MCM and applied to the Health Status domain of the assessment. These specific conditions are listed in the assessment in the appendix but are collapsed into categories for the analysis due to the large number of conditions and the small numbers of patients who reported experiencing them.

HIV-Related Conditions

Patient medical records were reviewed by the MCM for 31 past or current HIV-related conditions at enrollment. Approximately 39% of patients had at least one past HIV-related condition, and 19% had at least one current HIV-related condition. The average number of past HIV conditions (mean=1.8 conditions, range=1.0-9.0) and current HIV conditions (mean=1.4 conditions, range=1.0-6.0) varied significantly by acuity level (ANOVA $p<0.0001$). As seen in Figure 11, the prevalence of past HIV-conditions and current HIV conditions increased significantly as acuity severity increased (trend $p<0.0001$ for both).

Figure 11: Prevalence of Any HIV-Related Conditions by Acuity Level (n=1,204), 2013



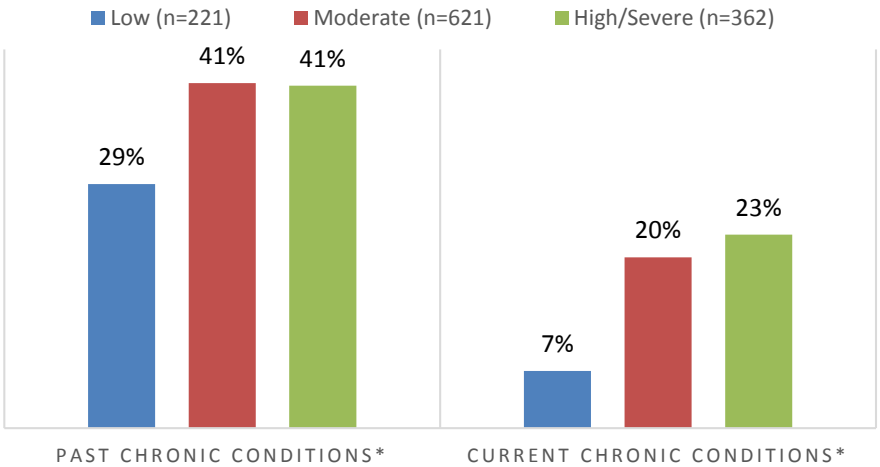
* Trend p=0.0002, X^2 p <0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

The differences in the prevalence of past and current HIV conditions by acuity level suggests that higher severity patients have historically had worse health status and continue to be more heavily impacted by HIV-related health conditions.

Chronic Diseases

Prevalence of past and current poorly controlled chronic disease was assessed at enrollment through medical record abstraction. Of the 1,204 patients, 38% had at least one past chronic disease, and 19% had at least one current, poorly controlled chronic disease condition. Figure 12 shows that both high/severe and moderate acuity patients (41% each) had significantly more past chronic disease compared to low acuity (29%; X^2 p-value0.008). Similar patterns are seen for current chronic disease by acuity level, with significantly higher proportions of patients experiencing current chronic diseases as acuity severity increases (trend p<0.0001). The average number of past chronic diseases (mean=1.2 diseases, range=1.0-8.0) and current chronic conditions (mean=1.6 conditions, range=1.0-6.0) varied significantly by acuity levels (ANOVA p<0.0001).

Figure 12: Prevalence of Chronic Diseases at Enrollment by Acuity Level (n=1,204), 2013



* Trend and X^2 p <0.01
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

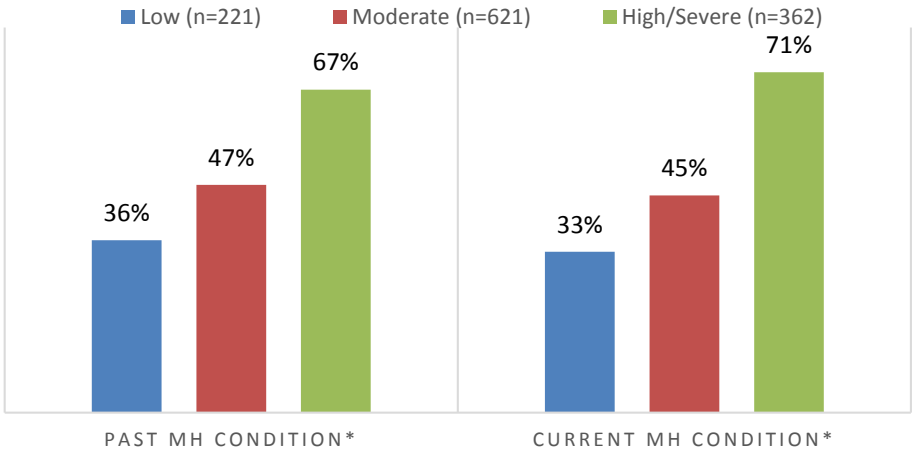
As seen with the HIV-related conditions, the differences in the prevalence of past and current chronic disease conditions by acuity level suggests that higher severity patients have historically had worse health status and continue to be more heavily impacted by chronic disease conditions.

Mental Health Diagnoses

Prevalence of previous and current diagnosed mental health conditions was abstracted from patients' medical records by the MCMs. Over half of patients (51%) had at least one previous mental health diagnosis, and the same proportion (51%) had ongoing mental health diagnoses at enrollment. The three most prevalent past diagnoses were depression (42%), anxiety (30%) and bipolar disorder (9%). The same conditions were also the most prevalent among current diagnoses: depression (41%), anxiety (29%) and bipolar disorder (9%).

As seen in Figure 13, the proportion of patients with previous and current mental health diagnoses increased significantly as acuity level increased (trend p<0.0001). Within both low and moderate acuity levels, the prevalence of current mental health diagnoses was lower than the prevalence of past mental health diagnoses, while the prevalence of a current mental diagnosis was higher among high/severe acuity patients compared to the prevalence of past mental health diagnosis.

Figure 13: Prevalence of Diagnosed Mental Health Conditions by Acuity Level (n=1,204), 2013



*Trend p<0.0001; X2 p<0.0001;
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

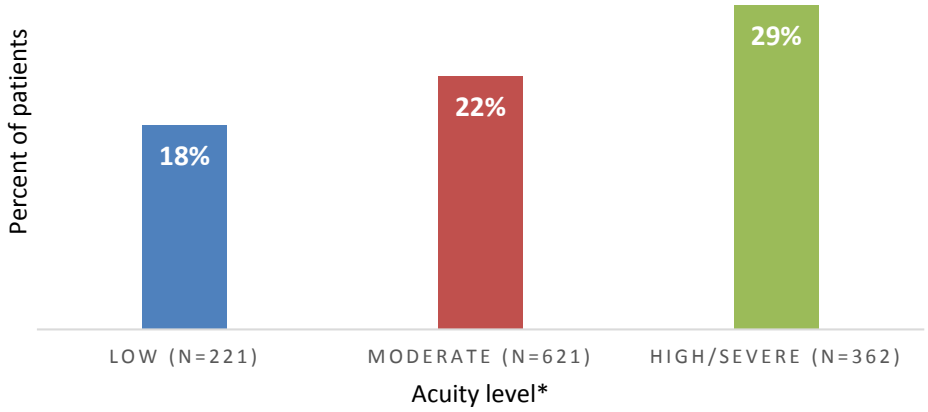
The average number of previously diagnosed mental health conditions (mean=1.4 conditions, range=1.0-4.0) and currently diagnosed mental health conditions (mean=1.5 conditions, range=1.0-4.0) differed significantly across acuity levels with a higher number of past and current mental health conditions diagnosed among high/severe compared to low and moderate patients (trend p<0.0001).

This high prevalence of past and current mental health diagnoses along with the significantly higher number of diagnoses among high/severe patients suggests that higher acuity patients may be struggling with more than one mental health issue and have more recently been diagnosed with a mental health condition compared to lower acuity patients.

Mental Health Medications

Based on medical chart abstraction at enrollment, 282 (23.4%) of the 1,204 MCC patients were currently taking medications for mental health conditions. As shown in Figure 14, the proportion of MCC patients taking mental health medications increased significantly as acuity severity increased, from 18% of low, to 22% of moderate, and to 29% of high/severe acuity patients (trend p=0.002).

Figure 14: Patients Taking Mental Health Medication at Enrollment by Acuity Level (n=1,204), 2013

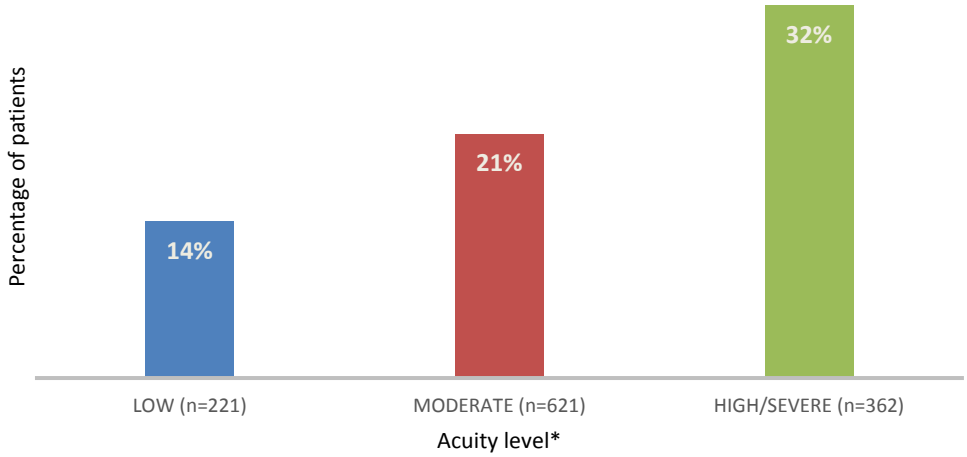


* Trend p<0.01; X^2 p=0.002
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Sexually Transmitted Diseases

Nearly a quarter of patients (23%) enrolled in MCC had been diagnosed with at least one STD in the past 6 months. These included: syphilis (11%), chlamydia (7%), gonorrhea (7%), herpes simplex (2%), human papilloma virus (1%), and trichomoniasis (<1%). As shown in Figure 15 below, the proportion of patients diagnosed with an STD in the past 6 months increased significantly by acuity level: low acuity (14%), moderate acuity (21%), and high/severe (32%; p=<0.0001).

Figure 15: Prevalence of an STD Diagnosis in the Past 6 Months by Acuity Level (n=1,204), 2013



Trend p<0.0001; X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

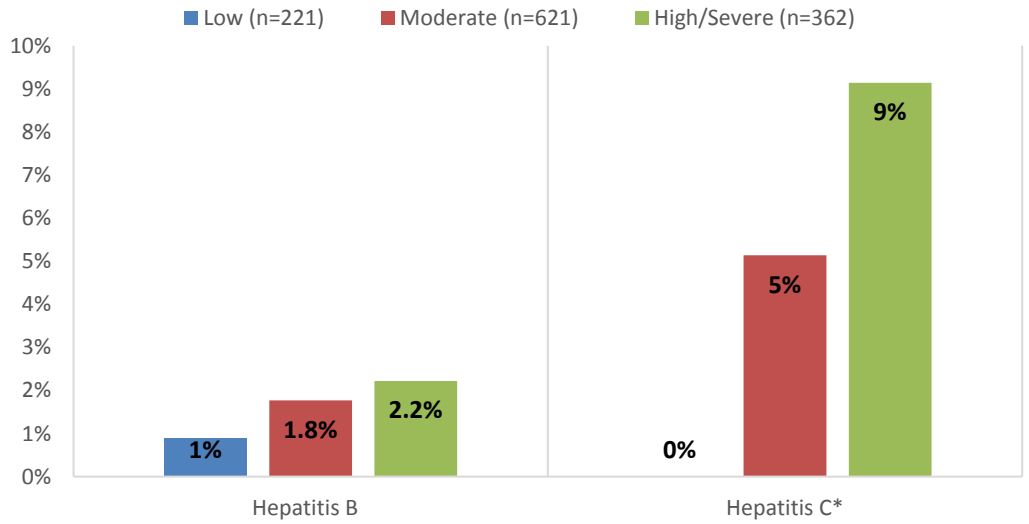
There were significant differences noted in the prevalence of recent chlamydia and syphilis diagnoses by acuity level (trend p<0.005). A significantly higher proportion of high/severe acuity patients (18%) had been diagnosed with syphilis in the past 6 months compared to low (4%) and moderate acuity patients (11%). Similarly, a significantly higher proportion of high/severe acuity patients (11%) had been diagnosed with chlamydia in the past 6 months compared to low (5%) and moderate acuity patients (6%). There were no significant differences in recent gonorrhea diagnoses by acuity level.

Recent STD infection among MCC patients may suggest inconsistent or low condom use. At enrollment in MCC, two-thirds of patients (70%) were not virally suppressed. PLWH who have unsuppressed viral load are more likely to transmit HIV to their partners through sexual intercourse especially if they are not using condoms [57, 58, 8]. Regardless of viral suppression, all PLWH are more likely to acquire and to transmit STDs through unprotected sex (without condom). MCC is effectively identifying a group of patients that may be at increased risk for STD acquisition and HIV and STD transmission.

Hepatitis

Data on Hepatitis B and C diagnoses as well as Hepatitis B vaccinations were collected through medical abstraction. Approximately 2% of MCC patients had ever been diagnosed with Hepatitis B and 5% with C (data not shown). Figure 16 below shows the proportion of patients diagnosed with Hepatitis B and C by acuity level. The proportion of patients diagnosed with Hepatitis C increased with acuity level (p<0.001), with the highest percentage in high/severe acuity group (9%). There were no significant differences in the proportion of patients with Hepatitis B by acuity level.

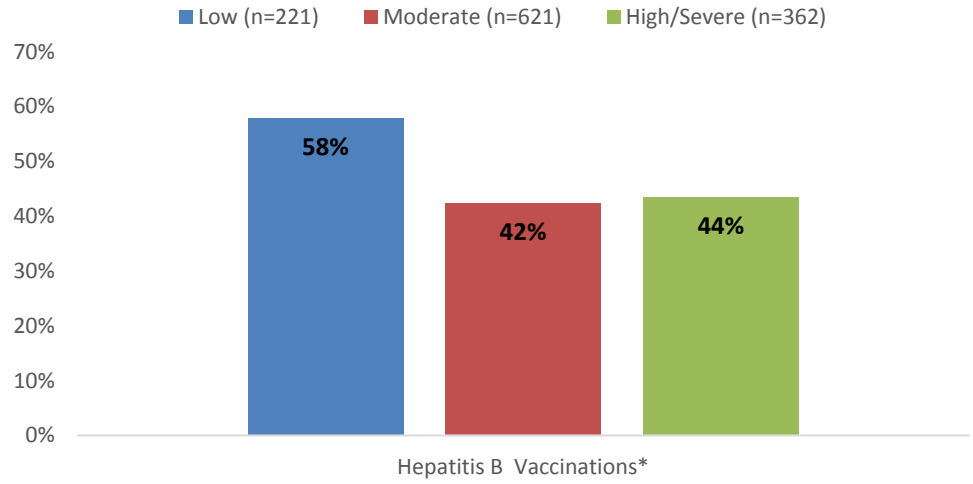
Figure 16: Prevalence of Patients with Hepatitis B and C at Enrollment by Acuity Level (n=1,204), 2013



* Trend and X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Among the 1,204 patients in MCC, 548 (46%) had ever been vaccinated for Hepatitis B. As shown below in Figure 17, a significantly higher proportion of low acuity patients had been vaccinated for Hepatitis B (58%) compared to high/severe (44%) and moderate acuity patients (42%; p<0.001).

Figure 17: Proportion of Patients Vaccinated for Hepatitis B at Enrollment by Acuity Level, 2013



* X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec

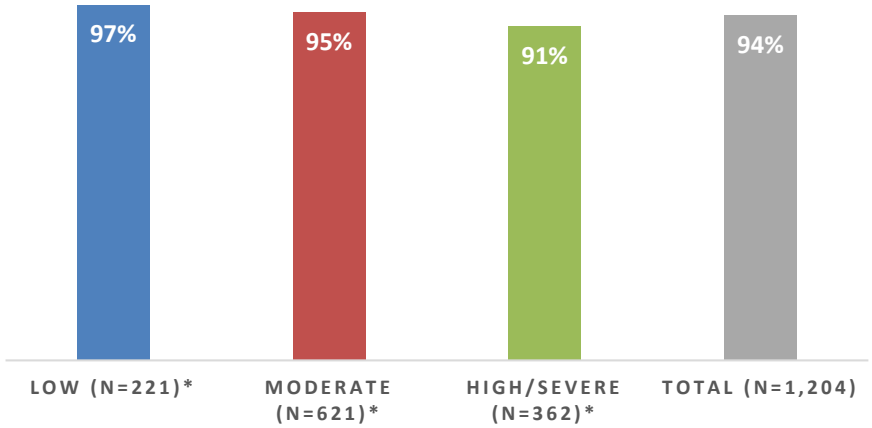
These data suggest that higher acuity patients are disproportionately affected by Hepatitis B and C compared to lower acuity patients and lower proportions of higher acuity patients are vaccinated for Hepatitis B. This is consistent with the data presented earlier demonstrating a higher prevalence of current HIV-related conditions and poorly controlled chronic disease among higher acuity patients.

Access to Health Care and Utilization

HIV Care

At enrollment in MCC, 94% of patients reported having a regular HIV doctor. Figure 18 illustrates the proportion of patients with a regular HIV doctor by acuity level. The proportion of patients with a usual HIV doctor decreased significantly as acuity severity increased (trend=0.002).

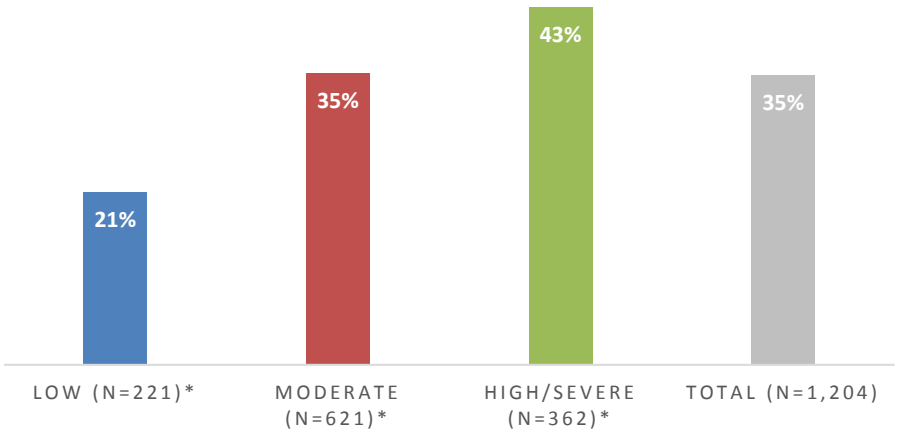
Figure 18: Patients with a Regular HIV Care Doctor at Enrollment (n=1,204), 2013



* Trend p<0.002; X^2 p=0.006
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

As shown below in Figure 19, at time of enrollment in MCC, approximately 35% of patients reported ever missing an appointment with their HIV doctor. The proportion ever missing an HIV care appointment increased significantly as acuity severity increased, ranging from 21% among low acuity patients to 43% among high/severity acuity patients. Poor engagement in HIV care is one of the screening criteria for MCC and is a key variable in calculating acuity, so it is not surprising to see increasing proportions of patients with missed visits by acuity level.

Figure 19: Self-Report of Ever Missed Appointments with HIV Doctor by Acuity Level at Enrollment (n=1,204), 2013



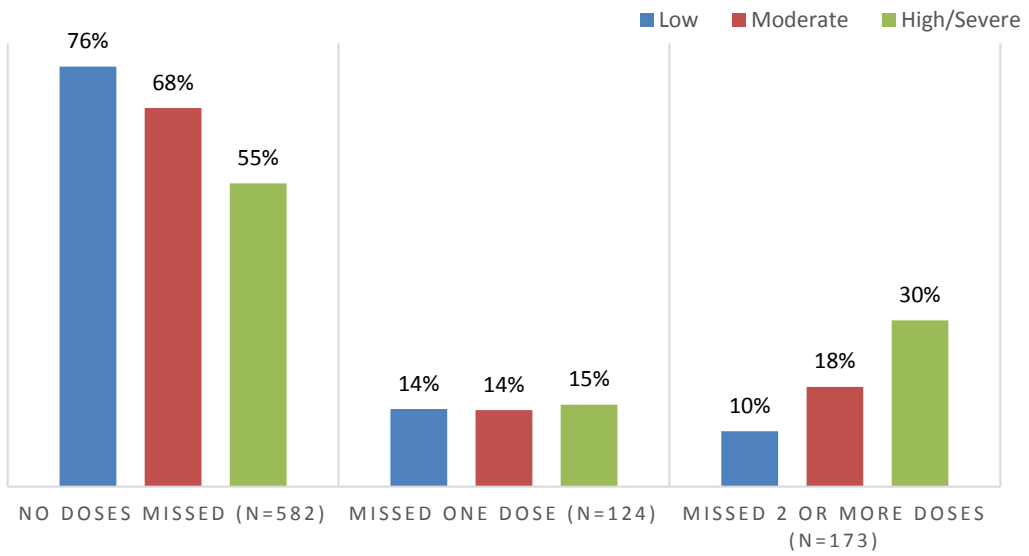
*Trend p<0.0001; X^2 p<0.0001
Source: Medical Care Coordination Assessment Summary Data, Jan 2013 - Dec 2013

Adherence to Antiretroviral Therapy

To assess adherence to ART, patients are often asked to report on how often they took their ART medication in several different ways [38]. By asking the same question in different ways, providers can get a better estimate of a patient's true medication-taking behavior. In MCC Assessment, patients were asked to report how many doses of their medication they missed taking in the last 7 days and to indicate what proportion of their ART medications they took in the past month on a scale ranging from 0-100%.

Of the 879 MCC patients prescribed ART at enrollment, 66% reported that they missed none of their ART doses in the past 7 days, 14% reported missing one dose and 20% reported missing 2 or more doses. As seen below in Figure 20, the proportion of patients who reported missing none of their ART doses in the past 7 days decreased significantly while those who reported missing 2 or more doses in the past 7 days increased significantly by acuity level (p<0.0001). There were no differences seen by acuity level in the proportion of patients missing one dose in the past 7 days.

Figure 20: Self-Reported Antiretroviral Therapy (ART) Adherence*: Missed Doses in the Past Week at Enrollment by Acuity Level (n=879), 2013

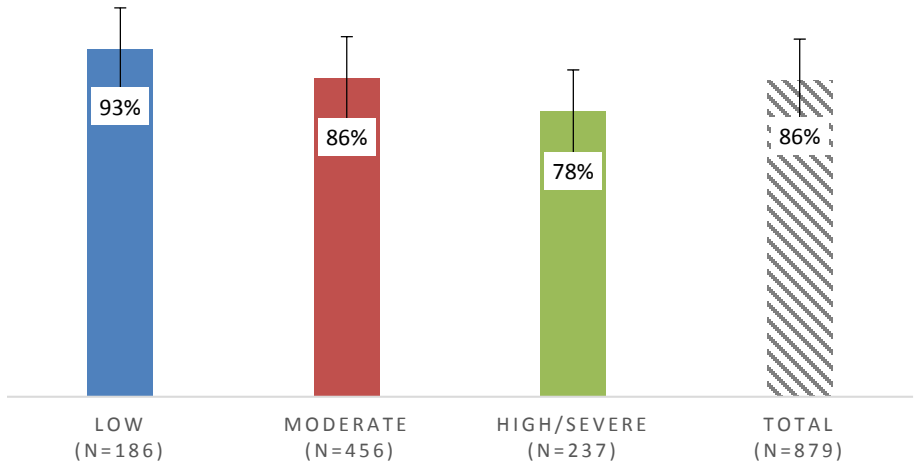


Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

*Among those who were currently on ART (n=879)

As shown in Figure 21 below, patients on ART at enrollment indicated that, on average, they took 86% of their HIV medications in the past month. Low acuity patients reported taking the highest proportion of their ART medication, however they still were below the recommended adherence threshold of adherence to 95% or more of prescribed doses to suppress viral load and reduce the development ART drug resistance [59]. Moderate and high/severe acuity patients reported a significantly lower proportion of doses taken compared to low acuity patients ($p<0.0001$).

Figure 21: Self-Reported Antiretroviral Adherence: Average Percent of ART Medications Taken in Past Month at Enrollment by Acuity Level (n=879), 2013



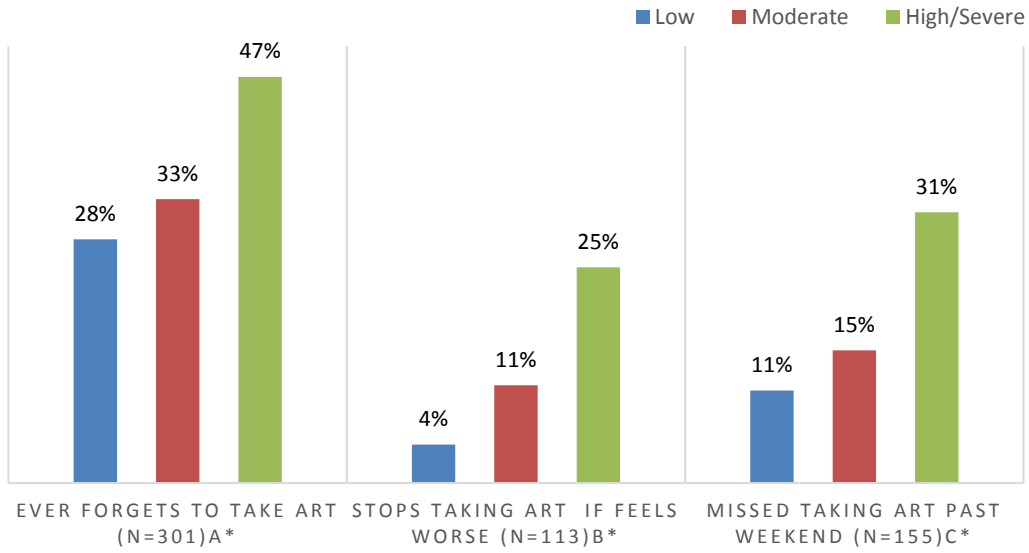
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

*Among those who were currently on ART (n=879)

Circumstances can impact how patients take their ART medication. Among the 879 patients on ART at enrollment, 35% of patients reported ever having forgotten to take their ART medication, 13% reported that they stopped taking their ART medications if they were feeling worse, and 18% reported that they missed taking their ART medication during the past weekend.

Figure 22 below presents the three circumstances for missed ART doses at enrollment by acuity level. The proportion of patients reporting these circumstances increased significantly by acuity level (Trend<0.0001). The most widely endorsed reason for non-adherence across acuities was forgetting to take their ART medications followed by missing ART medications during the past weekend and stopping taking ART medications if feeling worse.

Figure 22: Circumstances for Missed ART Medications among Patients on ART at Enrollment (n=879), 2013



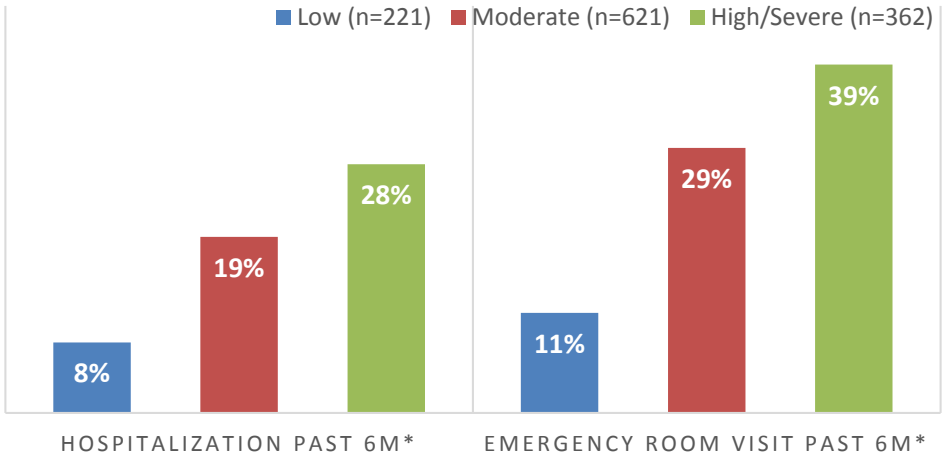
[A]Missing=26; [B]Missing=31; [C]Missing=40
*Trend and X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

These data demonstrate that over one-quarter of patients were not prescribed ART at time of enrollment and that those prescribed ART are not consistently taking their medications.

Hospitalizations and Emergency Room Use

Among the 1,204 patients enrolled in MCC, 20% reported a hospitalization in the past 6 months and 29% reported visiting an emergency room in the past 6 months. Figure 23 below illustrates the proportion of patients that self-reported hospitalizations and emergency room visits in the past 6 months by acuity level. Significant increases were seen in the proportion of patients hospitalized in the past 6 months and in those reporting an emergency room visit in the past 6 months by acuity level severity (Trend<0.0001).

Figure 23: Hospital and Emergency Room Utilization by Acuity Level (n=1,204), 2013



*Trend $p<0.0001$; X^2 $p<0.0001$

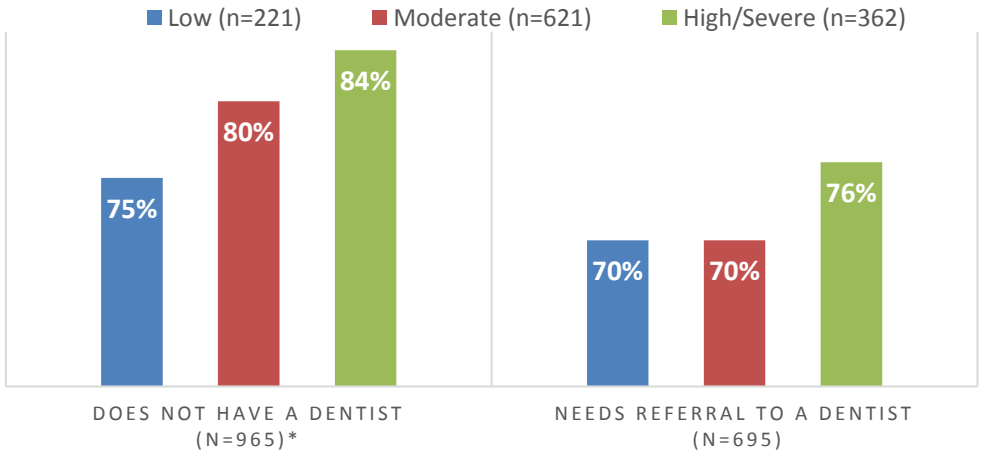
Source: Medical Care Coordination Assessment Summary Data, Jan 2013 - Dec 2013

These data suggest that higher proportions of high/severe acuity patients have been recently hospitalized and/or visited an emergency room compared with low or moderate acuity patients. This utilization pattern may reflect poor health status due to the higher prevalence of current HIV-related, chronic disease and mental health conditions observed among higher acuity patients. Among a sample of PLWH similar to MCC patients, both emergency room visits and hospitalizations were associated with poor health status and with low engagement in medical care [47].

Dental and Mental Health Service Access

Overall, 80% of patients reported that they did not have a dentist they saw regularly. Of the 965 patients without a dentist, 74% reported needing a referral to the dentist. Figure 24 below illustrates the proportion of patients by acuity level with access to and need for a dentist. The proportion of patients reporting that they did not have a dentist they saw regularly increased significantly as acuity increased (Trend p=0.009), however there were no significant differences seen across acuity levels in need for a dental referral.

Figure 24: Access to and Need for an Oral Provider at Enrollment by Acuity Level, 2013



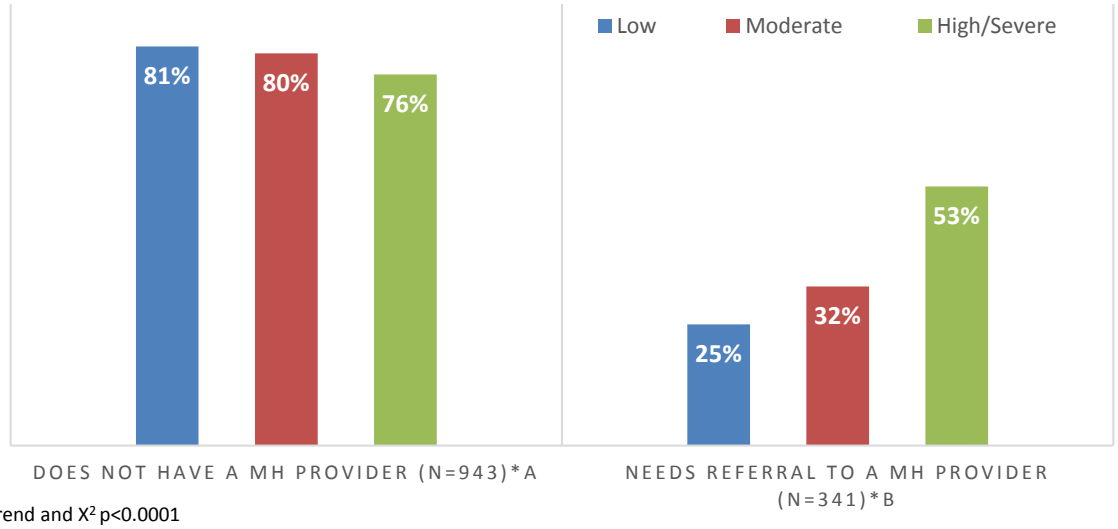
*Trend $p<0.05$; X^2 $p<0.01$

Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

These data are consistent with oral health data reported for RWHAP clients in 2013 where only 12% of all RWHAP clients received oral health services in the past 12 months [51]. In addition, based on a 2011 needs assessment of RWHAP clients in LAC, 34% of clients reported being unable to access needed oral health services [60].

Of the 1,204 MCC patients, 79% reported that they did not have a mental health provider that they saw regularly. Among the 943 patients who reported that they did not see a mental health provider, 37% reported that they needed a referral to a mental health provider. As shown in Figure 25, there were no significant differences by acuity level in the proportion of patients reporting that they did not have a mental health provider, however the proportion of patients reporting a need for mental health provider did increase significantly as acuity severity increased (Trend p<0.0001).

Figure 25: Access to and Need for a Mental Health Provider by Acuity Level, 2013



*Trend and X^2 p<0.0001
[a] Data missing for 8 patients
[b] Data missing for 15 patients
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

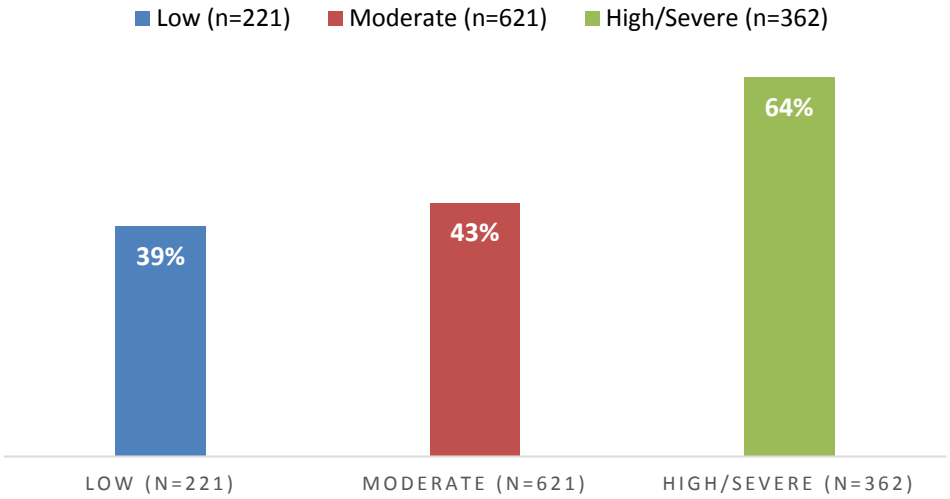
Over half (54%) of the patients in MCC have a history of a mental health condition, however at enrollment only about 20% of MCC patients reported having a mental health provider that they see regularly. These data suggest that patients with unmet need for a mental health provider are being reached by the MCC teams and identified through the assessment tool.

Behavioral Risk Factors

Mental Health

In addition to obtaining mental health information from the medical record, patients were also asked about their mental health status. Among patients enrolled in MCC, 48% reported that they had ever experienced or been diagnosed with a mental health illness or problem that got in the way of their daily routine. As seen below in Figure 26, the proportion of patients with a past mental health illness or problem increased significantly by acuity severity, with 39% of low, 43% of moderate and 64% of high/severe acuity patients reported experiencing a past mental health illness or problem (p<0.0001).

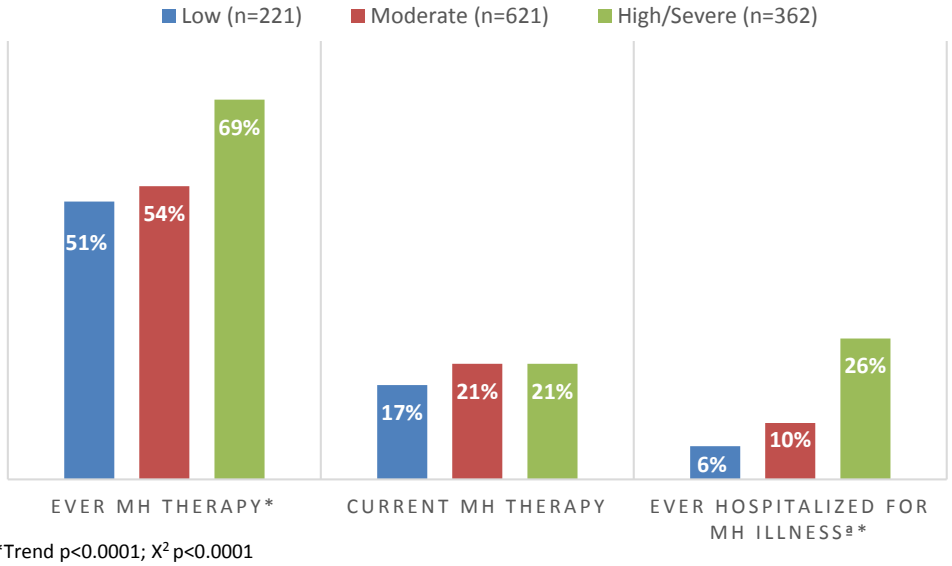
Figure 26: Prevalence of Past Mental Illness or Problem by Acuity Level (n=1,204), 2013



*Trend p<0.0001; X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Over half (58%) of patients enrolled in MCC reported ever receiving mental health counseling or therapy, 20% reported currently receiving mental health therapy or counseling, and 14% reported ever having been hospitalized for a mental or emotional illness. Figure 27 below illustrates the proportion of patients by acuity level who have ever received mental health therapy or counseling, who are currently receiving mental health therapy or counseling and who have ever been hospitalized with a mental or emotional illness. The proportion of patients who ever received mental health therapy or counseling and those who were ever hospitalized for a mental or emotional illness increased significantly by acuity severity (p<0.0001), however the proportion of patients currently receiving mental health therapy or counseling did not differ significantly by acuity severity.

Figure 27: Prevalence of Past and Current Mental Health Counseling/Therapy and Past Mental Health-Related Hospitalization by Acuity Level (n=1,204), 2013



*Trend p<0.0001; X^2 p<0.0001
[a]Ever Hospitalized missing for 21 patients (low=6, moderate=12, high/severe =3)
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

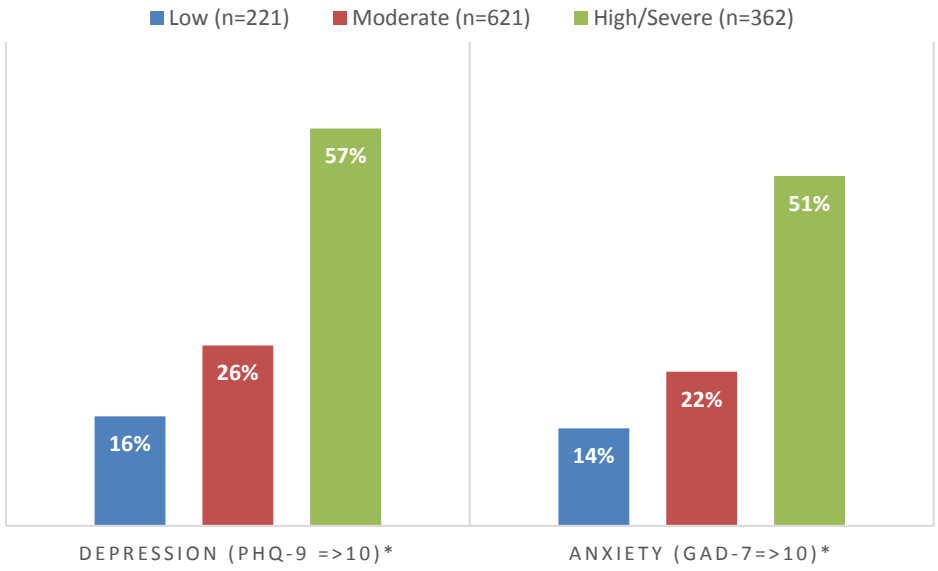
At enrollment in MCC, patients were screened to identify ongoing depressive and anxiety disorders. The Patient Health Questionnaire (PHQ)-9 was used to screen for clinically significant depressive disorders among patients enrolled in MCC [61, 34]. The PHQ-9 score ranges from 0-27 with 10 as the recommended cut-point for a possible depressive disorder requiring immediate treatment action through further assessment, a treatment plan and/or medication [34].

Patients in MCC were also screened for clinically significant anxiety disorders using the Generalized Anxiety Disorder (GAD) -7 [39]. The GAD-7 score ranges from 0-21 with 10 as the recommended cut-point for possible anxiety disorders requiring the same treatment action as described in the PHQ-9 [39].

Among patients enrolled in MCC, 34% met the PHQ-9 criteria for a depressive disorder and 29% met the GAD-7 criteria for an anxiety disorder. This proportion of patients meeting the PHQ-9 criteria is considerably higher than the 19% identified with a depressive disorder using a similar measure (PHQ-8) among a representative sample of 245 PLWH in LAC from the Medical Monitoring Project in 2013 [62]. There is no comparable data for the prevalence of anxiety disorders among PLWH, however among a sample of PLWH in HIV care in California, approximately 16% had an anxiety disorder as documented in their medical record [63].

As seen in Figure 28 below, the prevalence of probable depressive and anxiety disorders at enrollment increased significantly by acuity severity (Trend p<0.0001). As demonstrated by the PHQ-9 and GAD-7 cut-off scores, the prevalence of depressive and anxiety disorders among high/severe acuity patients was twice that seen among moderate acuity patients and three times higher than that of low acuity patients.

Figure 28: Prevalence of Probable Depressive and Anxiety Disorders at Enrollment by Acuity Level (n=1,204), 2013



*Trend p<0.0001; X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

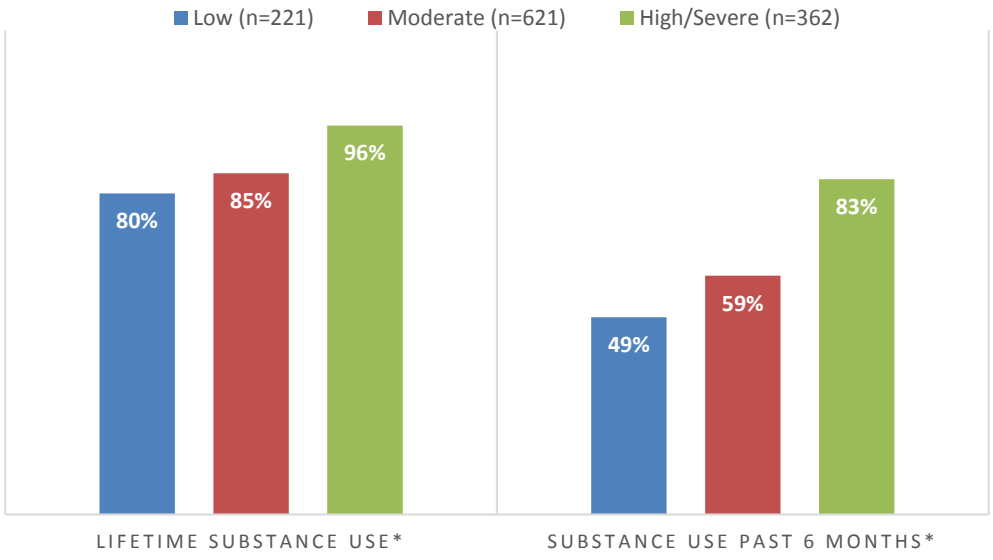
These data suggest that, compared to low and moderate acuity patients, a higher proportion of high/severe acuity patients have a history of mental health issues and related hospitalizations as well as ongoing depressive and/or anxiety disorders. Despite being disproportionately impacted by past and current mental health issues, only 20% of high/severe acuity patients were currently receiving any mental health therapy or support.

Anxiety and depressive symptoms among PLWH have been associated with low adherence to ART medications, poor clinical outcomes, and increased risk of HIV transmission [64, 65, 66]. Through the mental health screening in the MCC Assessment, the MCC team identified patients with need for mental health services and with undiagnosed or underdiagnosed mental health conditions – both of which are critical to address to improve health outcomes among PLWH.

Substance Use

At enrollment in MCC, 87% of patients reported ever using drugs or alcohol and 83% reported using drugs or alcohol in the past 6 months. As shown in Figure 29, there were significant differences in lifetime and recent substance use by acuity level. The proportion of patients that reported lifetime and recent substance use increased significantly as acuity severity increased (Trend p<0.0001).

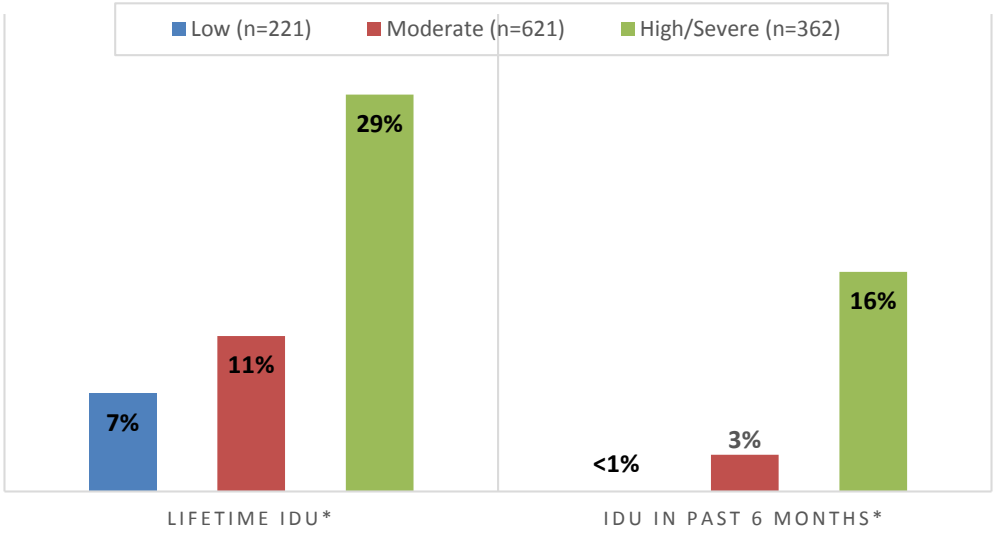
Figure 29: Prevalence of Lifetime and Recent Substance Use at Enrollment by Acuity Level (n=1,204), 2013



*Trend p<0.0001; X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Compared to any past or current substance use, a lower proportion of patients reported past and current injection drug use, 16% and 6%, respectively. The proportion of patients that reported lifetime and recent injection drug use increased significantly as acuity severity increased, as seen in Figure 30 below (Trend p<0.00001).

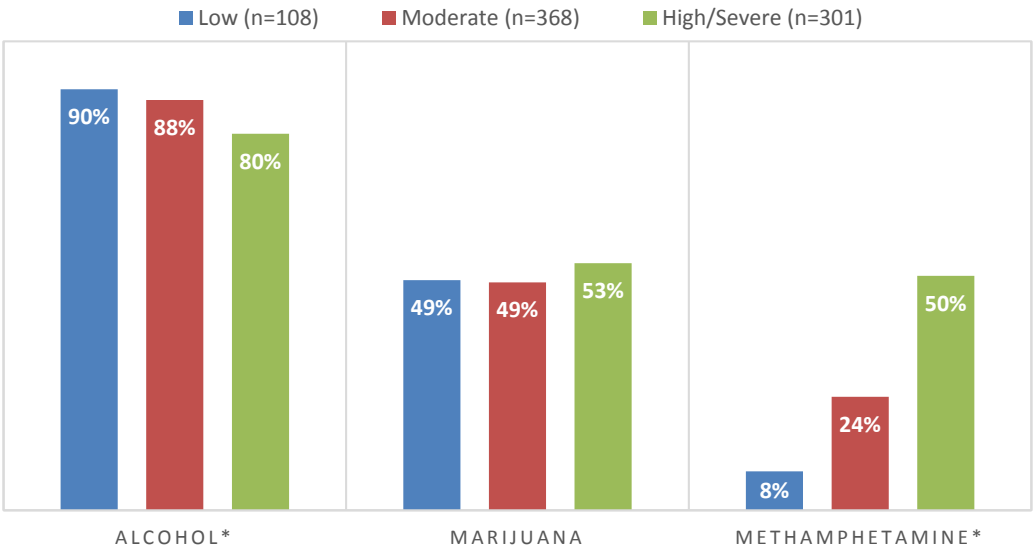
Figure 30: Prevalence of Lifetime and Recent Injection Drug Use at Enrollment by Acuity Level (n=1,204), 2013



*Trend p<0.0001; X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Among the 776 patients who reported substance use in the past six months, the most common substances used were: alcohol (85%), marijuana/hashish (50%) and methamphetamine (32%). As shown below in Figure 31, the proportion of patients reporting recent alcohol use decreased significantly as acuity severity increased (trend p-value=0.004) while there were no significant differences in the proportions of patients who reported marijuana use by acuity level. The proportion of patients reporting methamphetamine use in the past 6 months increased significantly from 8% of low acuity patients to 24% of moderate and 50% of high/severe acuity patients (trend p-value=0.004).

Figure 31: Substance Use in the Past 6 Months at Enrollment by Acuity Level (n=776), 2013

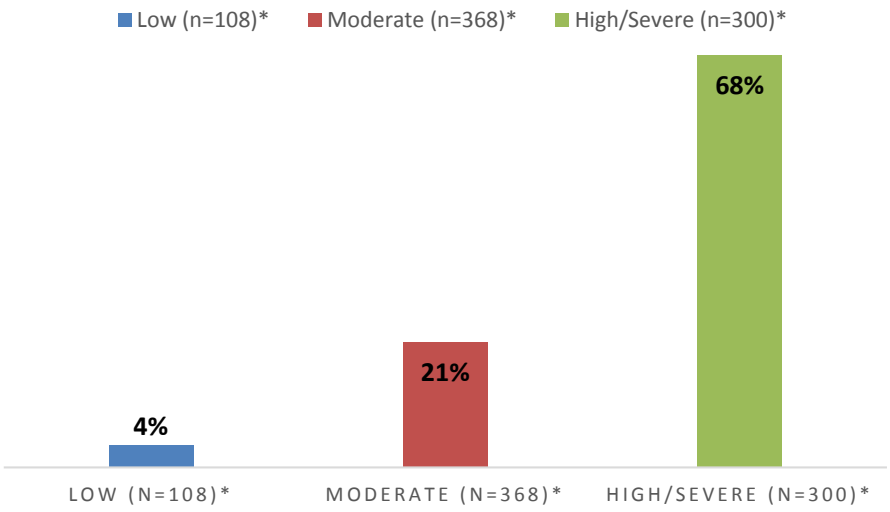


*Trend p<0.05; X2 p<0.05
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

As part of the MCC Guidelines, patients who report recent drug or alcohol use on the substance use screener questions are then screened for substance addiction [67]. Responses to nine questions related to the amounts of drugs and alcohol used, time spent for alcohol and drug use, trying to reduce substance use, withdrawal symptoms and other alcohol- and/or drug-related questions were scored. Scores of 3 or higher indicate the need for further evaluation for substance addiction.

Among the 776 patients who reported substance use in the past 6 months, 37% were identified as having a potential substance addiction based on the screener. As shown below in Figure 32, the proportion of patients identified with potential substance addiction increased significantly as acuity severity increased, with high/severe acuity patients disproportionately impacted by substance addiction compared to low and moderate acuity patients ($p<0.0001$).

Figure 32: Patients with Substance Abuse Score of 3 or More at Enrollment by Acuity Level (n=776), 2013

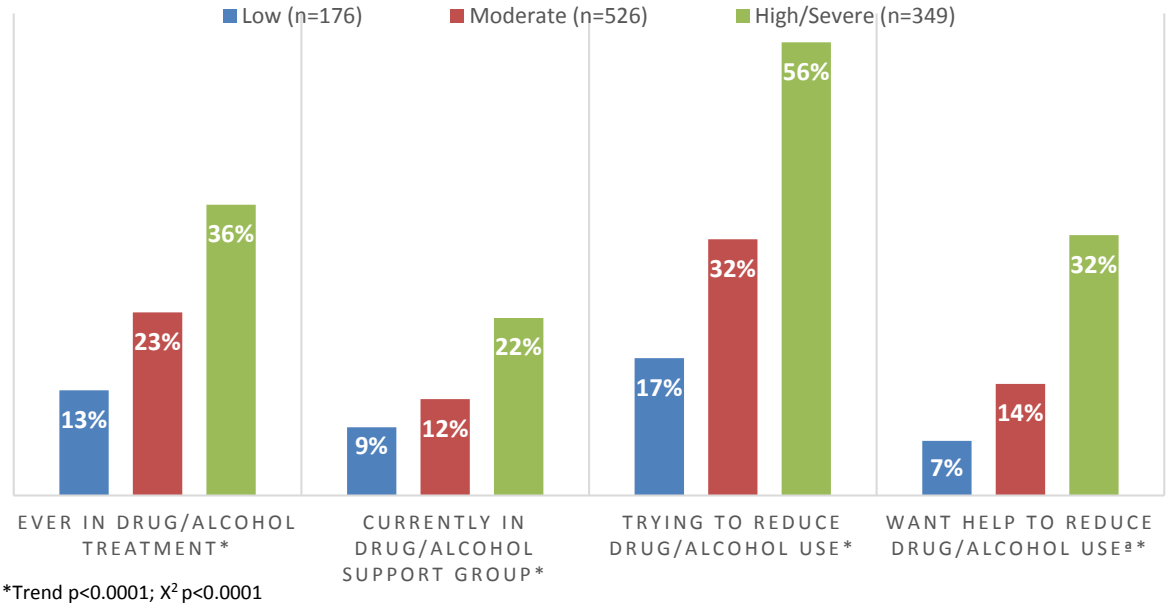


*Trend $p<0.0001$; X^2 $p<0.0001$
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

MCC patients who reported lifetime drug or alcohol use were asked about changing their substance use behaviors, past addiction treatment and current participation in addiction support groups. Among the 1,050 patients who reported ever using drugs or alcohol, 26% reported ever being in a substance use treatment program, 15% reported they were currently in a substance use support group, 38% reported that they were currently trying to reduce their substance use, 19% reported they would like help to reduce their substance use.

Figure 33 below illustrates the proportion of patients who reported ever using drugs or alcohol who also reported trying to reduce their substance use, wanting help reducing their substance use, ever being in a substance use treatment program, and currently participating in a substance use support group. The proportion of patients for each of the four items increased significantly by acuity severity (Trend<0.0001).

Figure 33: Substance Use Reduction and Treatment History among Patients Reporting Ever Substance Use by Acuity Level (n=1,050), 2013



*Trend p<0.0001; X^2 p<0.0001

Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Note: ª Excludes missing for 18 patients.

These data indicate that higher proportions of higher acuity patients report lifetime and recent drug and alcohol use. Methamphetamine use was more prevalent among higher acuity patients compared to those with lower acuity. A significantly higher proportion of MCC patients who report recent drug use may be experiencing substance addiction issues. Compared to low and moderate acuity patients, a larger proportion of high/severe acuity patients may be struggling with ongoing addiction as reflected by the proportion who reported trying to reduce their substance use and experience with addiction treatment and support groups.

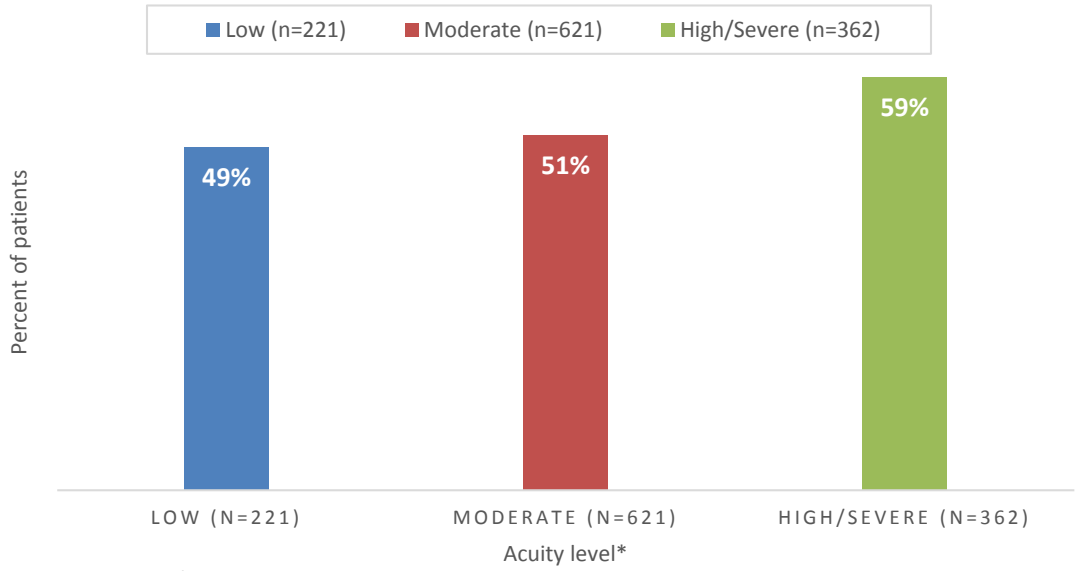
Based on a sample of HIV-positive patients in HIV care in California, it was estimated from medical record abstractions that 19% had a substance-related disorder [63]. Screening for and identifying potential substance addiction is a critical step to improving the health status of PLWH as drug and alcohol use have been associated with nonadherence to ART medications [68]. A higher proportion of patients with substance use are enrolled in MCC than may exist among PLWH generally, and their needs are identified through the assessment.

Sexual Behavior

At enrollment, 34% of the 1,204 patients in MCC reported having a primary sex partner. Of the 382 patients reporting a primary sex partner, 93% reported having disclosed their HIV status to that partner. The proportion of patients with a primary sex partner or in HIV disclosure to primary sex partner did not differ significantly across acuity levels.

Among the 1,204 enrolled in MCC, 640 (53%) reported having vaginal or anal sex in the past six months, with significantly higher proportion of high/severe acuity patients (59%) reporting sex in the past six months compared to low (49%) and moderate acuity patients (51%; Trend p=0.007, X^2=0.015) as shown below in Figure 34.

Figure 34: Percentage of Sexually Active in the Past Six Months Patients at Enrollment by Acuity Level (n=1,204), 2013

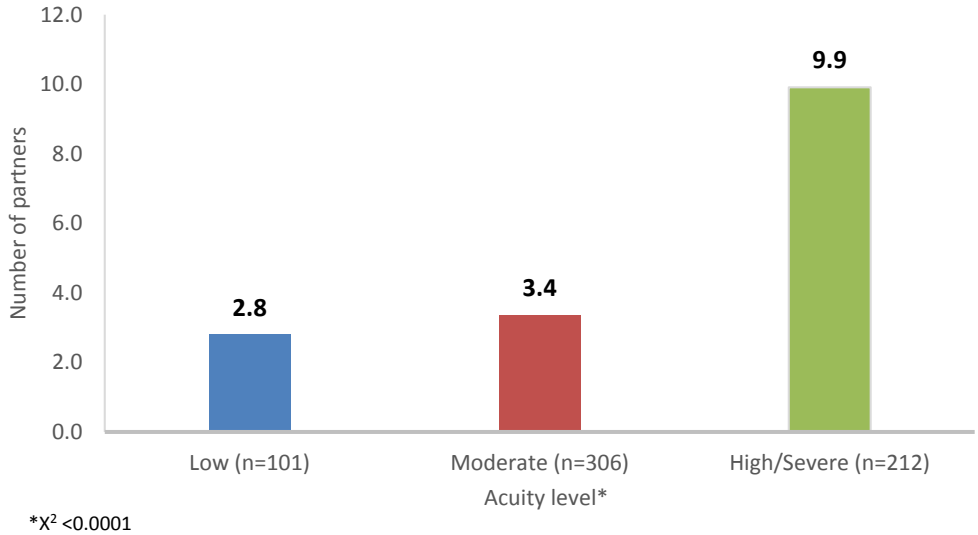


* Trend p=0.007; X^2=0.015
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Among sexually active patients (n=640), the average (mean) number of sexual partners in the past six months was 6 partners with a range from 1 to 150 partners (median=2), after exclusion of zero partners and extreme outliers.

There were significant differences in the mean number of sexual partners in the past 6 months by acuity level as illustrated in Figure 35 below (p<0.0001). High/severe acuity patients reported 9.9 sexual partners on average while moderate and low acuity patients each reported 3.4 and 2.8 sexual partners, respectively. Pairwise comparison indicated that the average number of sexual partners for high/severe acuity was significantly different from that of low and moderate acuity patients (p<0.0001), however the average number of partners did not differ between low and moderate acuity patients.

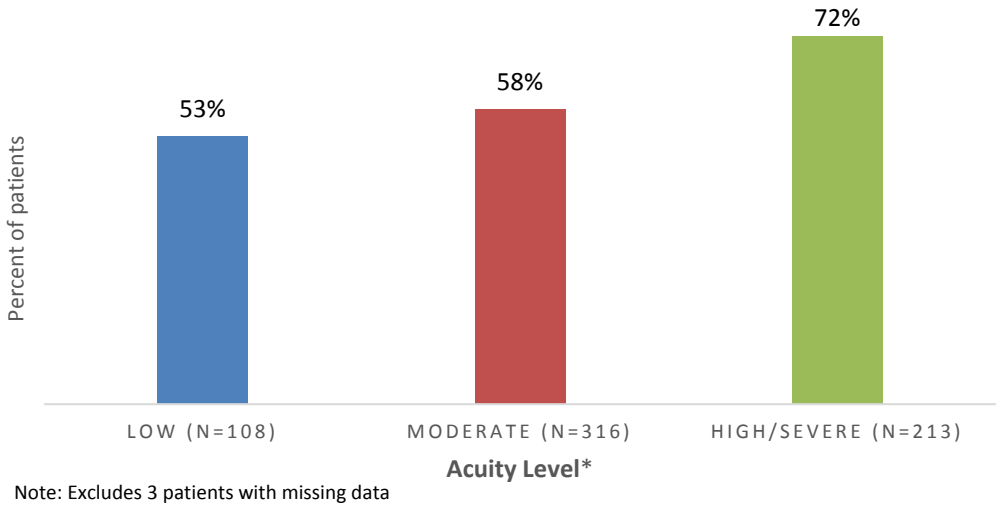
Figure 35: Average (Mean) Number of Sexual Partners in Past Six Months at Enrollment by Acuity Level (n=636), 2013



*X^2 <0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Of the 640 sexual active patients, 38% reported that they did not use condoms with any of their sexual partners. There were significant differences by acuity in the proportion of patients who did not use condoms with any of their sexual partners (Figure 36). Seventy-two percent of high/severe acuity patients reported not using condoms with any of their sexual partners in the past 6 months compared to 58% among moderate and 53% among low acuity patients. Among high/severe acuity patients, 23% were virally suppressed at enrollment. This highlights the importance to assessing sexual history and practices among PLWH to ensure that appropriate interventions to reduce risk of HIV transmission are delivered.

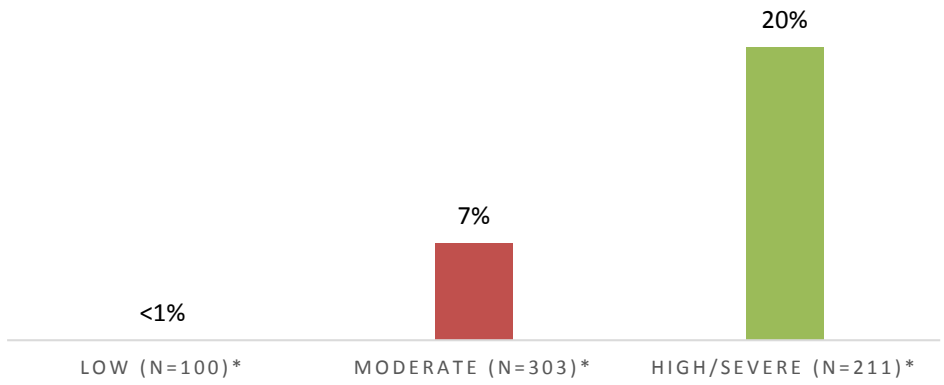
Figure 36: Percentage of Patients Who Did Not Use Condoms with Any Partner in the Past 6 Months by Acuity Level (N=640), 2013



Note: Excludes 3 patients with missing data
*Trend p<0.0001; X^2 p<0.0001
Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Approximately 10% of 614 sexually active MCC patients reported having sex in exchange for food, money, shelter, drugs or transportation with any of their recent sexual partners. Figure 37 below shows the proportion of patients reporting any transactional sex in the past 6 months increased significantly as acuity severity increased, with 20% among sexually active high/severe acuity engaging in exchange sex (Trend p-value<0.0001; X^2=0.0001).

Figure 37: Percentage of Patients Reporting Transactional Sex in Past Six Months by Acuity Level (N=614)[1], 2013



[1]Note: Excluded 26 patients with missing data
*Trend p<0.0001; X^2 p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

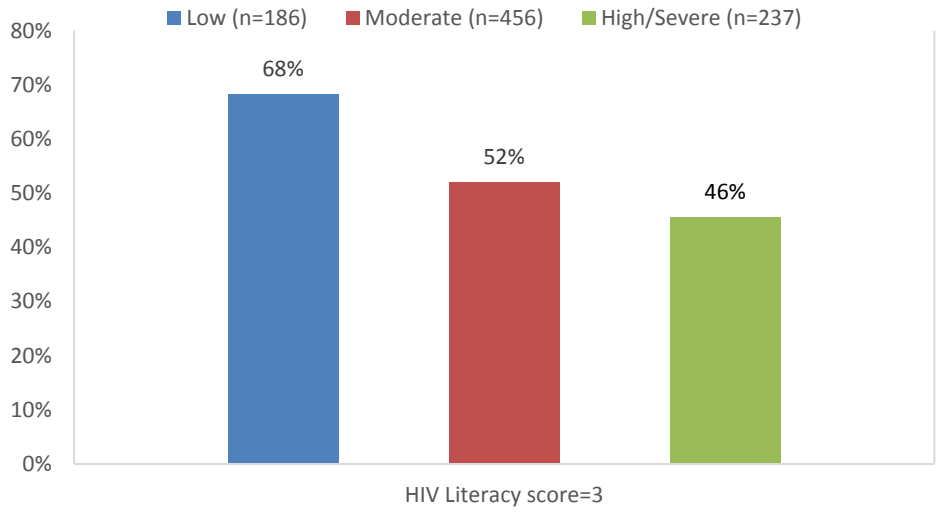
There were small but statistically significant differences in the proportion of MCC patients who were recently sexually active by acuity level. Compared to low and moderate acuity patients, high/severe acuity patients had significantly more sexual partners in the past 6 months, a higher proportion reported having sex without a condom with any of their recent sex partners, and transactional sex. Through the MCC assessment, MCC teams can identify those patients engaging in sexual behaviors that increase the risk of STD and HIV transmission and STD acquisition.

HIV Literacy

HIV literacy, or a patient's capacity to understand health information related to their HIV, was evaluated among patients prescribed ART using an abbreviated version of a validated HIV health literacy measure [35, 69]. The three items in the abbreviated measure assessed whether patients could: 1) describe what a CD4 count was; 2) describe what a viral load value was; and, 3) correctly name the ARTs they were taking [35]. The responses were summed and ranged from 0 to 3, with 0 being no correct responses and 3 being all correct responses. The proportion of patients that correctly answered all 3 questions is presented below.

Among the 879 patients prescribed ART at enrollment, approximately 54% had an HIV literacy score of 3. The proportion of patients with an HIV literacy score of 3 varied significantly by acuity level, with the highest (68%) for low acuity patients, 52% of moderate acuity and 46% of high/severe acuity patients scoring 3 (p<0.0001). (Figure 38)

Figure 38: HIV Literacy among MCC Patients Prescribed ART by Acuity Level (n=879), 2013



* Trend p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

These data suggest a lower level of understanding about HIV-related health information among higher acuity patients. Lower levels of HIV knowledge and health literacy have been associated with lower self-reported adherence to ART, viral suppression and HIV care utilization [35, 69, 70]. In addition, patients with lower levels of HIV literacy may not be able to effectively communicate with their provider or navigate complex healthcare

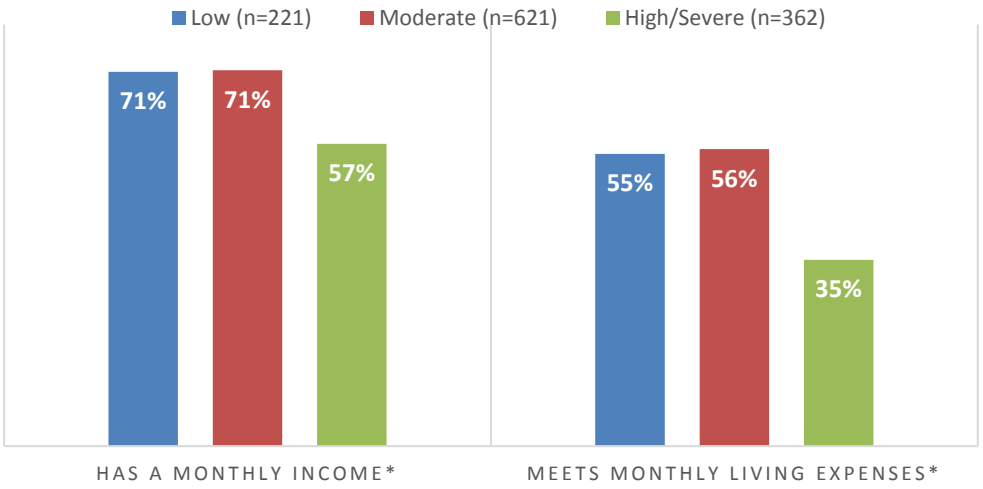
systems [70, 71]. PLWH with low HIV literacy are being engaged in the MCC program, and the MCC Assessment helps the MCC team to identify those patients in need of health education to improve their knowledge around HIV.

Social Determinants

Financial Stability

Financial stability was assessed by asking patients if they had a monthly income, and if they were able to meet their monthly living expenses. At enrollment, 67% of MCC patients reported having a monthly income, and 50% reported that they were able to meet their monthly living expenses. As shown in Figure 39 below, the proportion of high/severe acuity patients with a monthly income and the proportion who could meet their monthly living expenses was significantly lower than among low and moderate acuity patients.

Figure 39: Financial Stability Indicators at Enrollment by Acuity Level (n=1,204), 2013



* Trend p<0.0001; X^2=0.0001

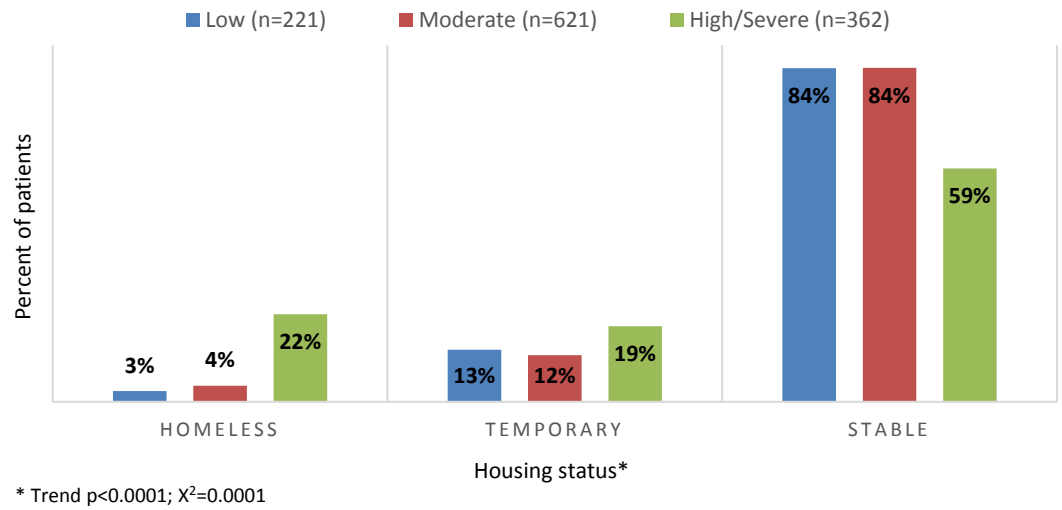
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

These data reflect similar patterns to the proportion of patients living at or below FPL by acuity level presented in Table 2. Compared to low and moderate acuity patients, a higher proportion of high/severe acuity patients were living at or below FPL, and a lower proportion of high/severe acuity patients reported having a monthly income or being able to meet living expenses. As previously described, lower socio-economic status has been associated with poor viral suppression and retention in HIV care, so identifying those patients experiencing Income instability provides an opportunity to provide additional needed support and resources to improve health outcomes [72, 73, 15, 54].

Housing

Key questions in the assessment to determine housing stability included current housing status and whether they had been homeless in the past 6 months. At enrollment, 9% of patients reported being homeless, 14% reported being in temporary housing (i.e., transitional housing, a hotel, motel or single residence occupancy), and 77% of MCC patients reported having stable housing.

Figure 40: Current Housing Status at Enrollment by Acuity Level (n=1,204), 2013

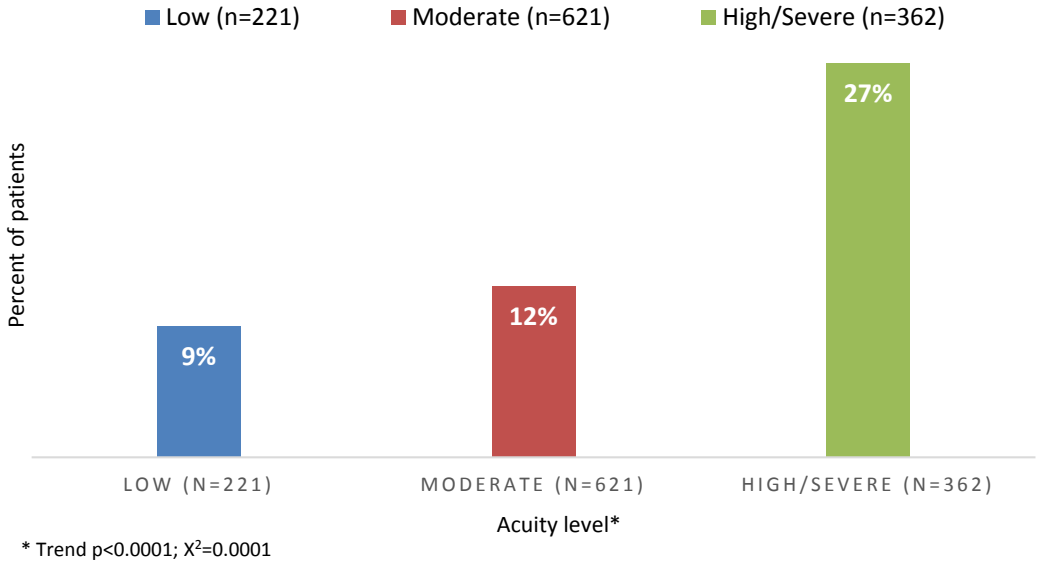


* Trend p<0.0001; X^2=0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

In Figure 40 above, compared to low (84%) and moderate acuity patients (84%), there was a significantly lower proportion of high/severe acuity patients who were stably housed (X^2<0.0001). In addition, the proportion of high/severe patients who were temporarily housed (19%) was significantly higher compared to low (13%) and moderate acuity patients (12%; X^2<0.0001). Similar but larger differences are seen in the proportion of high/severe acuity patients who were homeless (22%) compared to low (3%) and moderate acuity patients (4%; X^2<0.0001).

At enrollment, 15% of all MCC patients reported being homeless in the past six months. A higher proportion of patients in MCC were homeless compared to the 6% currently homeless reported among RWHAP clients in 2013 [51]. The proportion of patients who reported being homeless in the past 6 months increased significantly as acuity severity increased, as shown in Figure 41, with 27% high/severe patients reporting homelessness in the past 6 months (Trend<0.0001).

Figure 41: Homelessness in the Past Six Months at Enrollment by Acuity Level (n=1,204), 2013



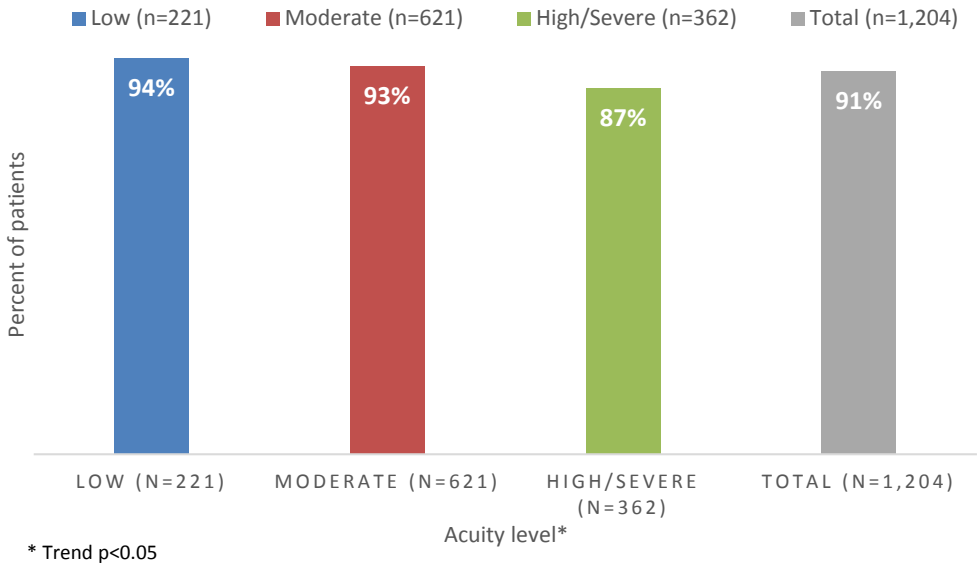
* Trend p<0.0001; X^2=0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

These data suggest that the MCC program is reaching and identifying PLWH who do not have stable housing. In addition, high/severe acuity patients are particularly impacted by housing instability compared to low and moderate acuity patients. Identifying and addressing housing instability is particularly important for PLWH as it has been shown to be a barrier to ART medications access, HIV care retention and viral suppression, and contributes to an increased risk of forward transmission of HIV [74].

Transportation

Patients reported that they got to the clinic using public transportation (39%), driving themselves (36%), or getting driven by family member or a friend (10%). Ninety-one percent of patients reported having a reliable source of transportation. The proportion of patients with a reliable transportation source decreased significantly as patient acuity level increased (Trend p=0.002) as illustrated in Figure 42 below.

Figure 42: Access to a Reliable Source of Transportation at Enrollment by Acuity Level, 2013



* Trend p<0.05

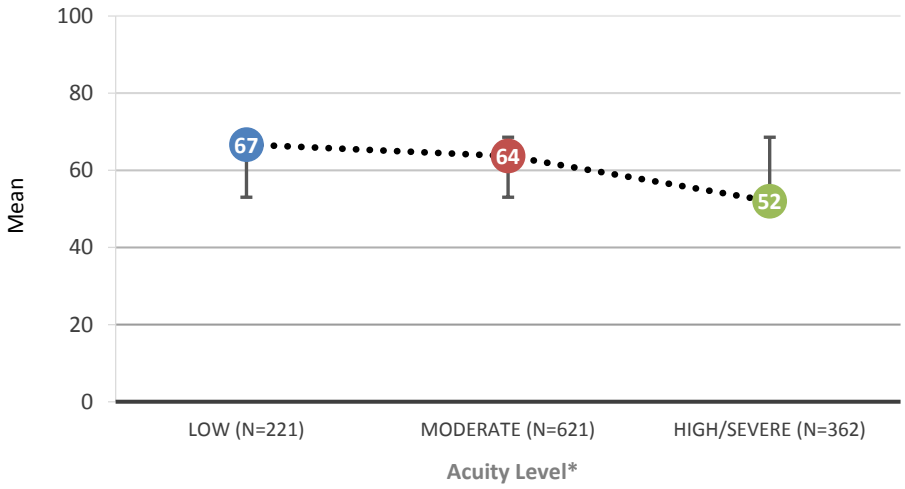
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Social Support

The majority of MCC patients reported their relationship status as single (65%), followed by married/partnered/in a relationship (25%), divorced/separated/widowed (7%) or other (3%). The main sources of social support cited among MCC patients were friends (47%) and non-parent family (19%). The main sources of stress from social networks were also friends (7%), non-parent family (8%) and other (14%), but 41% of patients reported they did not experience any of stress. There were no significant differences across acuity levels for relationship status and sources of support or stress.

Social support was evaluated using a five-question index that asked patients about receipt of emotional/informational and tangible support [37]. An index score ranging from 0-100 was calculated from responses to the five questions, with higher scores indicating more support.

Figure 43: Social Support Score Index at Enrollment by Acuity Level (n=1,204), 2013



* Kruskall-Wallis test p<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

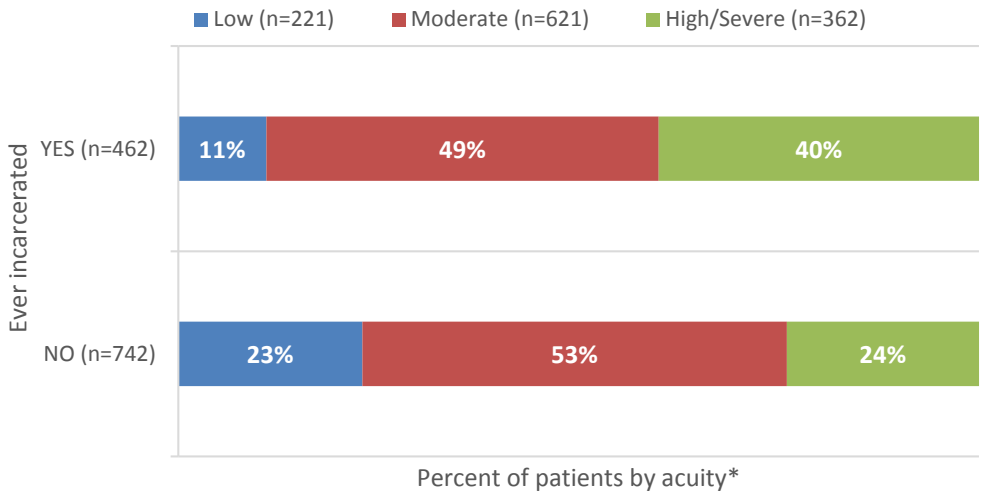
The average (mean) social support index (SSI) score for all patients enrolled in MCC was 61.0 (SD=28.0). In Figure 43 above, the average scores for the SSI are presented by acuity level. The highest SSI scores were reported among low acuity patients (SSI=67%; SD=27.3), followed by moderate acuity patients (SSI=64%; SD=27.3) and the lowest score was among high/severe acuity patients (SSI=52; SD=29.4). There were significant differences in SSI score by acuity level. Pairwise comparisons (Bonferroni t-tests) showed that SSI score for high/severe acuity level was significantly different from that of low and moderate acuity levels, but the index did not differ for low and moderate acuity patients.

These data suggest that higher acuity level patients have lower levels of social support available to them even though the reported sources of social support are similar across acuity levels. Social support has been identified as a facilitator to retention in HIV care [75, 76]. Higher levels of available social support have been associated with improved viral suppression, retention in HIV care, and adherence to ART medications [77]. The lower social support scores among high/severe acuity patients compared to low and moderate acuity patients together with lower level of viral suppression and adherence to ART also seen among higher acuity patients are consistent with these findings.

Incarceration History

At enrollment in MCC, 462 (38%) of the 1,204 MCC patients reported a history of incarceration. Of those, 126 (27%) had been incarcerated in the past 6 months. The proportion of MCC patients with a history of incarceration is considerably higher than the 13% of RWHAP clients that reported a history of incarceration in 2013 in LAC [51]. As shown in figure 44, a significantly higher proportion of previously incarcerated patients were high/severe acuity (40%) compared to patients who were never incarcerated (24%, X^2<0.0001).

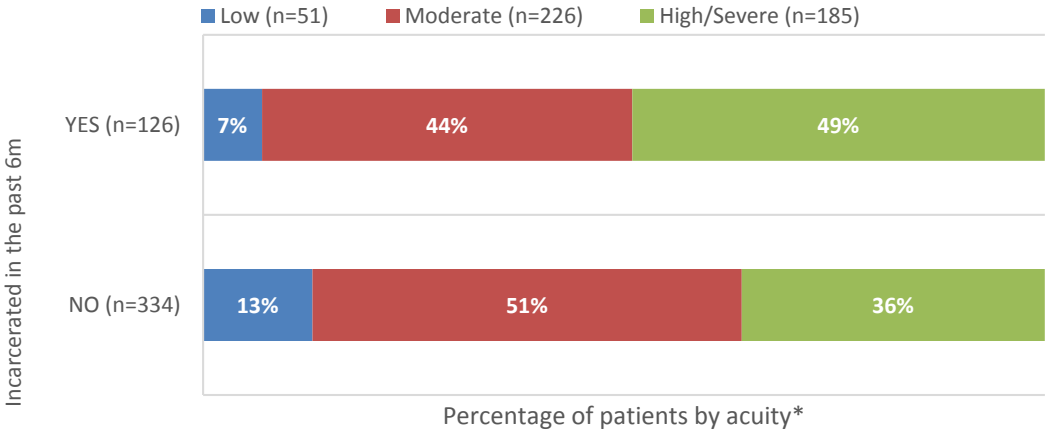
Figure 44: History of Previous Incarceration at Enrollment by Acuity Level (N=1,204), 2013



* Trend p<0.0001; X^2<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

A similar pattern in acuity level was observed among recently incarcerated patients. Figure 45 shows that there was a significantly higher proportion of recently incarcerated patients who were high/severe acuity (49%) compared to those who were not recently incarcerated (36%; x2=0.0347).

Figure 45: Recent Incarceration among Previously Incarcerated Patients at Enrollment by Acuity Level (n=462), 2013



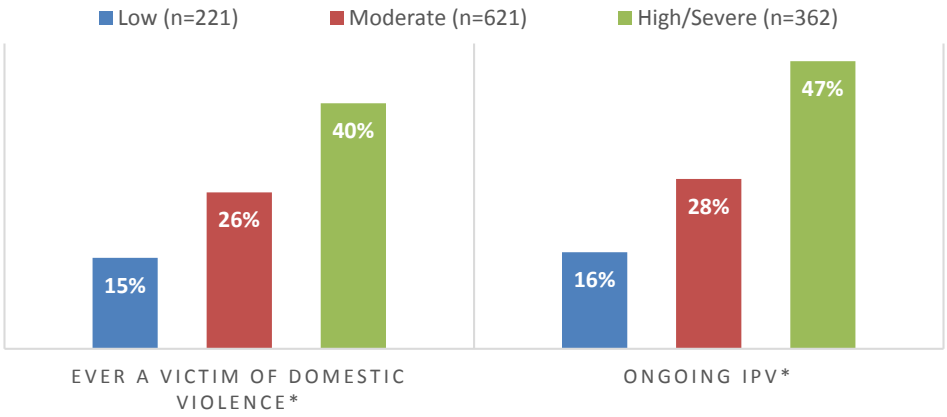
* X^2<0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Approximately 1 in 7 (14%) of PLWH in the US are estimated to have a history of incarceration [78]. A higher proportion of previously incarcerated PLWH are being enrolled into MCC (38% of MCC patients) compared to what is reported nationally (14%) and locally (13%) in LAC [51, 78]. This suggests that MCC is successfully engaging this vulnerable population and identifying their need for more intensive services as indicated by their higher acuity, compared to MCC patients with no incarceration history.

Abuse and Intimate Partner Violence

A history of domestic abuse and ongoing intimate partner violence (IPV) were evaluated in the MCC Assessment. Patients were asked if they had ever been a victim of domestic violence, and IPV was assessed by using the Ongoing Intimate Partner Violence (OVAT) screener to identify patients experiencing IPV at time of assessment [32]. The OVAT consists of 4 questions about different types of violence patients may have experienced in the past month. Responses are scored to provide a summary score indicative of any ongoing IPV.

Figure 46: Self-Reported Ever and Ongoing Domestic and Intimate Partner Violence by Acuity Level (n=1,204), 2013



* Trend p<0.0001; X^2=0.0001
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Approximately 28% of patients reported having ever been a victim of domestic violence and 31% reported IPV at enrollment based on the OVAT screener. As shown above in Figure 46, the proportion of patients that reported ever having been a victim of domestic violence increased significantly by acuity severity (Trend <0.0001), with the highest proportion (40%) reported among high/severe acuity patients. Similarly, the proportion of patients reporting ongoing IPV also increased significantly by acuity level, with the highest proportion (47%) among high/severe acuity patients (Trend <0.0001).

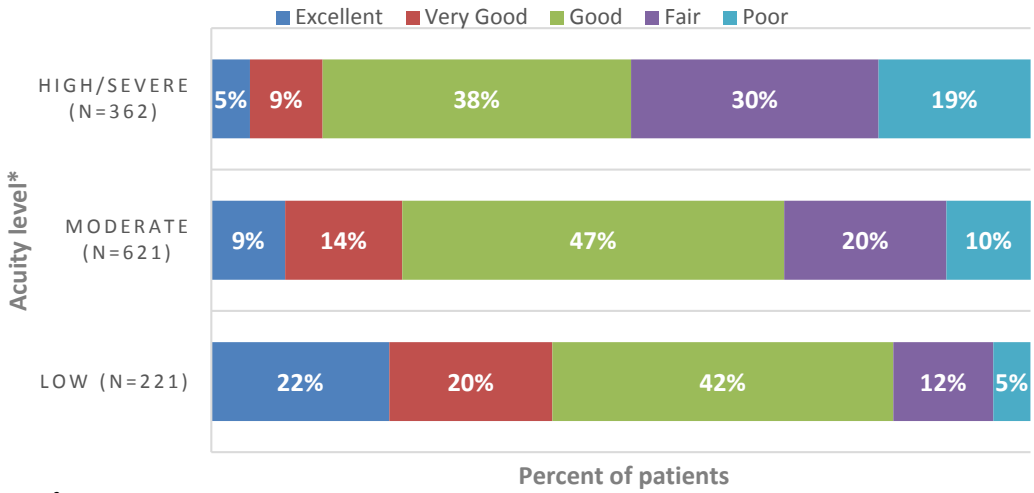
Domestic abuse and IPV are increasingly being examined as important social determinants of health among persons living with HIV [79, 80, 81, 82]. Abuse and IVP have been associated with lower engagement in HIV care, lower health-related quality of life, depression and anxiety disorders, substance use, and history of incarceration among women living with HIV [81]. Among HIV-positive gay and bisexual men, IPV has been associated with increased incidence of AIDS and lower health related quality of life [80]. Through the MCC assessment, IPV is being effectively identified among MCC patients, and those patients experiencing IPV are being offered more intensive services.

Health-Related Quality of Life

In the Quality of Life domain, patients' perception about their overall health status was assessed. The majority of MCC patients reported the quality of their overall health as good (43%), followed by fair (22%), very good (14%), poor (12%), and excellent (10%).

Figure 47 illustrates that while most patients across acuities reported good health quality, there were significant differences for those reporting fair to poor health. Compared to moderate (30%) and low acuity patients (17%), nearly half (49%) of patients who were high/severe acuity reported having fair to poor health quality at enrollment (X^2<0.0001).

Figure 47: Self-reported Overall Health Quality at Enrollment by Acuity Level (n=1,204), 2013

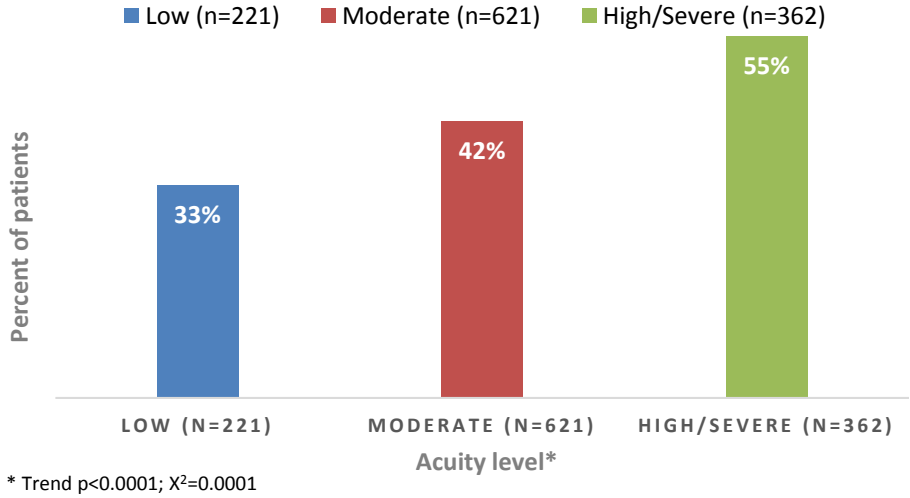


* X^2<0.0001

Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Following the quality of health question, patients were asked if they had any specific health concerns. Approximately 44% of MCC patients reported that they had specific health concerns. As shown in Figure 48 below, the proportion of patients reporting specific health concerns significantly differed by acuity level and as acuity severity increased, with over half (55%) of high/severe acuity patients reporting specific health concerns at time of enrollment (X^2<0.0001).

Figure 48: Prevalence of Self-Reported Health Concerns at Enrollment by Acuity Level (n=1,204), 2013



* Trend p<0.0001; X^2=0.0001

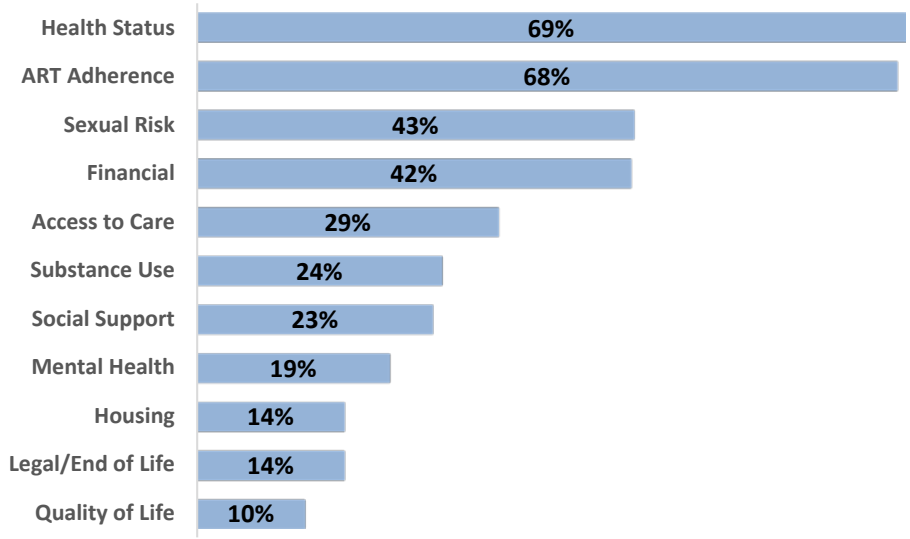
Source: Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

These data are consistent with data presented earlier demonstrating a higher prevalence of AIDS diagnoses and current HIV-related and chronic disease conditions, as well as higher viral load and lower CD4 count among higher acuity patients. The lower perceived health quality and higher proportion of patients with specific health concerns by acuity level may reflect the worse health status of higher acuity patients as seen in the data previously presented.

SERVICE DELIVERY AND FIDELITY

Patients who are high or severe acuity within a specific assessment domain are considered to have identified need in that domain. The proportion of patients with identified need within each domain is summarized below in Figure 49 below. The domains of Health Status (69%) and ART Adherence (68%) had the highest proportion of patients with identified need.

Figure 49: Prevalence of Identified Need across Assessment Domains at Enrollment (n=1,204), 2013



Source: DHSP, Casewatch, Years 22-23, MCC Assessment, Jan-Dec 2013

Service Hours

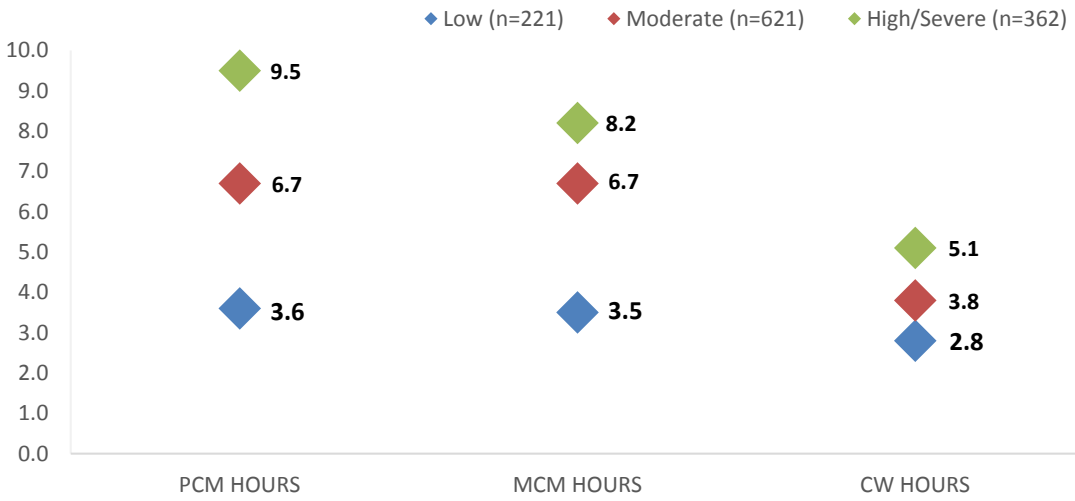
Hours of service and types of service activities were reported by MCC team members in the Casewatch system from January 2013 through December 2014. Of the 1,204 patients enrolled, 1,195 (99%) had corresponding service data reported in Casewatch. Patients with no minutes reported for any of the service activities were assigned a value of 0 minutes for that specific activity. Twelve-month service utilization data are presented below.

The average (mean) number of months of MCC utilization was calculated as the difference between the enrollment date and the last reported service date within 12 months of enrollment. Over the 12-month period, patients, on average, utilized MCC for 11.6 months (SD=3.1 months). There were no significant differences in utilization by acuity level.

Over 12 months, MCC teams delivered an average of 17.3 service hours per patient (SD=17.9 hours). The average (mean) number of service hours delivered varied by provider type. Per patient, PCM delivered an average of 6.8 service hours (SD=7.6 hours), followed by the MCM who delivered an average of 6.5 service hours (SD=7.8), and the CW who delivered an average of 3.9 service hours (SD=7.2 hours).

Figure 50 below illustrates the average (mean) service hours per patient delivered overall and by provider type for each acuity level. The average number of MCC hours delivered per patient differed significantly by acuity level ($p<0.001$). Low acuity patients received an average of 9.9 hours (SD=10.2), moderate acuity received an average of 17.2 hours (SD=16.7), and high/severe acuity patients received an average of 22.8 hours (SD=22.0). The average number of hours delivered by the MCM and the PCM also differed significantly by acuity level ($p<0.0001$), however the average number of hours delivered by the CW did not. Across all MCC team members, the high/severe acuity patients received the most hours, followed by moderate and low acuity patients.

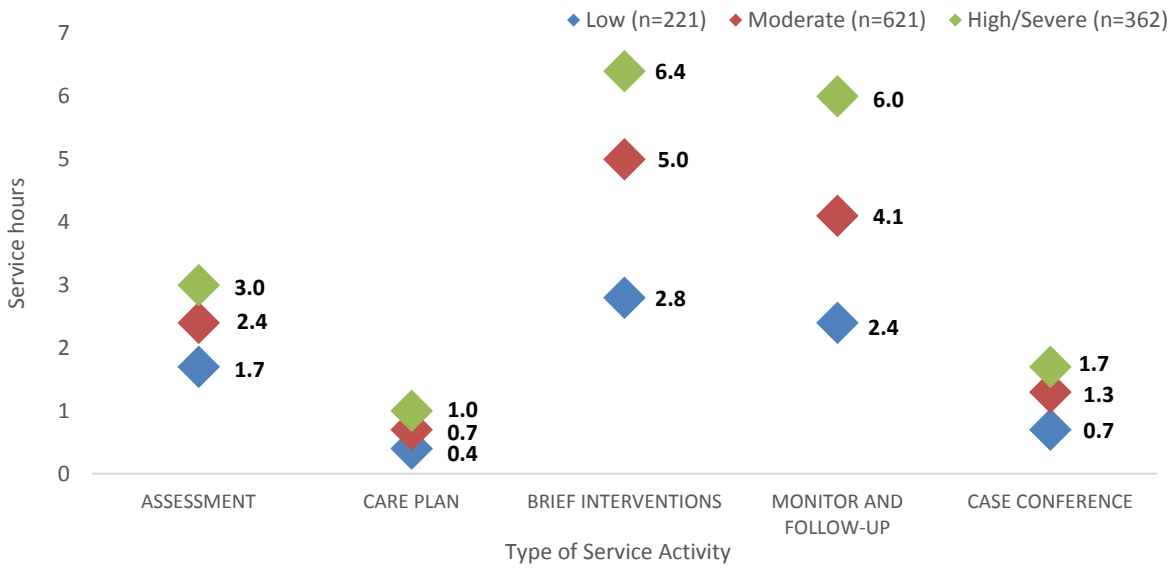
Figure 50: Average Number of MCC Service Hours Delivered Overall and by MCC Team Member Across Acuity Levels (n=1,204), 2013-2014



Source: DHSP Casewatch data 2013-14, Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

The average (mean) number of hours for each service activity by acuity level is presented in Figure 51. Across all service activities, higher acuity patients received a greater number of service hours. The average number of hours differed significantly across the three acuity levels ($p<0.001$).

Figure 51: Average Hours of MCC Service Activities by Acuity Level (n=1,204), 2013-2014



Source: DHSP Casewatch data 2013-14, Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Brief Interventions

Brief interventions (BI) are short, focused counseling sessions intended to raise awareness and motivate change in a patient around a specific issue or behavior [83, 84]. The MCC team members deliver brief interventions based on patients' identified need in the assessment and the ICP. The brief interventions are not a substitute for long-term care but are intended to increase readiness and support behavior change needed to access long-term care. MCC intervention activities primarily focus on, but are not limited to:

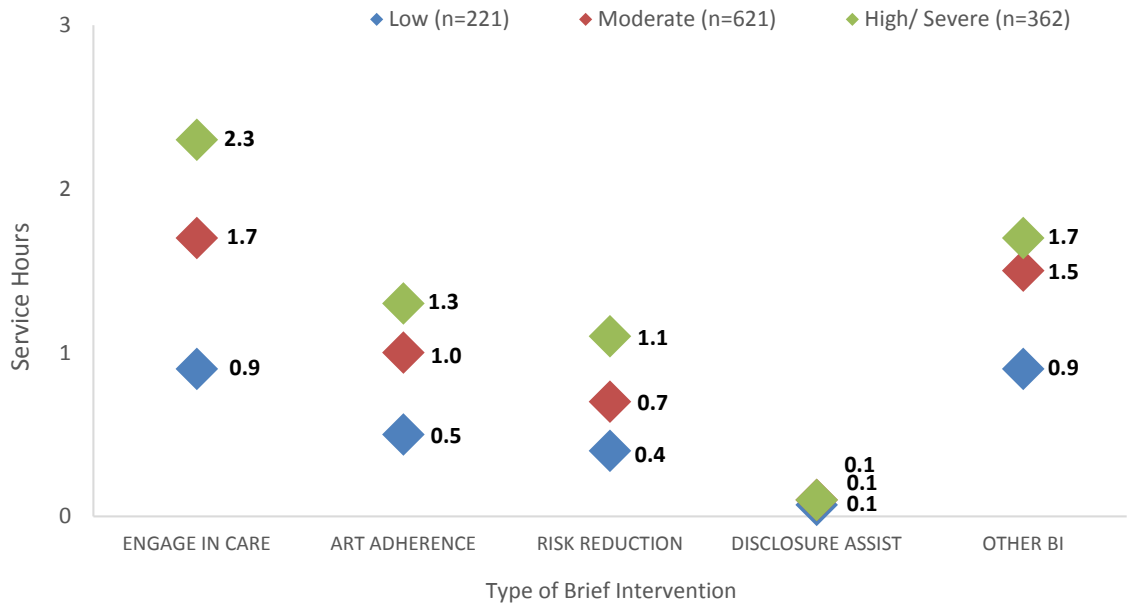
- ART Adherence: This is an evidence-based intervention that is a required for those patients with identified need for adherence support and education, so not all patients will receive it [43];
- Risk Reduction: This brief interventions (BI) that is required for patients with identified need for risk reduction around sexual behaviors. Agencies are recommended to use the "Options/Opciones" evidence-based intervention [42];
- Engagement in HIV Care: This is an evidence-based best practices focused on educating patients about the importance of seeing their doctor regularly and strategies to support healthy behaviors; and,
- Disclosure Assistance: This is a best practice specifically to facilitate and support disclosure of HIV status and emphasize the benefits of disclosure to the patient.

The BIs are described in further detail in the MCC Service Guidelines in the report appendix.

Of the 1,204 patients enrolled in MCC, 1,048 (87%) received at least one brief intervention: 887 (74%) received the Engagement in Care BI; 848 (70%) received ART Adherence BI; 809 (67%) received Risk Reduction BI; 315 (26%) received Disclosure Assistance BI; and, 650 (54%) received other BIs.

Figure 52 illustrates data on median hours of brief interventions delivered to patients in MCC by acuity level. The number of hours received for the Engagement in Care, ART Adherence, Risk Reduction and Other BIs were significantly different across the three acuity levels (P<0.0001). There were no significant differences across the three acuity levels for the Disclosure Assistance BI.

Figure 52: Mean Hours of Brief Interventions by Acuity Level (n=1,204), 2013-2014

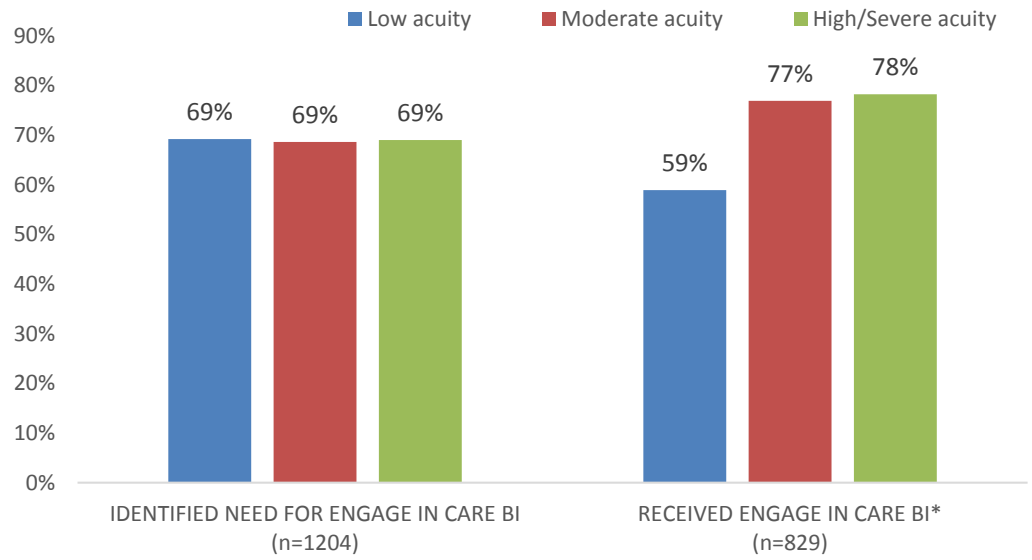


Source: DHSP Casewatch data 2013-14, Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

While all patients may receive BIs, MCC teams are specifically directed to deliver BIs to those patients with identified need in the assessment domains of ART Adherence, Health Status and Risk Behaviors. The following figures 53-55 show the number of patients with identified need within an assessment domain and the proportion that received the corresponding BI by acuity level.

At enrollment in MCC, 829 (69%) patients had identified need for the Engagement in Care BI. Identified need for the Engagement in Care BI did not differ significantly by acuity level (Figure 53). Of those with identified need for the Engagement in Care BI (n=829), 608 (73%) received the BI. The differences in the proportion of patients receiving the BI by acuity were significant (X^2 <0.05).

Figure 53: Need and Receipt of the Engagement in Care Brief Interventions (BI) by Acuity Level, 2013-2014

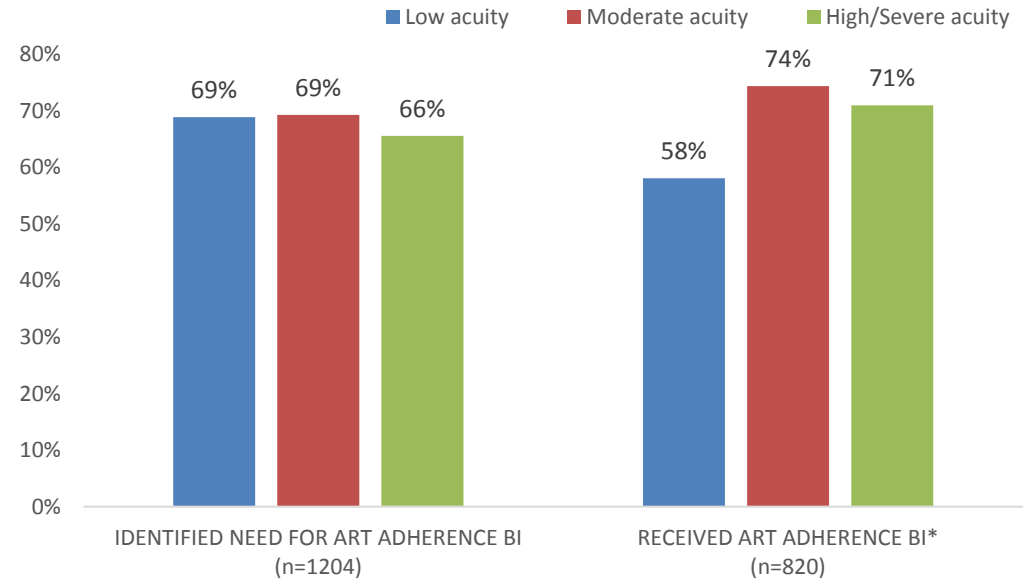


* X^2 test p <0.05

Source: DHSP Casewatch data 2013-14, Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Of the 1,204 patients in MCC, 820 (68%) had identified need for the ART Adherence BI at enrollment. No significant differences were observed by acuity level in the proportion of patients with identified need for the ART Adherence BI (Figure 54). Of the 820 patients with identified need for the ART Adherence BI, 573 (70%) received the BI. A significantly lower proportion of low acuity patients with identified need for the ART Adherence BI received it (58%), compared to moderate (74%) and high/severe (71%) acuity patients (X^2 <0.05).

Figure 54: Receipt of ART Adherence Brief Intervention by Acuity Level among Patients with Identified Need, 2013-2014



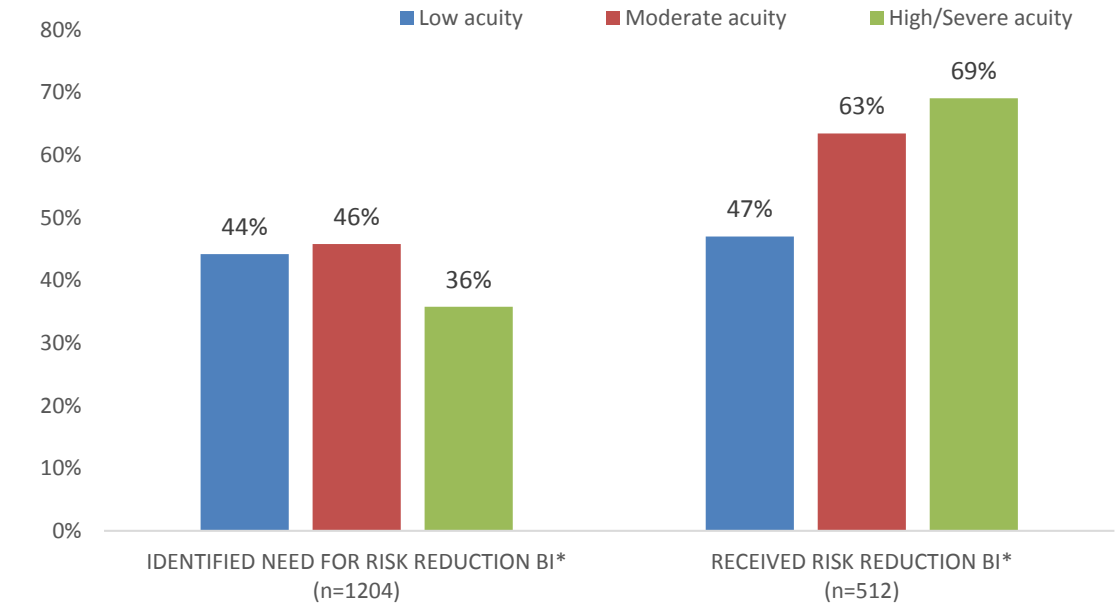
* X^2 test p <0.05

Source: DHSP Casewatch data 2013-14, Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

At enrollment in MCC, 512 (43%) of patients had identified need for the Risk Reduction BI. Identified need for the Risk Reduction BI differed significantly by acuity level (Figure 55). The majority of patients needing the Risk Reduction were moderate (46%), followed by low (44%) and high/severe acuity (36%; P<0.05).

Of the 512 with identified need for the Risk Reduction BI, 313 (61%) received the BI. There were significant differences in the proportion of patients receiving the BI by acuity (X^2 p<0.05).

Figure 55: Need and Receipt of Risk Reduction Brief Intervention by Acuity Level, 2013-2014



* X^2 test p <0.05

Source: DHSP Casewatch data 2013-14, Medical Care Coordination Assessment Data, Jan 2013 - Dec 2013

Across all domains, the need for BIs was equal to or lower among high/severe acuity patients compared to low and moderate acuity patients. As seen in the assessment data presented earlier, higher proportions of high/severe acuity patients reported recent substance use including methamphetamines, current and recent homelessness, a history of incarceration and symptoms of depressive and/or anxiety disorders which are not include in the determination of need for BIs which contribute to the calculation of overall acuity level.

MAIN OUTCOMES

Retention in HIV Care

There was a statistically significant improvement in the proportion of patients retained in HIV care before and after enrollment in MCC ($p<0.05$). In the 12 months prior to enrollment in MCC, 59% of patients were estimated to be retained in care. In the 12 months following enrollment in MCC, 83% of patients were estimated to be retained in care. **This represents a 41% improvement in retention in care from pre-MCC enrollment to post-MCC enrollment, and exceeds the 2014 NHAS target for 64% of PLWH to be in continuous HIV care** [17].

Compared to PLWH in LAC in 2013, a lower proportion of MCC patients were retained in HIV care in the 12 months before enrollment in MCC (61% versus 59%) and a higher proportion were retained in HIV care in the 12 months after enrollment MCC (61% versus 83%). Similarly, 81% of RWHAP clients were retained in care in 2013 – a higher proportion than among MCC patients before enrollment (81% versus 59%), but slightly lower than the proportion of MCC patients retained in care after enrollment (81% versus 83%) [51, 21].

These data demonstrate that the appropriate patients were targeted for MCC – those with poor retention in care as demonstrated compared to the RWHAP and LAC populations. Yet despite these disparities, after 12 months in MCC, the proportion of MCC patients retained in care exceeded that for both the RWHAP and LAC populations.

Viral Suppression

Statistically significant improvements were observed in the proportion of patients with suppressed viral load (viral load <200 copies/mL) before and after enrollment in MCC ($p<0.05$). In the 12 months prior to enrollment in MCC, 31% of patients had suppressed viral load. In the 12 months following enrollment in MCC, 64% of patients were virally suppressed. This represents a 106% improvement in the proportion of patients with viral suppression from pre-MCC enrollment to post-MCC enrollment.

The proportion of patients with viral suppression after 12 months of MCC (64%) exceeds the 2014 NHAS target for 55% of PLWH to be virally suppressed [17]**.** While the proportion of MCC patients with suppressed viral load after 12 months is less than the 80% of RWHAP clients in 2013 with suppressed viral load, it exceeds the 50% of PLWH in LAC who were virally suppressed in 2013 [51, 21].

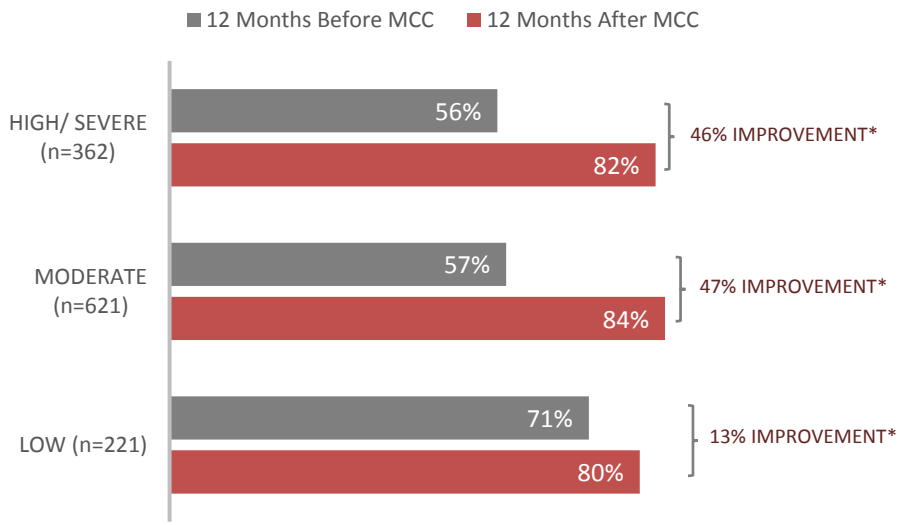
The measures of retention in care and viral suppression reflect two different, yet related, health behaviors – attending medical care appointments several times a year and taking HIV medication every day. For example, researchers have demonstrated that it takes patients with poor retention longer to achieve viral suppression compared to patients retained in consistent HIV care [85, 86, 87, 88]. Similarly, patients reporting low levels of adherence to ART medications - which directly impacts viral suppression- also are poorly retained in HIV care.

Patients in MCC were enrolled because they were identified as being at risk for poor health outcomes including low engagement in care and unsuppressed viral load. While MCC is effective at improving these critical outcomes among enrolled patients, additional analysis is needed to better understand how MCC can be further enhanced and to support patients in sustaining change in these important health behaviors.

Outcomes by Acuity Level

As shown below in Figure 56, there were significant improvements in retention in care for patients in each of the acuity groups ($p<0.05$). The greatest improvement in the proportion of patients retained in care was seen among moderate acuity patients (47%), followed by high/severe (46%) and low (13%) acuity patients. **Across all acuity levels, the proportion of patients retained in care exceeded the 2014 NHAS target for 64% for PLWH to be in continuous HIV care.**

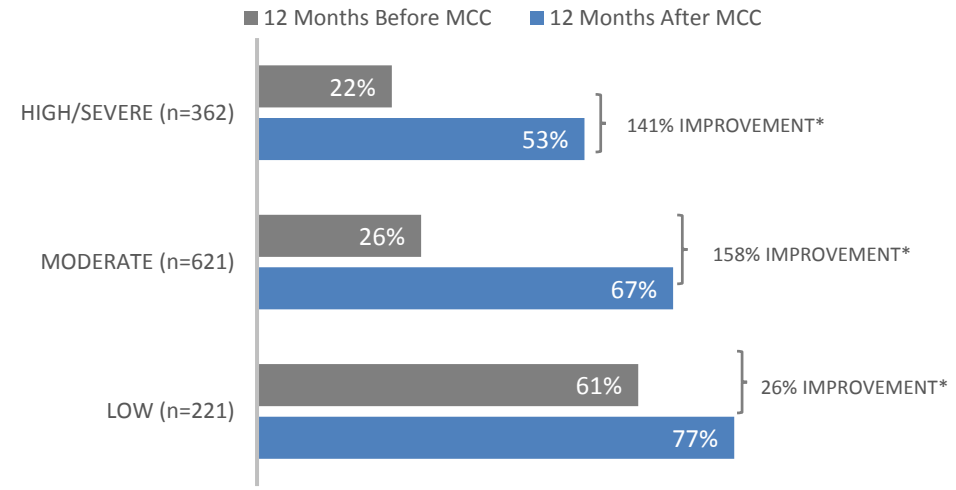
Figure 56: Retention in Care Before and After MCC by Acuity Level (n=1,204), 2012-2014



*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

As shown below in Figure 57, there were also significant improvements in the proportion of patients with viral suppression 12 months before and after enrollment in MCC across the three acuity levels ($p<0.05$). **The proportion of patients with viral suppression after 12 months of MCC in moderate and low acuity levels exceeded the 2014 NHAS target for 55% of PLWH to achieve viral suppression** [17]**.** Despite a relative improvement of 141% in viral suppression among high/severe acuity patients, the proportion of patients who were virally suppressed after 12 months in MCC did not meet the 2014 NHAS target of 55%.

Figure 57: Viral Suppression Before and After MCC Enrollment by Acuity Level (n=1,204), 2012-2014



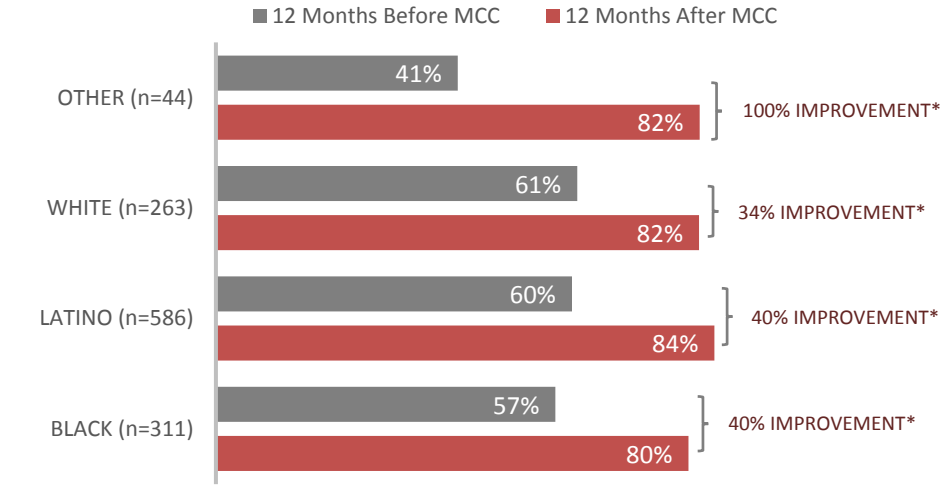
*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

As illustrated in the key assessment findings, compared to low acuity patients, higher acuity patients are disproportionately impacted by homelessness, mental health disorders, substance use, and co-morbid disease. Despite these disparities, after 12 months of MCC, these patients demonstrated the greatest magnitude of improvement in retention in care and viral suppression relative to low acuity patients.

Outcomes by Race/Ethnicity

There were significant improvements in the proportion of patients retained in HIV care by race/ethnicity as presented below in Figure 58 (p<0.05). The greatest improvement in the proportion of patients retained in care was seen among patients of other racial/ethnic groups (100%), followed by Latinos and Blacks (40%) and Whites (34%). Approximately 84% of the patients in the other race/ethnicity group were Asian and Native Hawaiian/Pacific Islanders. **Across all racial/ethnic groups, the proportion of patients who were retained in care after 12 months in MCC exceeded the 2014 NHAS target for 64% of PLWH to be in continuous HIV care** [17]**.**

Figure 58: Retention in Care Before and After MCC Enrollment by Race/Ethnicity (n=1,204), 2012-2014

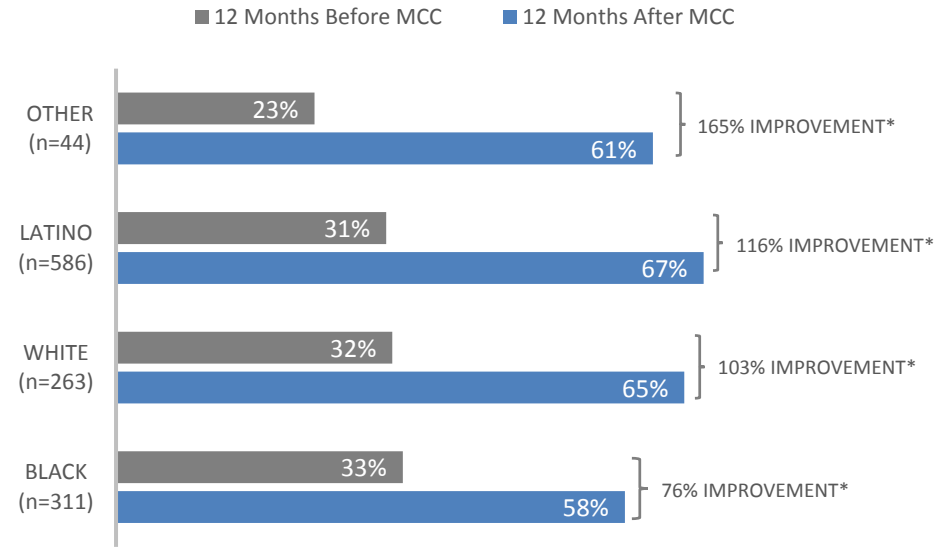


*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Although the percentage of patients retained in care at baseline significantly differed by race/ethnicity, the proportion of patients retained in care after 12 months of MCC did not differ by race. This contrasts with patterns of retention in care by race/ethnicity reported in LAC where retention in HIV care is significantly higher among Latinos and Asian/Pacific Islanders and lower among Blacks compared to Whites [21]. This suggests that MCC may be useful to reduce disparities in HIV care utilization by race/ethnicity.

There were also significant improvements in the proportion of patients with viral suppression by race/ethnicity as shown below in Figure 59 ($p<0.05$). The greatest improvement in the proportion of patients with viral suppression was seen among patients of other racial/ethnic groups (165%), followed by Latino (116%), White (103%) and Black patients (76%). **Across all racial/ethnic groups, the proportion of patients with viral suppression after 12 months of MCC exceeded the 2014 NHAS target of 55%** [17]**.**

Figure 59: Viral Suppression Before and After MCC Enrollment by Race/Ethnicity (n=1,204), 2012-2014



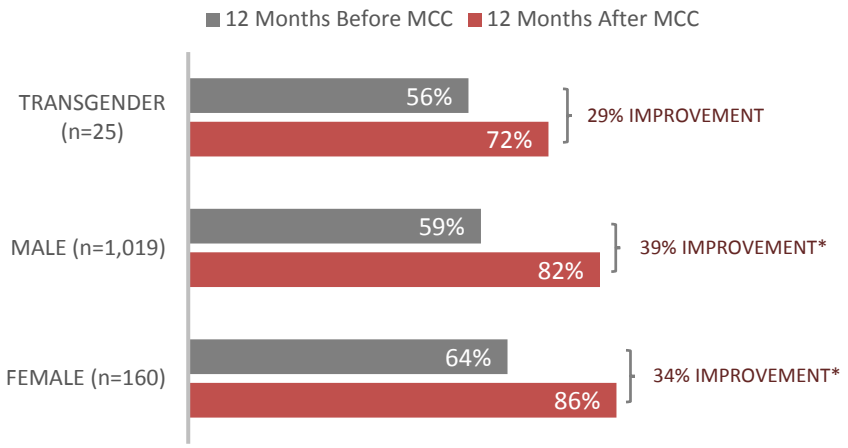
*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

While significant improvements were seen in viral suppression before and after MCC enrollment, further refinements to MCC are needed to maximize viral suppression among Black patients. While Black MCC patients had slightly better viral suppression compared to other racial/ethnic groups at enrollment and did see significant improvement, they experienced the smallest magnitude of improvement.

Outcomes by Gender

As shown below in Figure 60, there were statistically significant improvements in retention in care from 12 months before and after enrollment among females and males ($p<0.05$), but not among transgender patients. There were however, improvements in retention among transgender, that are promising, and a lack of significant findings may be the result of small numbers rather than the effectiveness of the model. The greatest magnitude improvement in the proportion of patients retained in care was seen among male patients (39%), followed by females (34%) and transgender patients (29%). **The proportion of patients retained in care after 12 months of MCC across all genders, including transgender patients, exceeded the 2014 NHAS target for 64% of PLWH to be in continuous HIV care** [17]**.**

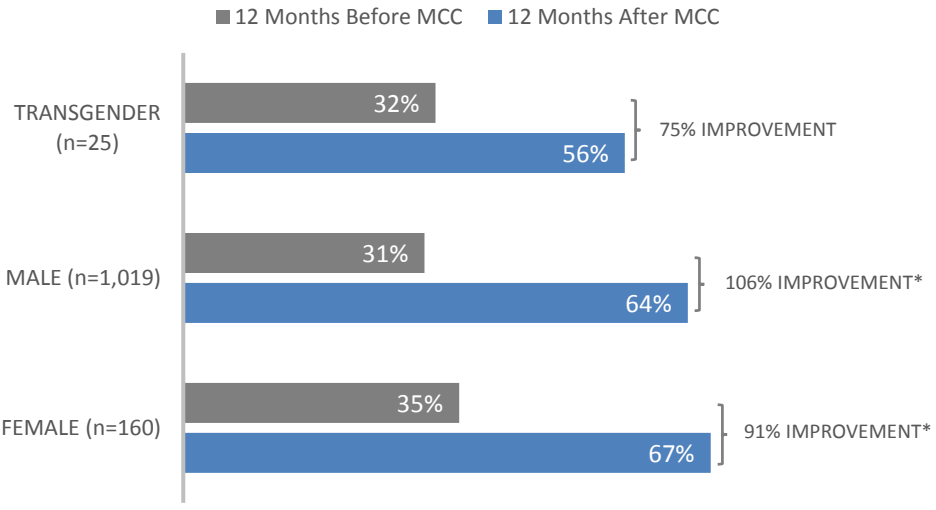
Figure 60: Retention in Care Before and After MCC Enrollment by Gender (n=1,204), 2012-2014



*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

There were statistically significant relative improvements in viral suppression before and after MCC enrollment among female and male patients as shown below in Figure 61 (p-value <0.05). As seen for retention, non-significant differences in viral suppression among transgender patients before and after MCC enrollment may be the result of small numbers. The greatest improvement in the proportion of patients with viral suppression was seen among males (106%), followed by females (91%) and transgender patients (75%). **Across all gender groups, the proportion of patients with viral suppression exceeded the 2014 NHAS target for the proportion of PLWH with viral suppression of 55%** [17]**.**

Figure 61: Viral Suppression 12 Months Before and After MCC Enrollment by Gender (n=1,204), 2012-2014



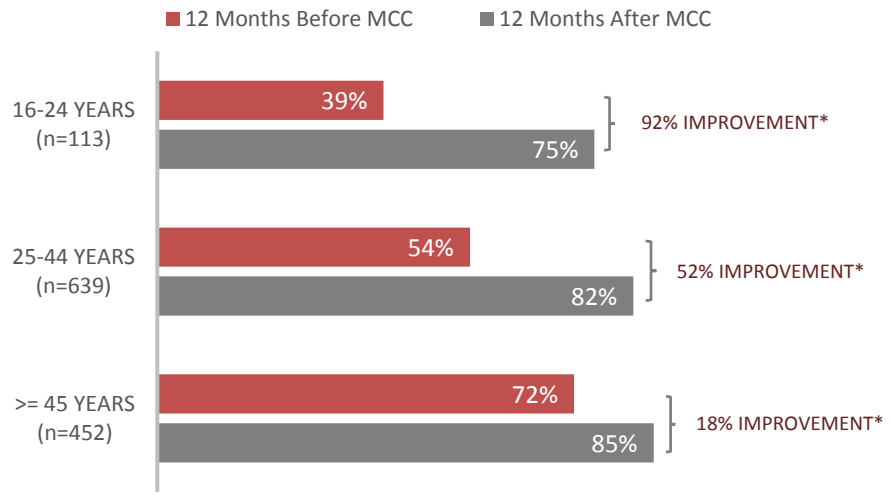
*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Despite having 49 times higher odds of HIV infection compared to non-transgender individuals, there are limited HIV care and treatment resources for transgender women [89]. Disparities in viral suppression by gender is also observed in LAC overall in 2013, with only 47% of transgender persons achieving viral suppression compared to 59% of cisgender men and 56% of cisgender women [21]. A higher proportion of transgender patients in MCC had suppressed viral load after 12 months compared to transgender PLWH in LAC in (56% versus 47%).

Outcomes by Age Group

There were statistically significant improvements in the proportion of patients retained in care in the 12 months before and after MCC enrollment across all age groups as shown below in Figure 62 ($p<0.05$). **The proportion of patients retained in care after 12 months in MCC across all age groups exceeded the NHAS target for 64% of PLWH to be retained in care** [17]**.**

Figure 62: Retention in Care Before and After MCC Enrollment by Age Group (n=1,204), 2012-2014

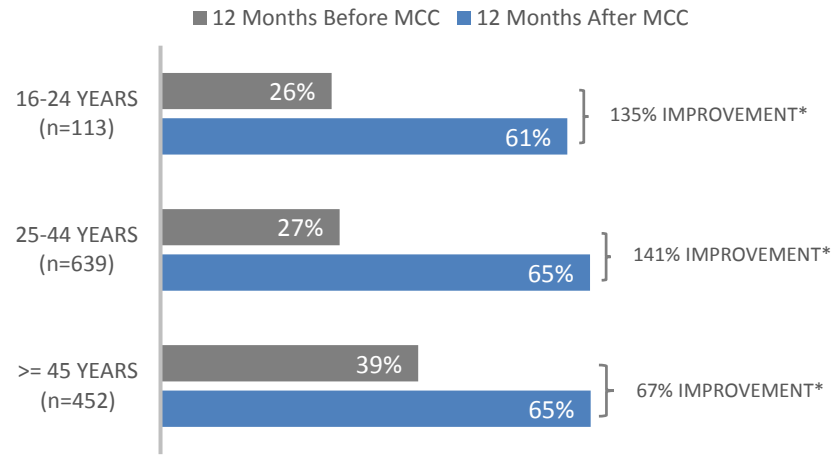


*p <0.05

Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

There were also statistically significant improvements in the proportion of patients with viral suppression in the 12 months before and after MCC enrollment across all age groups as shown below in Figure 63 ($p<0.05$). The greatest improvement in the proportion of patients with viral suppression was seen among patients aged 25-44 (141%), followed by patients aged 16-24 (135%) and aged 45 years and older (67%). **The proportion of patients with suppressed viral load after 12 months in MCC across all age groups exceeded the 2014 NHAS target to increase the proportion of PLWH who are virally suppressed to 55%** [17]**.**

Figure 63: Viral Suppression Before and After MCC Enrollment by Age Group (n=1,204), 2012-2014



*p <0.05

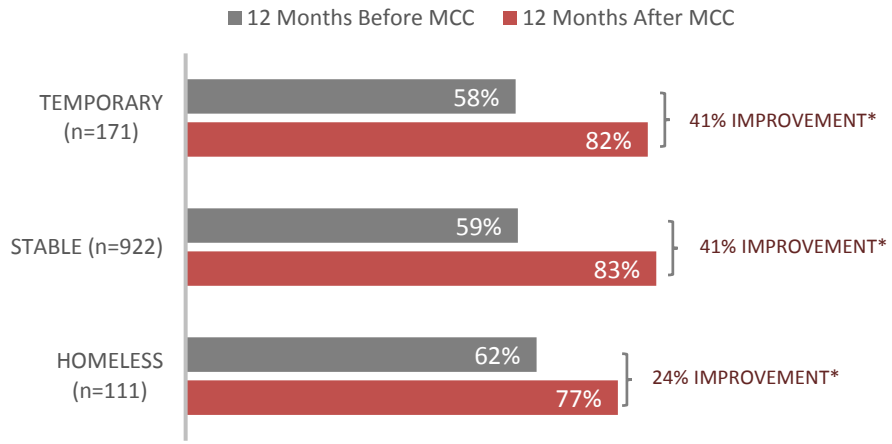
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

The magnitude of improvement in retention in care and viral suppression among patients aged 16-24 and 25-44 in MCC is important, as younger PLWH are less likely to be adherent to ART, have suppressed viral load or be retained in HIV care both in and outside the RWHAP [15, 21, 90, 91, 14, 92]. Among younger adults particularly, retention is strongly associated with and critical to achieving viral suppression [93].

Outcomes by Housing Status

While all patients by housing status showed statistically significant improvements in retention in HIV care and viral suppression (p-value <0.05), the largest relative improvements in both retention and viral suppression were seen among stably housed patients (Figures 64 and 65). While there were statistically significant improvements in retention in care and viral suppression among homeless patients, these patients experienced the smallest magnitude of improvement. **Across stably housed, temporarily housed and homeless patients, the proportion retained in care after 12 months in MCC exceeded the NHAS target for 64% of PLWH to be retained in care** [17]**. Among patients with stable and temporary housing status the proportion with viral suppression after 12 months in MCC exceeded the 2014 NHAS target for 55% of PLWH to have suppressed viral load** [17]**.**

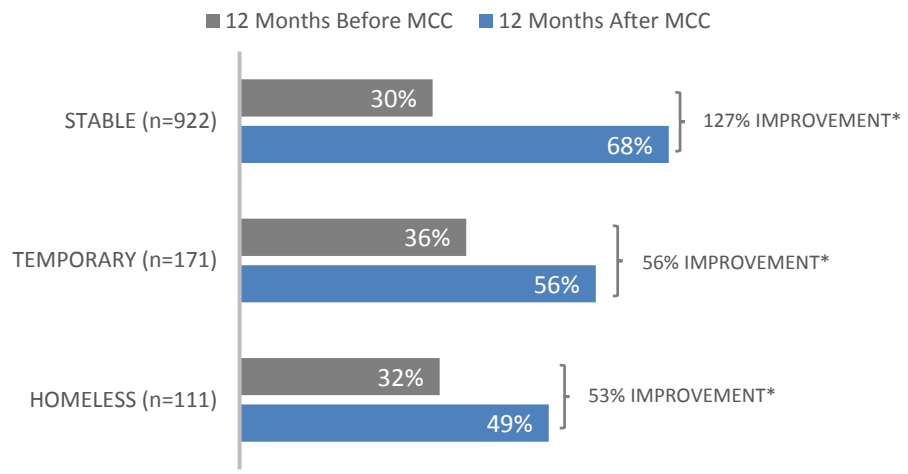
Figure 64: Retention in Care 12 Months Before and After MCC Enrollment by Housing Status (n=1,204), 2012-2014



*p <0.05

Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

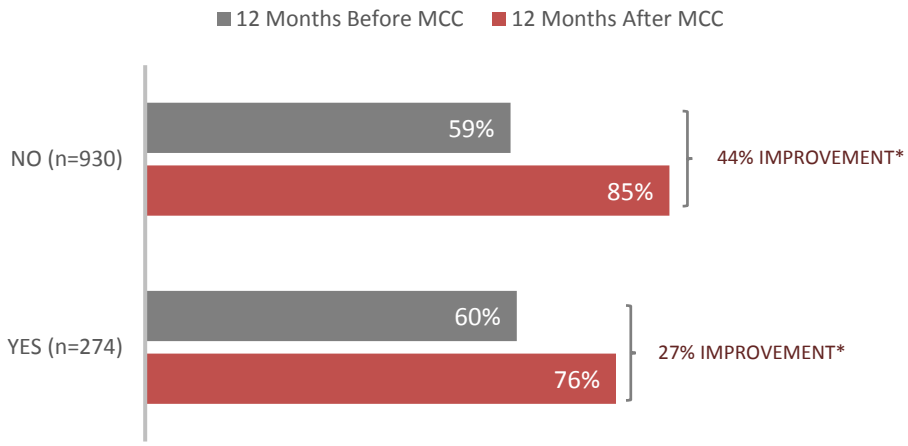
Figure 65: Viral Suppression 12 Months Before and After Enrollment in MCC by Housing Status (n=1,204), 2013-2014



*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

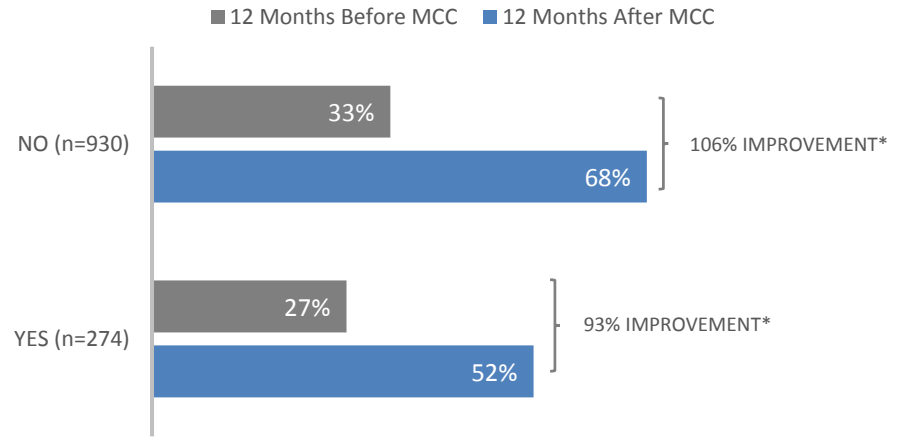
Similarly, while substantial improvements were observed for retention in care and viral suppression among recently homeless patients (p<0.05), these improvements were not as large as those observed among patients who did not report recent homelessness (Figures 66 and 67). **The proportion of recently homeless patients retained in care after 12 months of MCC exceeded the 2014 NHAS target of 64%** [17]**. Despite significant improvements in viral suppression, the proportion of recently homeless patients who achieved viral suppression after 12 months in MCC did not meet the 2014 target of 55%** [1]

Figure 66: Retention in Care 12 Months Before and 12 Months After MCC Enrollment by Recent Homelessness (n=1,204), 2012-2014F



*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Figure 67: Viral Suppression 12 Months Before and 12 Months After MCC Enrollment by Recent Homelessness (n=1,204), 2012-2014



*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

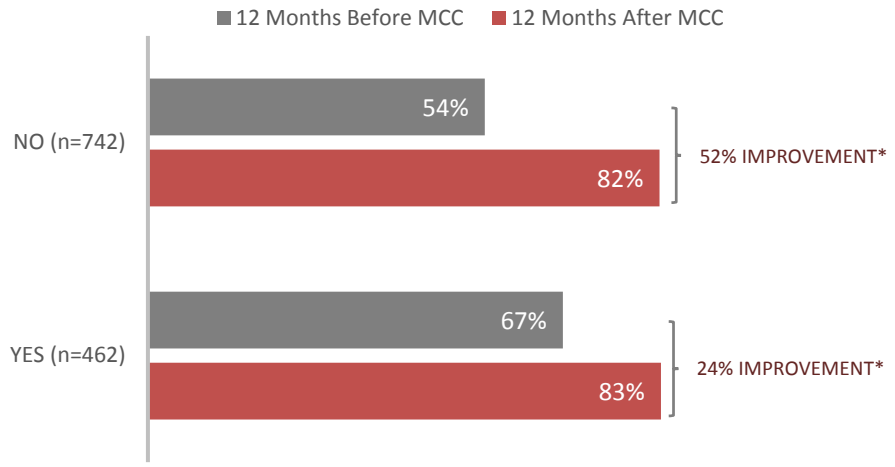
Improving housing status and access to stable housing is a priority for the NHAS to address disparities in HIV care continuum outcomes [17]. Housing instability and homelessness are barriers to accessing and adhering to ART, engagement and retention in HIV care, and viral suppression [74, 15]. In addition, housing instability and homelessness are also associated with increased risk of HIV transmission behaviors. While critical improvements in retention in care and viral suppression were seen among currently homeless and recently homeless patients in MCC, disparities relative to stably housed patients persist.

Outcomes by Incarceration History

As seen in Figure 68 below, there were statistically significant improvements in the proportion of patients retained in HIV care in the 12 months after enrollment in MCC for those both with and without a history of incarceration ($p<0.05$). **Regardless of incarceration history, the proportion of MCC patients retained in care at 12 months exceeded the 2014 NHAS target of 64%** [17]**.**

While patients without a history of incarceration had 52% improvement in retention in care, those with a history of incarceration saw an improvement in retention in care of only 24%. Before enrollment in MCC, a higher proportion of patients with a history of incarceration were retained in care (67%) compared to those without a history of incarceration (54%), which persisted after 12 months in MCC, with the proportion of patients retained in care with a history of incarceration still slightly exceeding retention among those without a history of incarceration (83% versus 82%).

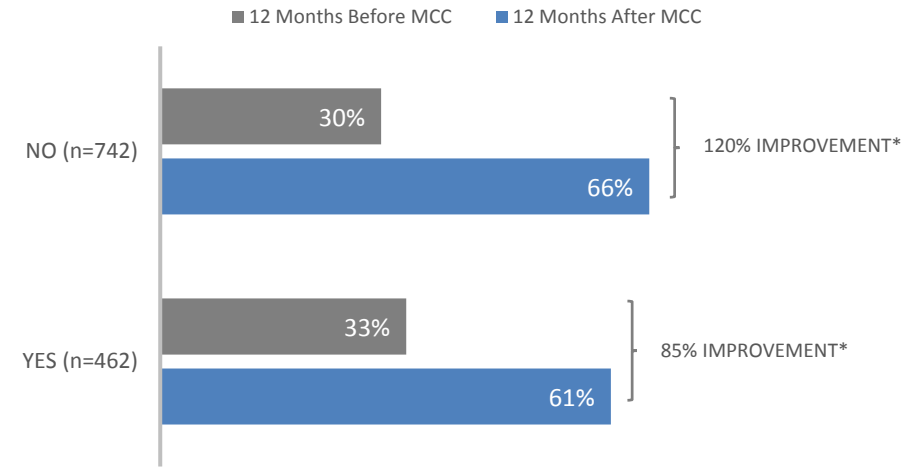
Figure 68: Retention in Care 12 Months Before and After MCC Enrollment by Incarceration History (n=1,204), 2012-2014



*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Statistically significant improvements in the proportion of patients with viral suppression after 12 months were observed among those with and without a history of incarceration (p<0.05). **The proportion of patients with suppressed viral load after 12 months in MCC regardless of their incarceration status exceeded the 2014 NHAS target for 55% of PLWH to achieve viral suppression** [17]**.** The magnitude of improvement in viral suppression, however, was lower among those with history of incarceration (85%) compared to those without history of incarceration (120%).

Figure 69: Viral Suppression 12 Months Before and After Enrollment in MCC by Incarceration History (n=1,204), 2012-2014



*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

The higher proportions of previously incarcerated patients retained in care and with suppressed viral load in the 12 months before MCC may be due to greater access to HIV medical care and ART during a recent incarceration. Previously incarcerated PLWH generally have lower retention in HIV care, access to ART medications and viral suppression compared to the PLWH who have not been incarcerated [94, 95]. However, data suggests that prior to incarceration, these PLWH would have been similar to never incarcerated PLWH with regard to retention in HIV care, access to ARTs and viral suppression [94].

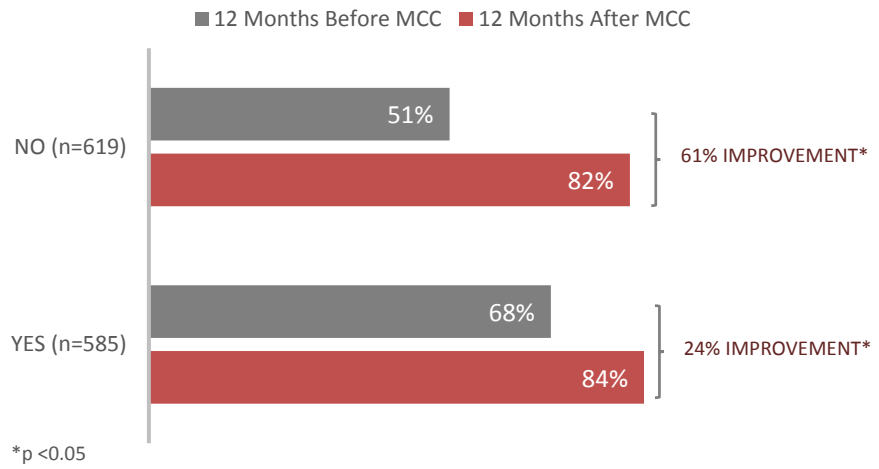
Outcomes by Mental Health Status

As presented in Figure 70 below, there were statistically significant improvements in the proportion of patients retained in HIV care in the 12 months after enrollment in MCC for those with and without a past mental health diagnosis ($p<0.05$). **Regardless of their mental health history, the proportion of patients retained in care after 12 months in MCC exceeded the NHAS target of 64%** [17]**.**

A higher proportion of patients with a past mental health diagnosis were retained in care in the 12 months after enrollment in MCC (84%) compared to those without a past mental health diagnosis (82%), however, the relative improvement in retention in care for patients with no history of mental illness was lower than that for those with a history of mental illness (24% versus 61%).

Among patients with a past mental health diagnosis, a higher proportion were retained in care in the 12 months before MCC (68%) compared to patients without a mental health diagnosis (51%). The experience of receiving mental health treatment may differentially impact care-seeking behaviors among patients with a past mental health diagnosis compared to those without a past mental health diagnosis.

Figure 70: Retention in HIV Care 12 Months Before and After MCC Enrollment by Past Mental Health Diagnosis (n=1,204), 2012-2014

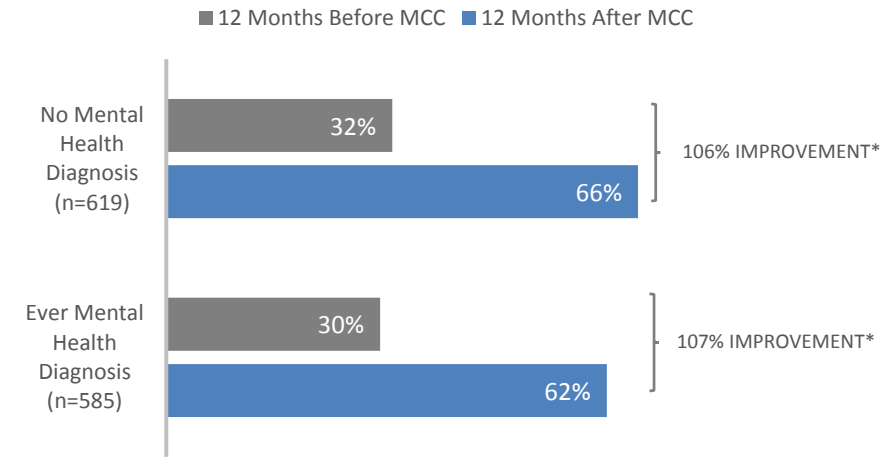


*p <0.05

Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

As shown in Figure 71, there were statistically significant improvements in the proportion of patients with viral suppression before and after MCC enrollment regardless of mental health status, and the relative improvement was nearly the same for both groups. **The proportion of virally suppressed patients after 12 months in MCC for both those with and without past mental health diagnosis exceeded the 2014 NHAS target of 55% of PLWH** [17]**.**

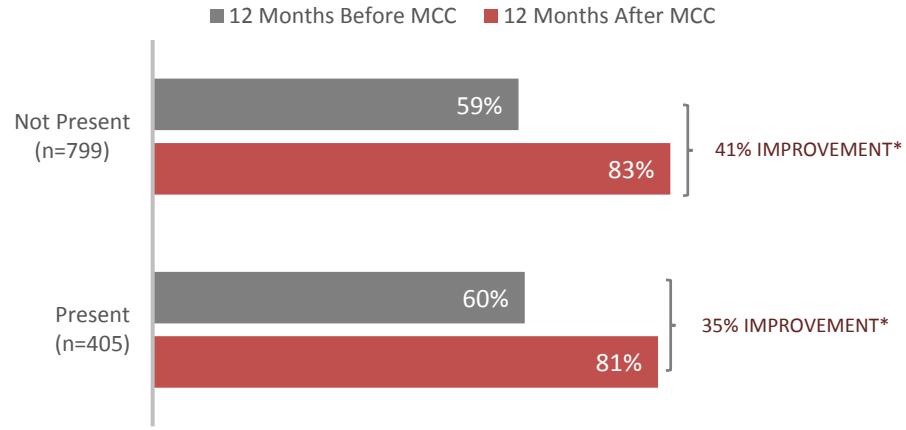
Figure 71: Viral Suppression 12 Months Before and After MCC Enrollment by Past Mental Health Diagnosis (n=1,204), 2012-2014



*p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

As seen in Figure 72 below, there were statistically significant improvements in the proportion of patients retained in HIV care in the 12 months after enrollment in MCC for those both with and without depressive disorder symptoms (p<0.05). The magnitude of improvement in retention in care was also slightly lower among those with depressive symptoms compared to patients without depressive disorder symptoms (35% and 41%, respectively). **Regardless of the presence of depressive disorder symptoms, patients exceeded the NHAS target of 64% for retention in HIV care** [17]**.**

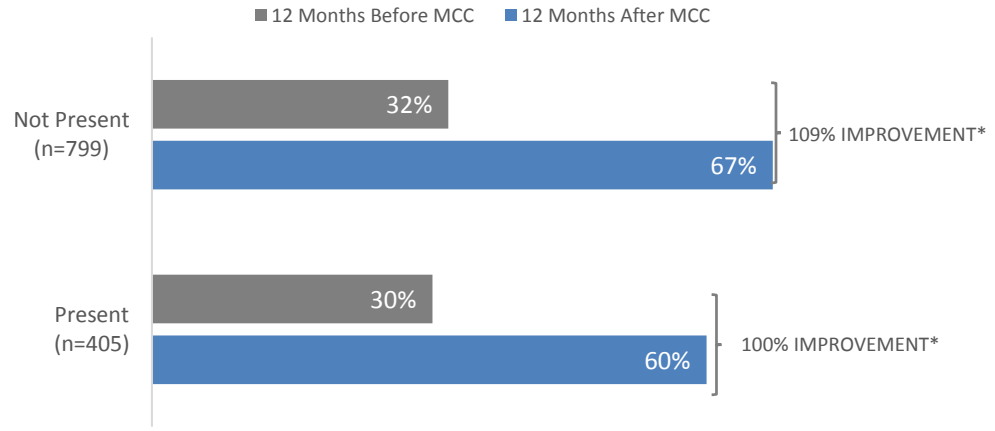
Figure 72: Retention in HIV Care 12 Months Before and After MCC Enrollment by Depressive Disorder Symptoms[a] (n=1,204), 2012-2014



[a]Present=moderate to severe depression symptoms (PHQ-9 ≥10); *p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Improvements in the proportion of virally suppressed patients in the 12 months after enrollment in MCC for those both with and without depressive disorder symptoms were significant (Figure 73; p<0.05). The magnitude of improvement in the proportion of patients with viral load suppression was lower among patients with depressive symptoms compared to those without symptoms (100% versus 109%). **The proportion of virally suppressed patients after 12 months in MCC, regardless of the presence of depressive symptoms, exceeded the 2014 NHAS target for 55% viral suppression in PLWH** [17]**.**

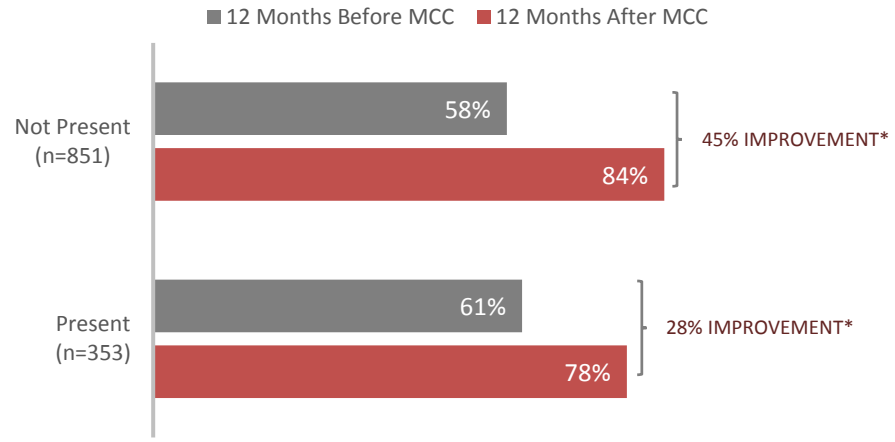
Figure 73: Viral Suppression 12 Months Before and After MCC Enrollment by Depressive Disorder Symptoms[a] (n=1,204), 2012-2014



[a]Present=moderate to severe depression symptoms (PHQ-9 ≥10); *p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Among patients with and without anxiety disorder symptoms there were statistically significant improvements in the proportion of patients retained in HIV care in the 12 months before and after enrollment in MCC (p<0.05). As seen in Figure 74 below, a slightly higher proportion of patients with anxiety symptoms was retained in care compared with those without anxiety symptoms before MCC enrollment (61% vs 58%, respectively), while after 12 months in MCC, a lower proportion of patients with anxiety symptoms were retained in HIV care compared to those without symptoms (78% vs 84%, respectively). The relative improvement in the proportion of patients retained in care was higher in patients without anxiety symptoms present than among those patients with anxiety symptoms present (45% and 28%, respectively). **Retention in care 12 months after MCC among patients both with (78%) and without anxiety disorder symptoms (84%) exceeded the 2014 NHAS target of 64%** [17]**.**

Figure 74: Retention in HIV Care 12 Months Before and After MCC Enrollment by Anxiety Disorder Symptoms[a] (n=1,204), 2012-2014

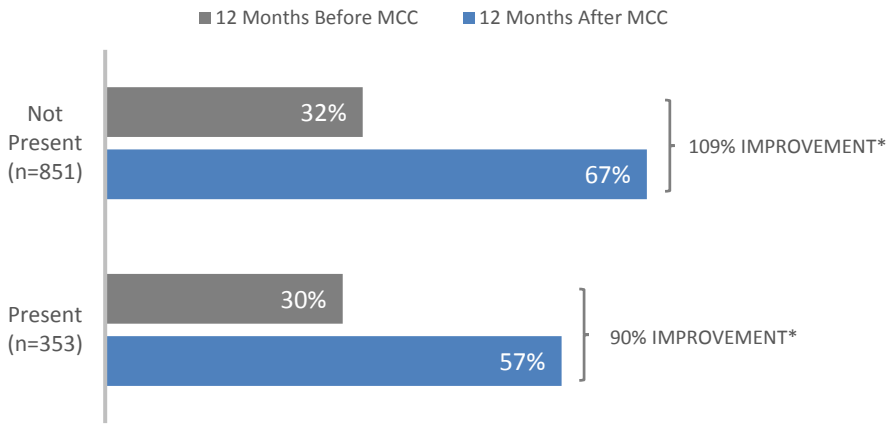


[a]Present=moderate to severe depression symptoms (PHQ-9 ≥10); *p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

As presented below in Figure 75, there were statistically significant improvements in the proportion of patients with suppressed viral load in the 12 months before and after enrollment in MCC for those both with and without

anxiety symptoms. Improvements in the proportion of patients with viral load suppression were lower in patients with anxiety symptoms (90%) compared to patients without anxiety symptoms (109%). **The proportion of patients with suppressed viral load after 12 months in MCC, regardless of the presence of anxiety disorder symptoms, exceeded the 2014 NHAS target of 55% for viral suppression among PLWH** [17]**.**

Figure 75: Viral Suppression 12 Months Before and After MCC Enrollment by Anxiety Disorder Symptoms[a] (n=1,204), 2012-2014



[a]Present=moderate to severe symptoms of anxiety (GAD-7≥10); *p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Smaller relative improvements in retention in care and viral suppression were seen among MCC patients with current symptoms of depressive and anxiety disorders compared to those without symptoms. This is consistent with studies that found that PLWH experiencing mental illness are less likely to attend medical visits, to adhere to ARTs or to achieve viral suppression compared to those without mental illness and [96, 71].

Outcomes by Substance Addiction Status

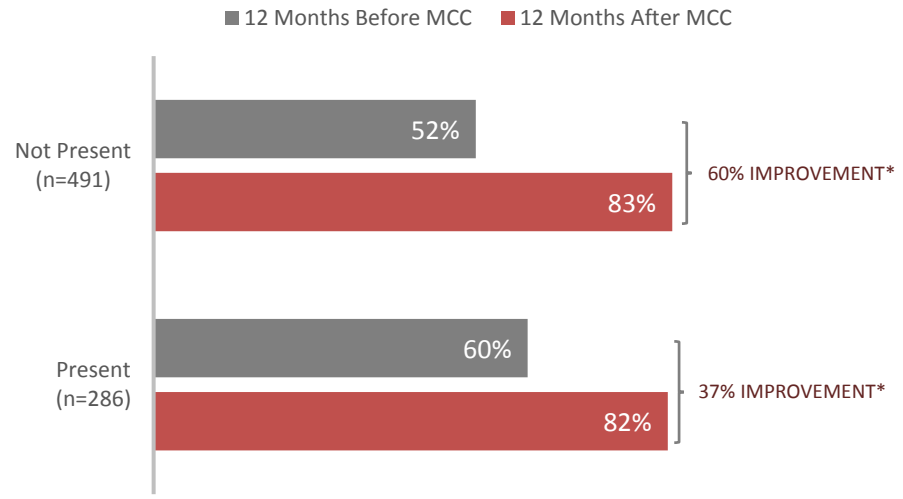
Patients who reported substance use in the past 6 months were screened for possible substance addiction (n=786). Statistically significant improvements were observed in the proportion of patients retained in HIV care and virally suppressed in the 12 months after enrollment in MCC for those both with and without symptoms of substance addiction.

As shown in Figure 76 below, a higher proportion of patients with substance addiction symptoms were retained in HIV care before MCC enrollment (60%) compared to those without those symptoms (52%). Among MCC patients with symptoms of substance addiction, 66% also had comorbid mental health diagnoses, the treatment of which may differentially impact their care-seeking behaviors.

After 12 months in MCC, the proportion of patients without substance addiction symptoms retained in care slightly exceeded those with substance addiction symptoms (83% versus 82%). While patients without substance addiction symptoms had 60% improvement in retention in care, those with substance addiction symptoms saw an

improvement in retention in HIV care of only 37%. **Despite this disparity, after 12 months all patients exceeded the NHAS target of 64% for retention in HIV care** [17]**.**

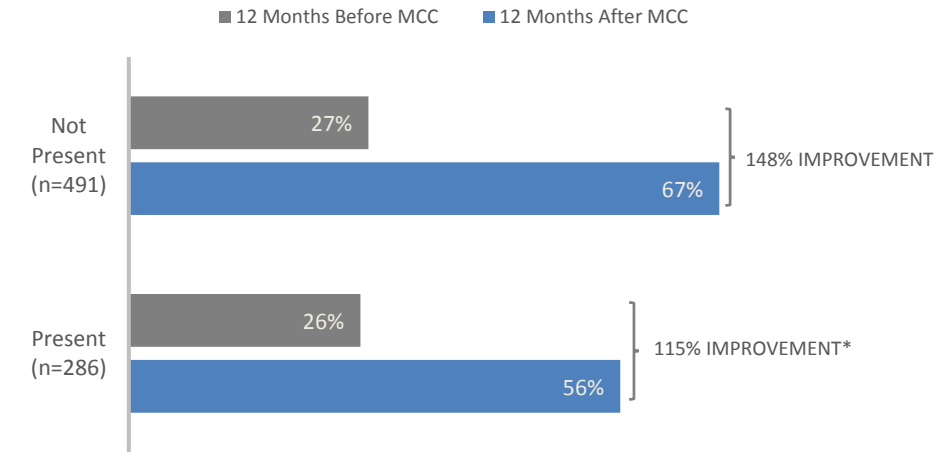
Figure 76: Retention in HIV Care 12 Months Before and After MCC Enrollment by Substance Addiction Symptoms[a] (n=786), 2012-2014



[a]Present=TCU Substance Abuse Screener ≥3; *p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

As presented below in Figure 77, despite very similar proportions of viral suppression among patients with and without substance addiction symptoms before MCC enrollment, a lower proportion of those with substance addiction symptoms was virally suppressed after 12 months compared to those without substance addiction symptoms (56% versus 67%). **Regardless of the disparity, the proportion of patients both with and without substance addiction symptoms who achieved viral suppression after 12 months in MCC exceeded the 2014 NHAS target of 55%** [17]**.**

Figure 77: Viral Suppression 12 Months Before and After MCC Enrollment by Substance Addiction Symptoms[a] (n=786), 2012-2014



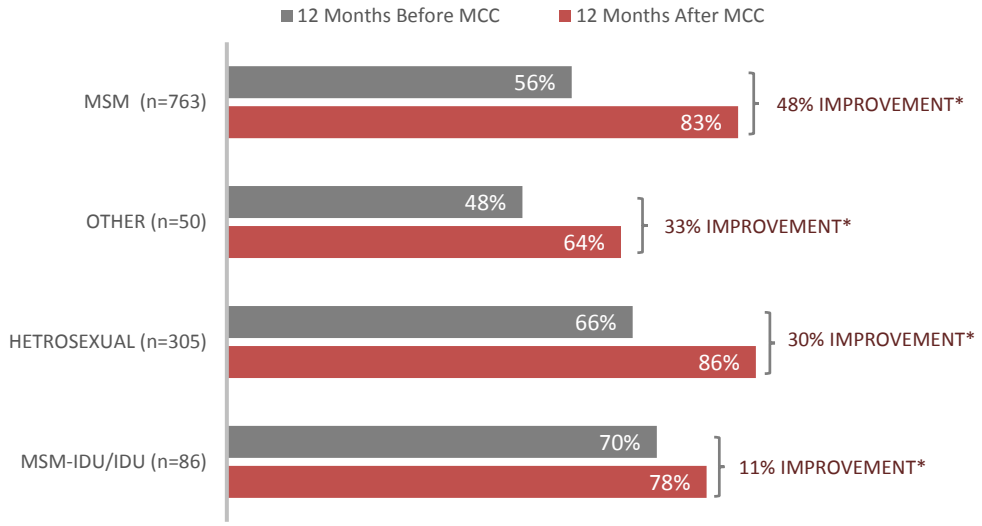
[a]Present=TCU Substance Abuse Screener ≥3; *p <0.05
Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Outcomes by HIV Transmission Mode

Statistically significant improvements in the proportion of patients retained in HIV care in the 12 months after enrollment in MCC were observed by MSM and heterosexual modes of transmission ($p<0.05$). As seen in Figure 78 below, the largest improvement in the proportion of patients retained in HIV care was observed among MSM (48%), followed by those with other (33%), heterosexual (30%) and MSM-IDU/IDU (11%) modes of transmission. Patients with other HIV transmission mode included Hemophilia/coagulation disorder, perinatal, transfusion, other, and no identified risks (NIR).

The largest proportion of patients retained in HIV care before enrollment in MCC was observed among MSM-IDU/IDU (70%), followed by heterosexual (66%), MSM (56%) and patients with other modes of HIV transmission (48%). In the 12 months after enrollment in MCC, however, the largest proportion of patients retained in care by HIV modes of transmission was observed among heterosexuals (86%), followed by MSM (83%). **Regardless of the mode of HIV transmission, patients after 12 months in MCC exceeded the NHAS target (64%) for retention in HIV care** [17]**.**

Figure 78: Retention in HIV Care 12 Months Before and After MCC Enrollment by HIV Transmission Mode (n=1,204), 2012-2014

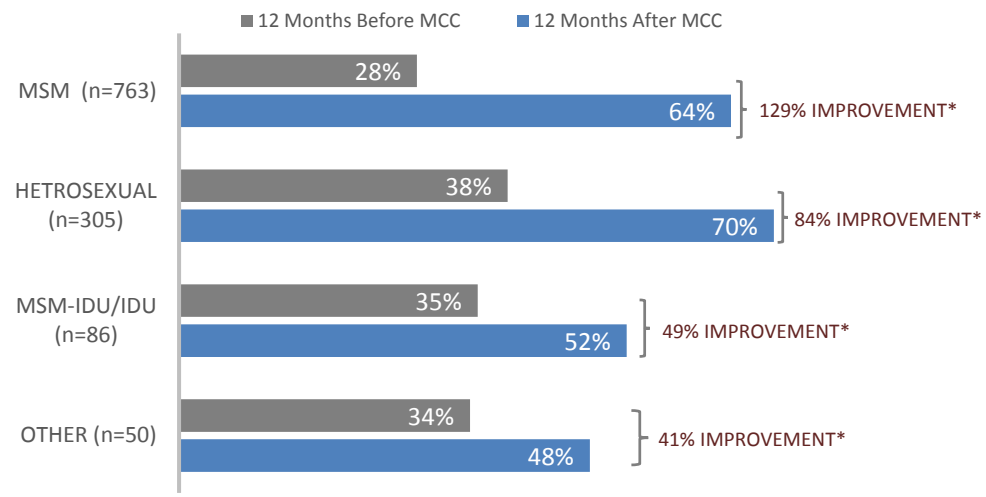


*p <0.05

Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

Apart from patients with Other HIV transmission mode, there were statistically significant improvements in the proportion of patients with suppressed viral load in the 12 months after enrollment in MCC across all transmission modes ($p<0.05$). As shown in Figure 79 below, the largest improvement in the proportion of patients with viral load suppression was among MSM (129%), followed by heterosexual (84%), MSM-IDU/IDU (49%) and other (41%) HIV transmission mode. **Among patients with heterosexual and MSM modes of HIV transmission, the proportion of patients with viral suppression after 12 months in MCC exceeded the 2014 NHAS target of 55% for PLWH** [17]. However, the proportion of virally suppressed among MSM-IDU/IDU and other modes of HIV transmission did not meet the 2014 NHAS target.

Figure 79: Viral Suppression 12 Months Before and After MCC Enrollment by HIV Transmission Mode (n=1,204), 2012-2014



*p <0.05

Source: DHSP Casewatch data 2013-14, HIV Surveillance data 2012-14

In LAC, the MSM is the primary HIV transmission mode representing the mode of HIV exposure for approximately 78% of PLWH. Improvements in retention in care and viral suppression among MSM are critical as this group is estimated to account for most HIV transmission relative to PLWH with other risk factors [8].

CONCLUSIONS

Engagement in continuous care and viral suppression are critical to achieve the broader benefits of antiretroviral therapy that include better health and longer lives for PLWH, as well as reducing the opportunity for forward transmission [8, 7, 2, 3]. Despite the availability of effective and well-tolerated ART regimens, fewer than half of PLWH in LAC and in the US had suppressed viral load in 2011 [10, 9, 50]. Retention in care and viral suppression rates are even lower among populations disproportionately impacted by HIV that those who are younger, Black or Latino, have less education, or are lower income [11, 12, 13, 14, 15] . In addition, for many PLWH, unmet behavioral health, medical, socioeconomic and competing life needs can interfere with and serve as barriers to accessing continuous HIV care and medication [15, 16].

To improve the health of PLWH and reduce the spread of HIV, the LAC Department of Public Health's DHSP developed and implemented the MCC program. This LAC-based program integrates behavioral interventions and support services with medical care to fully respond to patients' needs, and to promote treatment adherence and health outcomes [24, 20]. MCC services are delivered by multidisciplinary teams consisting of a nurse, social worker and case worker that are co-located at Ryan White medical homes to facilitate coordination with medical providers. The MCC team assesses patients to understand their unique needs and delivers targeted interventions to address those needs to improve their use of medical care and adherence to HIV medication.

The first-year evaluation findings presented in this report demonstrate that the MCC program significantly increased viral suppression and retention in care among PLWH who are at risk for poor health outcomes in a real-

world setting. Improvements in the main health outcomes were also observed across all patient demographic characteristics and key determinants of health to include patients who were aged 16-24, transgender, uninsured and high/severe acuities. In addition, the proportion of patients who were retained in HIV care and were virally suppressed after 12 months in MCC surpassed the 2014 National HIV AIDS Strategy benchmarks for 64% of persons with HIV to be in continuous medical care and for 55% to be virally suppressed [1].

This report represents an important first step in evaluating the MCC program, however further examination is needed to determine how to improve the program to achieve greater equity in health outcomes for key vulnerable populations who include transgender, youth, homeless, recently incarcerated, and those with mental health issues and/or substance addiction. In addition, it is critical to understand the cost and cost-effectiveness of this intensive service, with consideration of potential longer-term costs savings accrued resulting from patients' improved health status that include reductions in incidence of HIV-related morbidity and mortality and HIV transmission. It is also important to understand the impact of the program as its reach expands – over 6,000 high risk patients have been enrolled to date, additional staff have been added to improve efforts to re-engage out of care patients, and the model is being piloted in three non-RWHAP medical homes. Finally, as the program matures, longitudinal analyses are needed to monitor and evaluate trends in retention in care, viral suppression, acuity and mental health and substance addiction indicators over time as well as the durability of improved health outcomes.

MCC is the first program of its kind nationally to systematically apply a modified chronic disease care model to coordinate and manage medical and non-medical support services for PLWH. In 2015, the MCC program was recognized with the "Changemaker Award" by the Los Angeles County Commission on Quality and Productivity. It was also identified in 2015 by the Centers for Disease Control and Prevention as a "success story" to improve the HIV care continuum and meet the National HIV/AIDS Strategy goals in LAC [97].

These results have clear implications for MCC as an effective strategy to improve health outcomes of PLWH, strengthen the HIV care continuum, and meet the targets of the National HIV/AIDS Strategy in LAC [17, 1]. Policy makers and public health officials should strongly consider adoption of this model as they seek to improve the lives of persons living with HIV and reduce forward transmission.

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APPENDICES

MCC SERVICE GUIDELINES

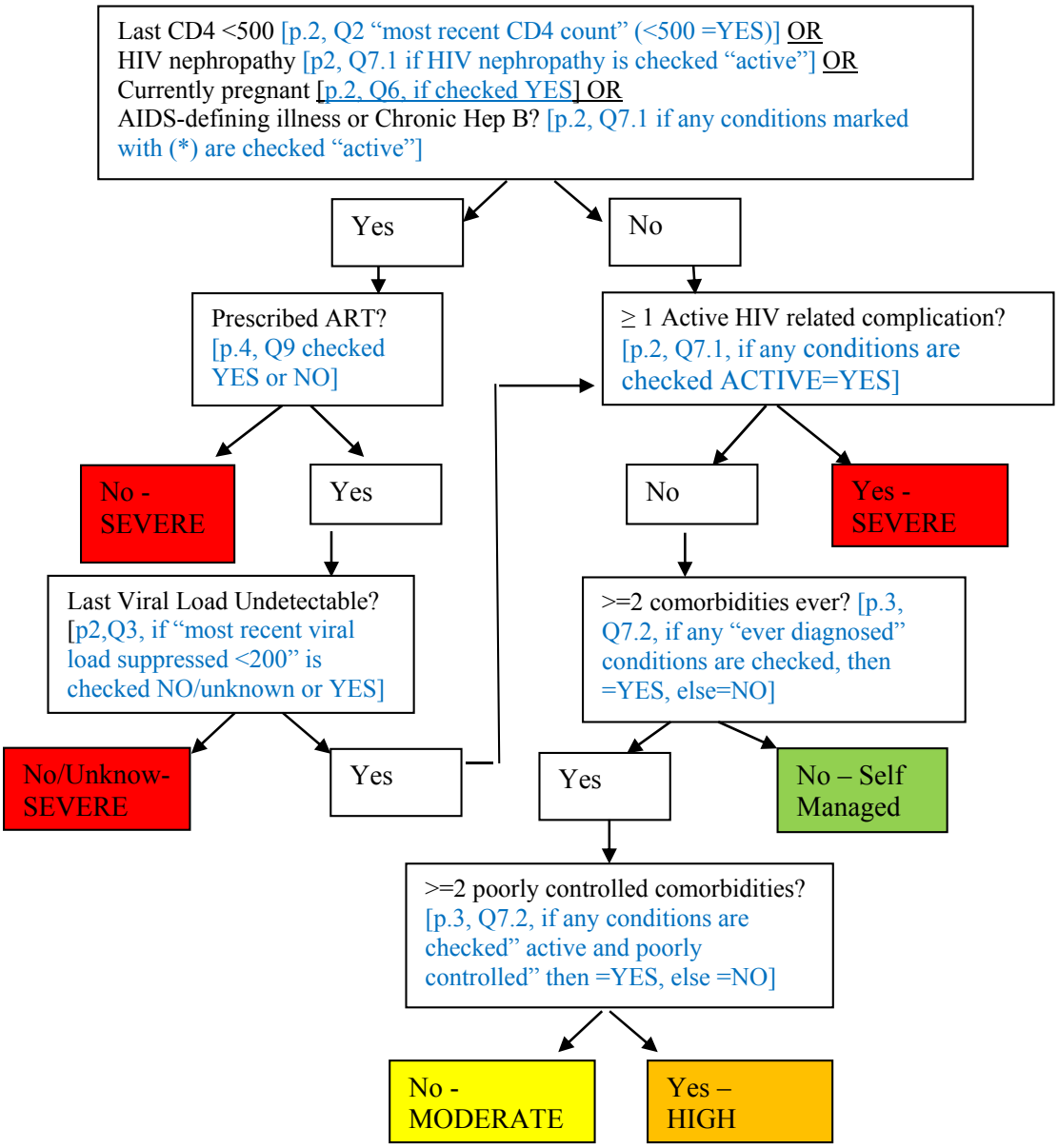
http://www.publichealth.lacounty.gov/dhsp/Contractors/MCC/MCCGuidelinesRevised2017.pdf

MCC ASSESSMENT

http://www.publichealth.lacounty.gov/dhsp/Contractors/MCC/Appendix%20E%20-%20MCCAssessment9-13.pdf

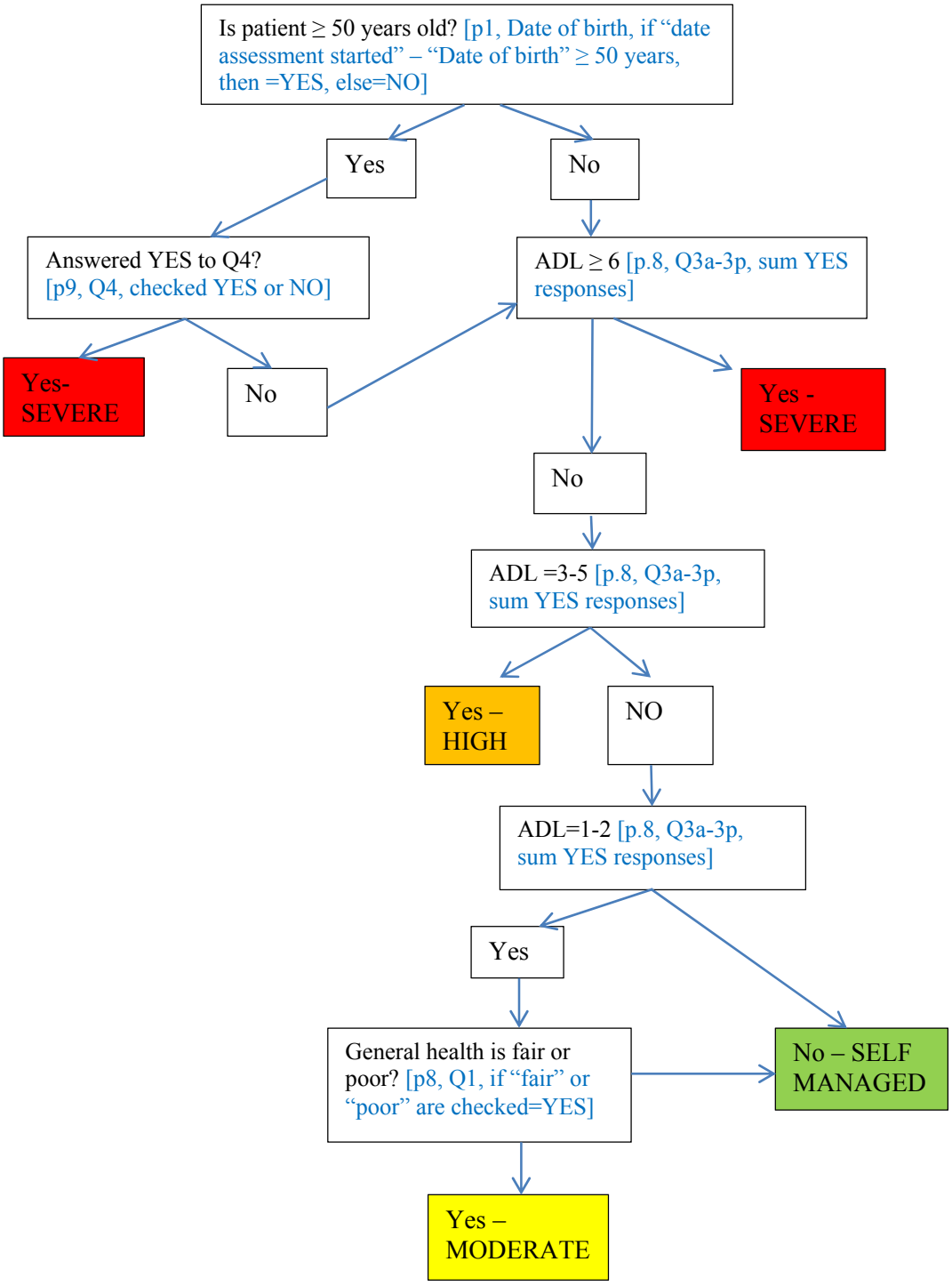
MCC ACUITY DECISION TREES MAPPED TO 9-1-13 ASSESSMENT

Section I: Health Status

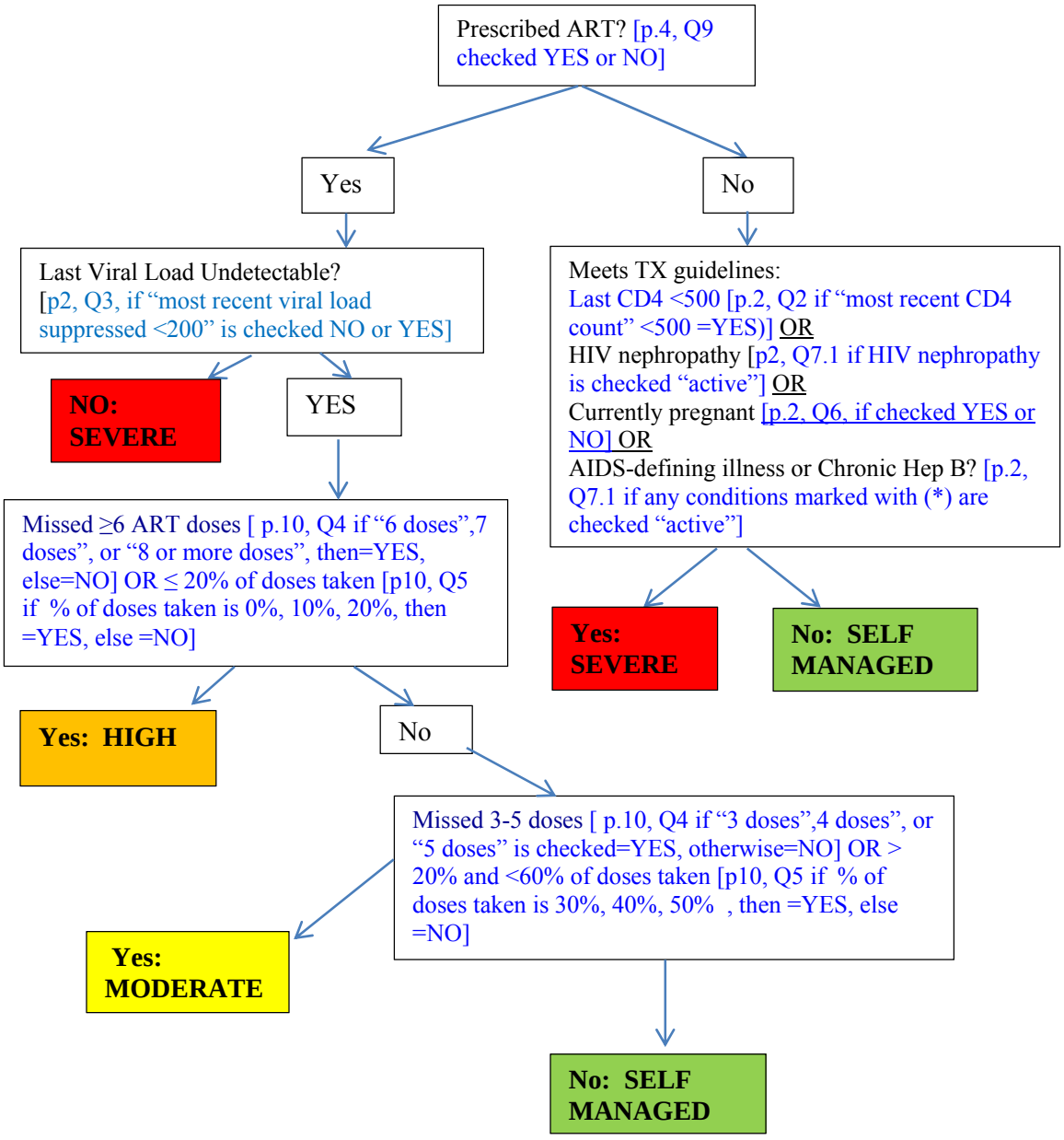


KEY: p=page, Q=question

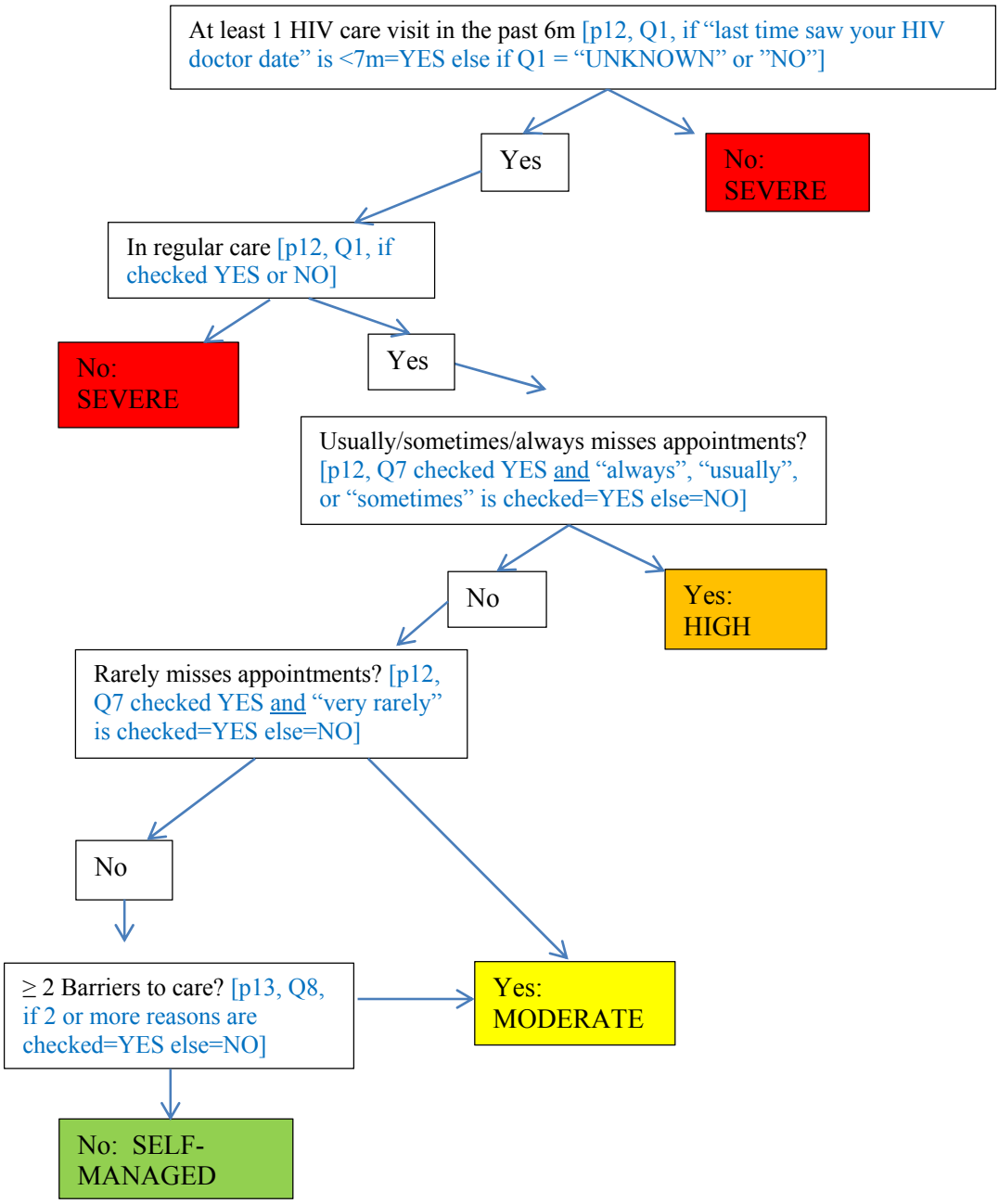
Section II: Quality of Life



Section III: Medication Access and Adherence



Section IV: Medical Access, Linkage and Retention



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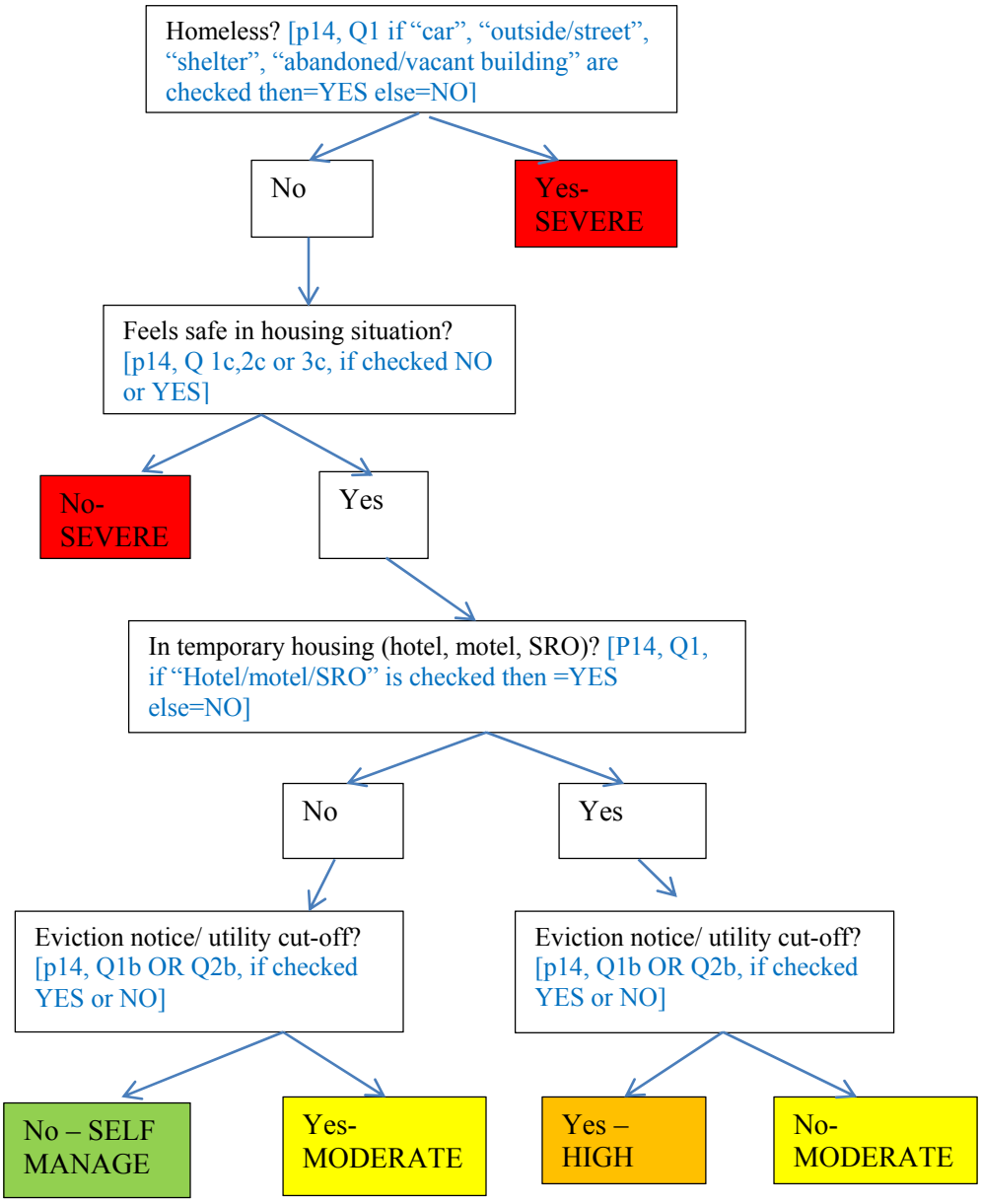

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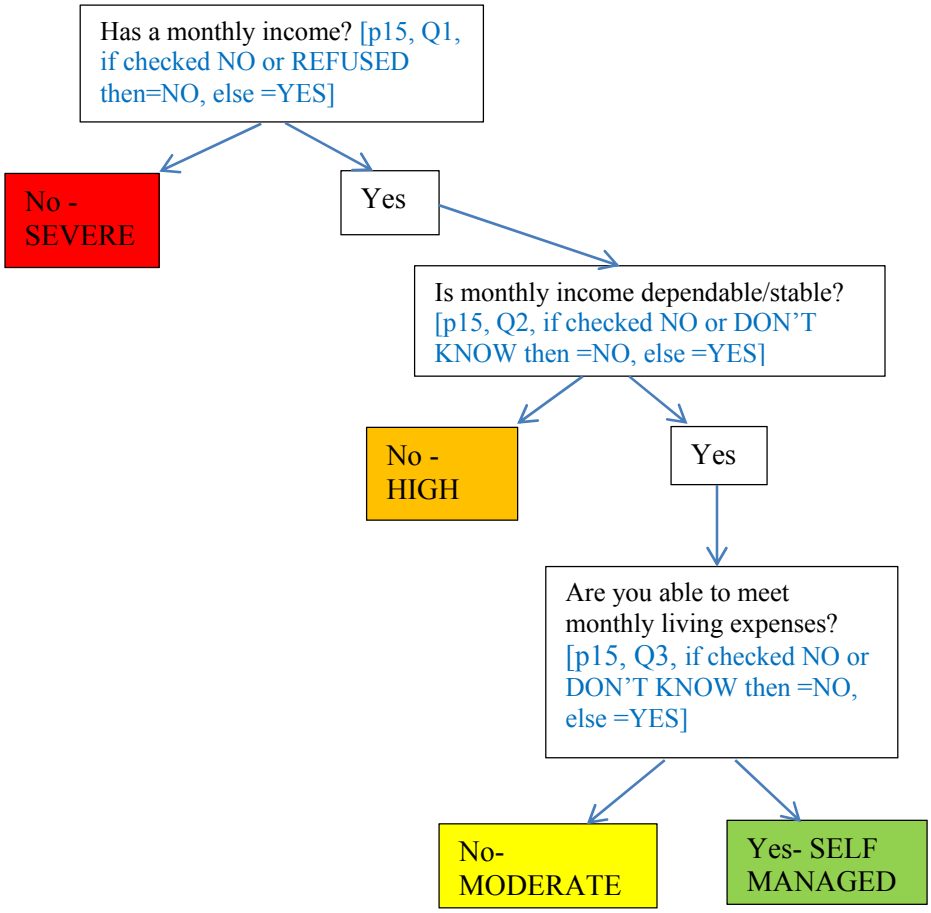
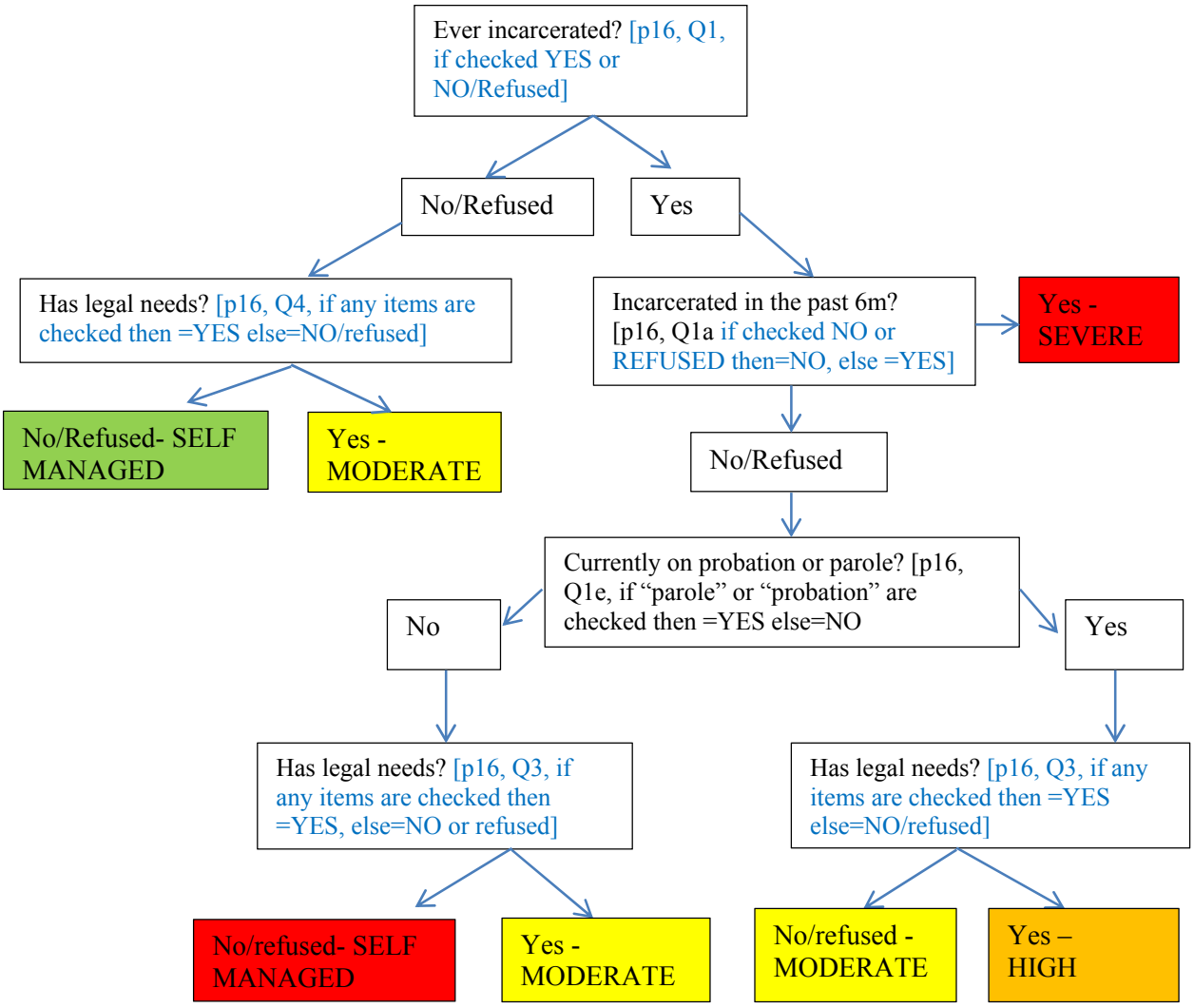


Section VII: Transportation – this section is not mapped or scored

Section VIII: Legal



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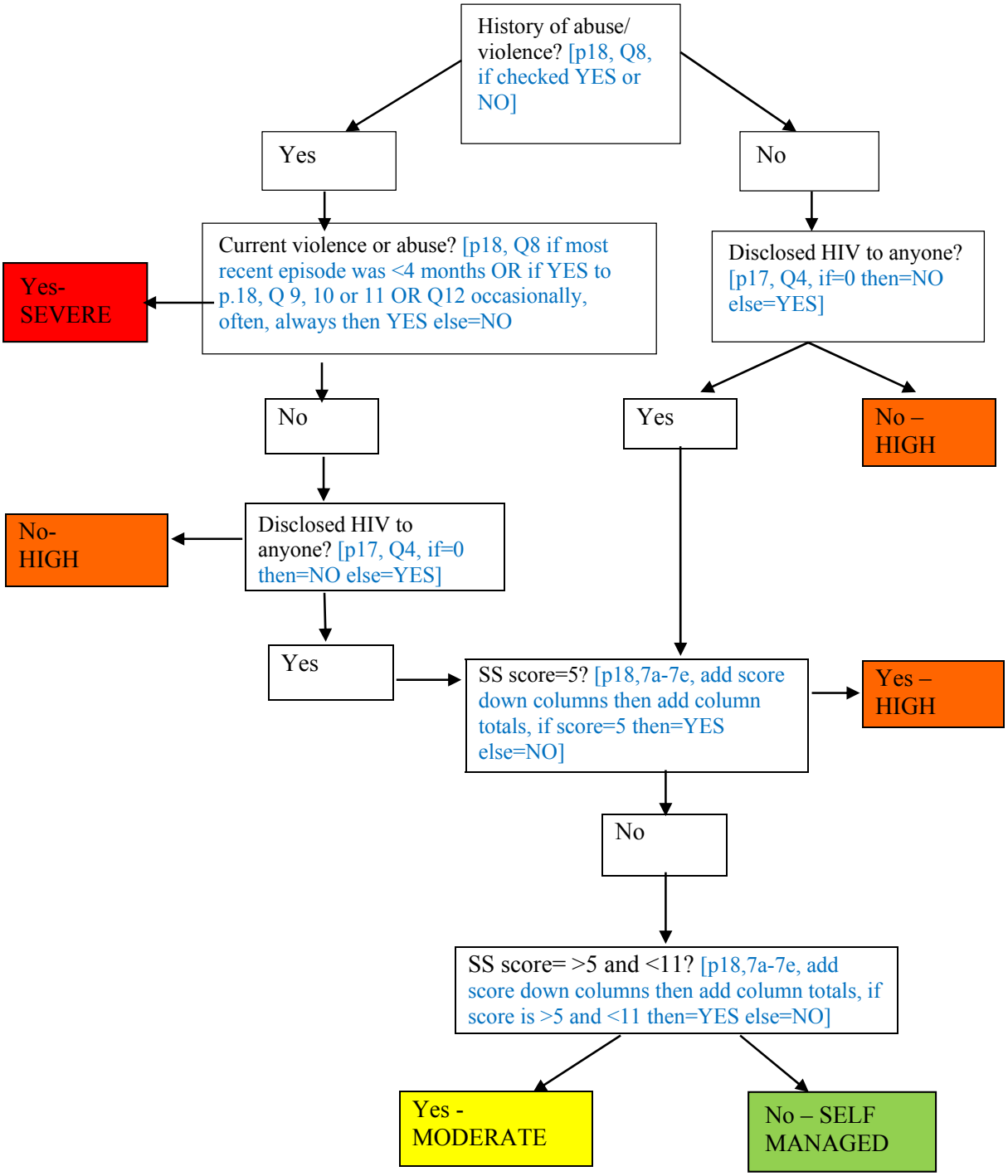
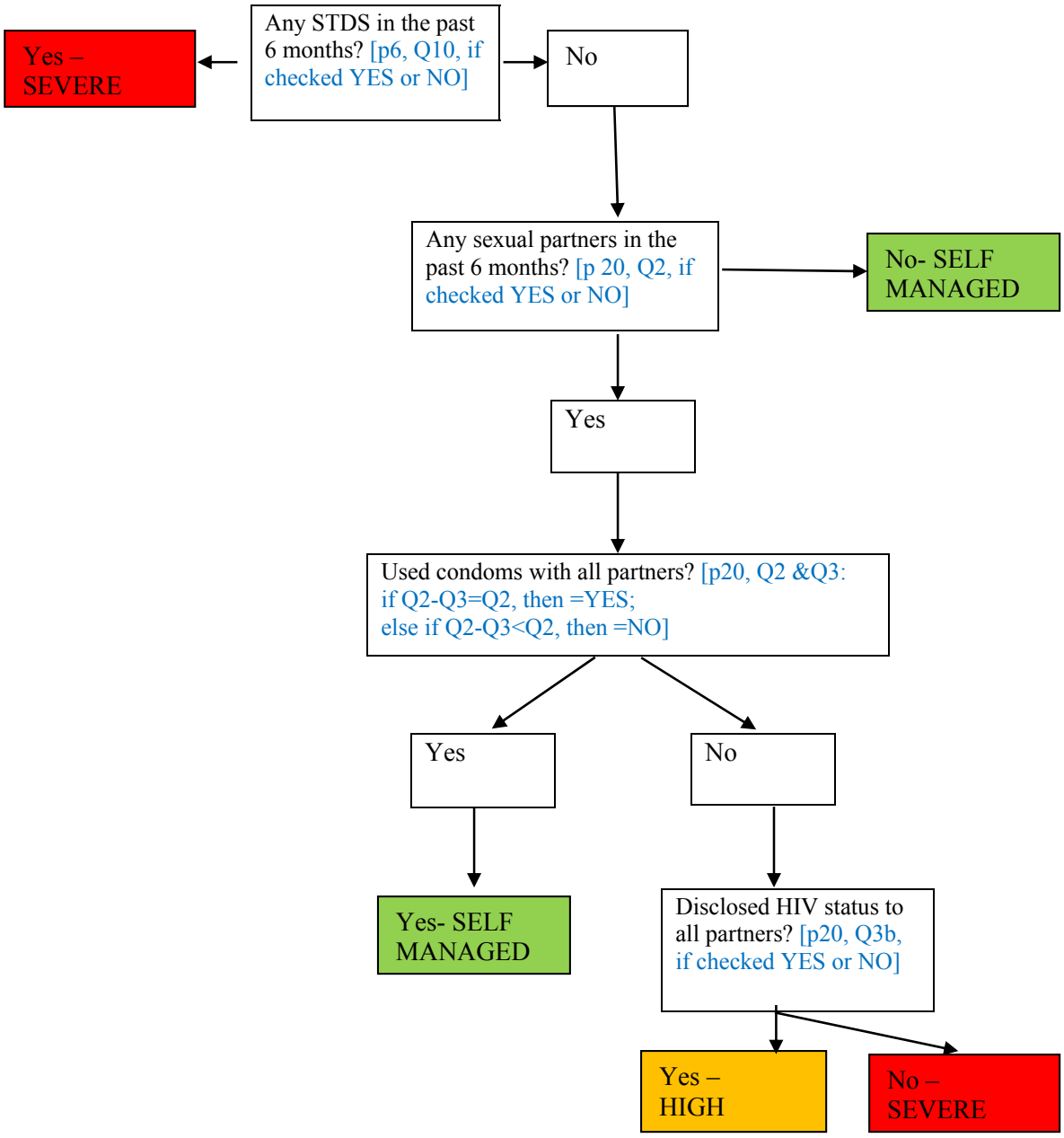
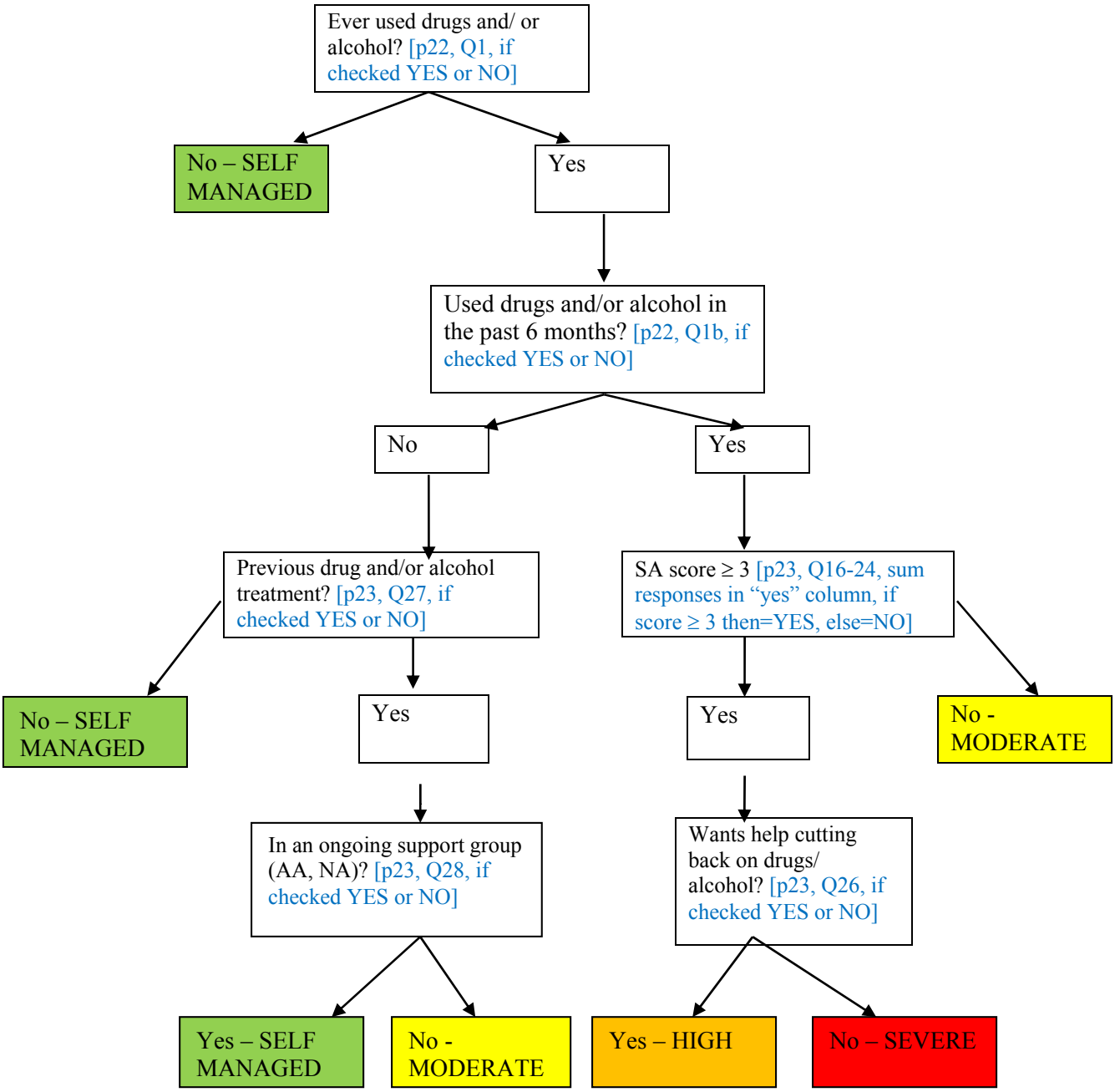


Section X: Risk Behaviors



Section X: Drug and Alcohol Use



Section XII: Mental Health