DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Medicare & Medicaid Services
7500 Security Boulevard, Mail Stop S2-25-26
Baltimore, Maryland 21244-1850

State Demonstrations Group

May 6, 2021

Karen Kimsey
Director
Virginia Department of Medical Assistance Services
600 East Broad Street, Suite 1300
Richmond, VA 23219

Dear Ms. Kimsey:

The Centers for Medicare & Medicaid Services (CMS) completed its review of the Substance Use Disorder (SUD) and Former Foster Care Youth (FFCY) components of the Evaluation Design, which is required by the Special Terms and Conditions (STC) of Virginia's section 1115 demonstration, "Building and Transforming Coverage, Services, and Supports for a Healthier Virginia" (Project No: 11-W-00297/3), effective through December 31, 2024. CMS has determined that the evaluation design, which was submitted on June 24, 2020 and revised on April 29, 2021, meets the requirements set forth in the STCs and our evaluation design guidance, and therefore, approves the SUD and FFCY components of the demonstration's evaluation design.

CMS added the approved evaluation design covering the SUD and FFCY components of the demonstration to the STCs as Attachment C. A copy of the STCs, which includes the new attachment, is enclosed with this letter. In accordance with 42 CFR 431.424, the approved evaluation design may now be posted to the state's Medicaid website within thirty days. CMS will also post the approved evaluation design as a standalone document, separate from the STCs, on Medicaid.gov. The state is continuing to work with CMS to finalize the evaluation design focused on one remaining component, i.e., the High Needs Supports program, of the Building and Transforming Coverage, Services, and Supports for a Healthier Virginia demonstration. Once finalized and approved by CMS, that evaluation design component will also be appended to Attachment C of the STCs.

Please note that an interim evaluation report, consistent with the approved evaluation design, is due to CMS one year prior to the expiration of the demonstration, or at the time of the extension application, if the state chooses to extend the demonstration. Likewise, a summative evaluation report, consistent with this approved design, is due to CMS within 18 months of the end of the

demonstration period. In accordance with 42 CFR 431.428 and the STCs, we look forward to receiving updates on evaluation activities in the demonstration monitoring reports.

We appreciate our continued partnership with Virginia on the state's Building and Transforming Coverage, Services, and Supports for a Healthier Virginia section 1115 demonstration. If you have any questions, please contact your CMS demonstration team.

Sincerely,

Danielle Daly -S
Digitally signed by Danielle Daly -S
Date: 2021.05.06 12:51:41 -04'00'

Andrea J. Casart -S
Digitally signed by Andrea J. Casart -S
Date: 2021.05.06 12:41:07 -04'00'

Danielle Daly
Director
Division of Demonstration Monitoring and Evaluation

Andrea Casart
Director
Division of Eligibility and Coverage Demonstrations

cc: Margaret Kosherzenko, State Monitoring Lead, CMS Medicaid and CHIP Operations Group

Building and Transforming Coverage, Services, and Supports for a Healthier Virginia Section 1115 Demonstration Evaluation Design: Substance Use Disorder (SUD) and Former Foster Care Youth (FFCY) Demonstration Components
Demonstration Period: January 1, 2020-December 30, 2024

1.0 General Background Information

1.1 Description and history of demonstration

The number of fatal drug overdoses more than doubled in Virginia between 2007 and 2017, from 721 fatalities in 2007 to 1,526 in 2017.[1] After a small decrease in 2018, fatal drug overdoses resumed their upward trend in 2019. More than 80 percent of fatal drug overdoses in 2018 were due to prescription or illicit opioids, with heroin and fentanyl driving the increase in fatalities in recent years. However, overdoses due to cocaine and methamphetamines have also been rising sharply.

To increase access to substance use treatment services for Virginia Medicaid members, Virginia received approval from the Center for Medicare and Medicaid Services (CMS) in December 2016 for the Addiction and Recovery Treatment Services (ARTS) benefit. Implemented in April 2017, ARTS expanded coverage of treatment services for substance use disorders (SUD) for Medicaid members, including community-based services, short-term residential treatment that meet the definition of an Institution for Mental Diseases (IMD), and inpatient detoxification services.

ARTS was approved as an amendment to an existing Section 1115 demonstration waiver, the Virginia Governors Access Plan (GAP), that had originally been approved in January, 2015. This demonstration provided a limited package of behavioral and physical health services to childless adults and non-custodial parents aged 21 through 64 with household incomes at or below 100 percent of the federal poverty line, and who had been diagnosed with a serious mental illness. After the December 2016 amendment expanded SUD benefits through the ARTS program, there was an additional amendment to the demonstration in September 2017 which added coverage for former foster care youth (FFCY) who aged out of foster care under the responsibility of another state and are now applying for Medicaid in the Commonwealth of Virginia.

CMS approved an extension of Virginia's Section 1115 Demonstration in December 2019, effective January 1, 2020 through December 31, 2024. Under this extension, Virginia will continue to have the authority to provide services to Medicaid members through the ARTS benefit, as well as to provide coverage to FFCY up to age 26 who aged out of foster care in another state and now reside in Virginia. The demonstration will no longer include a separate GAP program (which provided limited benefits to people at or below 100 percent of FPL), as these beneficiaries were transitioned into full Medicaid coverage starting January 1, 2019 through Virginia's Medicaid expansion.

With the end of the GAP program, the name of the demonstration has been changed to Building and Transforming Coverage, Services, and Supports for a Healthier Virginia Section 1115 Demonstration Evaluation Design: Substance Use Disorder (SUD) and Former Foster Care

[1] Virginia Department of Health. Fatal Drug Overdose Quarterly Report: First quarter 2019 (July, 2019). http://www.vdh.virginia.gov/content/uploads/sites/18/2019/07/Quarterly-Drug-Death-Report-FINAL-Q1-2019.pdf

Youth (FFCY) Demonstration Components. (Project Number 11-W-0029713). As most of the evaluation plan described below pertains to the ARTS benefit, we will use the term "ARTS" when describing evaluation activities. In section 5.0, we describe the evaluation of Medicaid coverage of FFCY who aged out of foster care in another state.

1.2 Evaluation of ARTS program

In July 2017, the Virginia Department of Medical Assistance Services (DMAS) contracted with Virginia Commonwealth University School of Medicine to conduct an independent evaluation of the ARTS benefit. The evaluation has been conducted by faculty and staff from the Department of Health Behavior and Policy.

The VCU evaluation under the previous demonstration authority focused primarily on how the ARTS benefit affected; (1) the number and type of health care practitioners providing ARTS services; (2) members' access to and utilization of ARTS services; (3) outcomes and quality of care, including hospital emergency department and inpatient visits; (4) the performance of new models of care delivery, especially Preferred Office-Based Opioid Treatment (OBOT) programs.

A recently published report by the VCU evaluation team found substantial increases in the supply and utilization of addiction treatment services among Virginia Medicaid members in the two years since the ARTS benefit was implemented (through March 2019).[2] This includes large increases in the number of providers across the continuum of care providing addiction treatment services to Medicaid members, including an almost four-fold increase in the number of outpatient practitioners submitting claims for ARTS services. In addition, the percent of members with SUD who received treatment increased from 24 percent before ARTS to almost 50 percent during the second year of ARTS. The use of medications for opioid use disorder (MOUD) treatment increased from 36 percent of those with opioid use disorder (OUD) before ARTS, to 49 percent during the second year of ARTS. Evidence of improved quality of care and outcomes was shown by significant decreases in emergency department visits and inpatient stays for members with OUD, relative to other Virginia Medicaid members.[3]

1.3 Goals of the evaluation of ARTS demonstration renewal

CMS guidelines require independent evaluations of approved demonstrations, including for renewals of existing demonstrations. The state must submit a draft evaluation design, for CMS comment and approval, no later than 180 calendar days after approval of the demonstration, which occurred December 30, 2019. To meet this requirement, DMAS requested that the VCU evaluation team prepare an evaluation plan for the ARTS demonstration renewal.

The evaluation design described in this document will build on and continue the evaluation of the ARTS program conducted under the December 2016 amendment that authorized the ARTS program, and will also take advantage of data sources not available at the

---

[2] VCU Department of Health Behavior and Policy. *Addiction and Recovery Treatment Services (ARTS): Access and Utilization During the Second Year (April 2018 – March 2019).* https://hbp.vcu.edu/media/hbp/policybriefs/pdfs/FinalARTS2yearreport.Feb2020.pdf

[3] Barnes A, et al., Hospital Use Declines After Implementation of Virginia Medicaid's Addiction and Recovery Treatment Services Program. *Health Affairs*. 2020(2): 238-246. https://www.healthaffairs.org/doi/10.1377/hlthaff.2019.00525

time of the initial evaluation plan, which increase opportunities for identifying suitable comparison groups and including a broader set of measures.

Also, while the renewal includes no changes to benefits and services covered under the ARTS benefit, the number of members eligible for and using ARTS services has increased substantially since January 1, 2019, when the state expanded Medicaid eligibility to all adults with family incomes less than 138 percent of the federal poverty level. In just the first three months of expansion (January through March 2019), there were an additional 12,000 members with SUD who had enrolled through Medicaid expansion. As of April 2020, more than 28,000 members enrolled through Medicaid expansion had received ARTS services.[4]

The evaluation of the ARTS demonstration renewal has three main goals:

1) Extend the post-implementation period of the evaluation beyond the first two years of ARTS to include the years 2019-2024. In particular, the evaluation will examine and account for the impact of Virginia's Medicaid expansion in 2019 on SUD prevalence, access to and quality of treatment services, and outcomes among the Medicaid population.
2) To strengthen conclusions about the causal impact of ARTS on key measures of access and quality of care by comparing adjusted summary statistics in Virginia to other states using the Medicaid Outcomes Distributed Research Network (MODRN).
3) To examine the cumulative impact of ARTS and Medicaid expansion on addiction treatment services for the Virginia population, using national data sources that permit comparisons of treatment before and after expansion in Virginia, and between Virginia, other states, and the overall U.S. on selected measures of SUD treatment access, utilization, quality of treatment, and rates of fatal overdoses.

2.0 EVALUATION QUESTIONS AND HYPOTHESES

The specific evaluation questions and hypotheses for the evaluation are directly informed by the stated goals of the ARTS demonstration, as described on p. 25 of the Special Terms and Conditions: These include:

- Increase rates of identification, initiation, and engagement in treatment;
- Increase adherence to and retention in treatment;
- Reduce overdose deaths, particularly those due to opioids;
- Reduce utilization of emergency departments and inpatient hospital settings through improved access to a continuum of services;
- Reduce preventable admissions to the same or higher level of care; and
- Improve access to care for physical health conditions among beneficiaries.
- Increase IMD SUD costs and outpatient SUD treatment costs and decrease SUD-related emergency room visit and inpatient stay costs.

Figure 1 conceptualizes these goals in terms of the overall purpose (reducing overdose deaths), the primary drivers that will directly lead to fewer overdose deaths (the other six goals

[4] Estimates from Medicaid Expansion Access and Health Services Dashboard as of April 15, 2020. Virginia Department of Medical Assistance Services. https://www.dmas.virginia.gov/#/accessdashboard

of the ARTS demonstration), and secondary drivers that reflect the main mechanisms the ARTS demonstration uses to affect addiction treatment services and, ultimately, overdose deaths.

The ARTS demonstration seeks to achieve its goals primarily through: (1) increasing the supply of addiction treatment providers serving Medicaid members; (2) increasing the capacity of existing treatment providers; (3) expanding services to cover the entire continuum of addiction treatment services, based on the American Society of Addiction Medicine (ASAM) criteria; (4) facilitating transitions between different levels of treatment; and (5) improving the coordination of addiction treatment services with other physical health, mental health, and social service needs.

To **increase the supply and capacity of addiction treatment providers**, the ARTS program increased reimbursement rates for a number of services, such as residential treatment services, outpatient services, and MOUD treatment. To further increase outpatient capacity, the ARTS demonstration also established a new type of provider, the Preferred Office-Based Opioid Treatment model (P-OBOT). In addition, extensive provider training, outreach, and recruitment efforts by state agencies and managed care organizations are intended to increase provider participation in Medicaid addiction treatment services.

The ARTS demonstration also **expanded Medicaid-covered services along the ASAM continuum of care**, especially residential treatment services and medically managed intensive inpatient services, outpatient, as well as peer recovery services. **Improving transitions across different levels of care,** and **coordinating addiction treatment services with other physical, mental health, and social needs** are to be accomplished by, (1) shifting behavioral health services to a "carve-in" model so that they are provided by the same managed care organizations (MCOs) that provide other Medicaid services; (2) the use of licensed care coordinators by MCOs for addiction treatment services; and (3) enhanced payment for care coordination services by the new Preferred OBOT providers.

Finally, Medicaid expansion will amplify the effects of the ARTS demonstration by extending access to treatment services to hundreds of thousands of Virginians, most of whom were uninsured prior to January 1, 2019 and did not have access to ARTS benefits. Additional coverage of people with SUD is expected to further decrease the rate of fatal overdoses in the Virginia population. In addition, greater coverage of addiction treatment services through Medicaid expansion is likely to strengthen the addiction treatment system by increasing the number and capacity of addiction treatment providers serving Medicaid patients.

Table 1 describes the specific research questions, hypotheses, and performance metrics that will be used to assess whether the ARTS demonstration has achieved the goals as described above. These research questions and hypotheses are grouped into four over-arching evaluation questions:

1) Does the demonstration increase access to and use of SUD treatment services?
2) Does the demonstration improve the quality of treatment through improved care coordination of services?
3) Does the demonstration reduce the rate of overdose deaths due to substance use disorders?
4) How do costs for SUD-related and non-SUD-related services change over the evaluation period?

Figure 1. Driver Diagram for ARTS Demonstration Evaluation

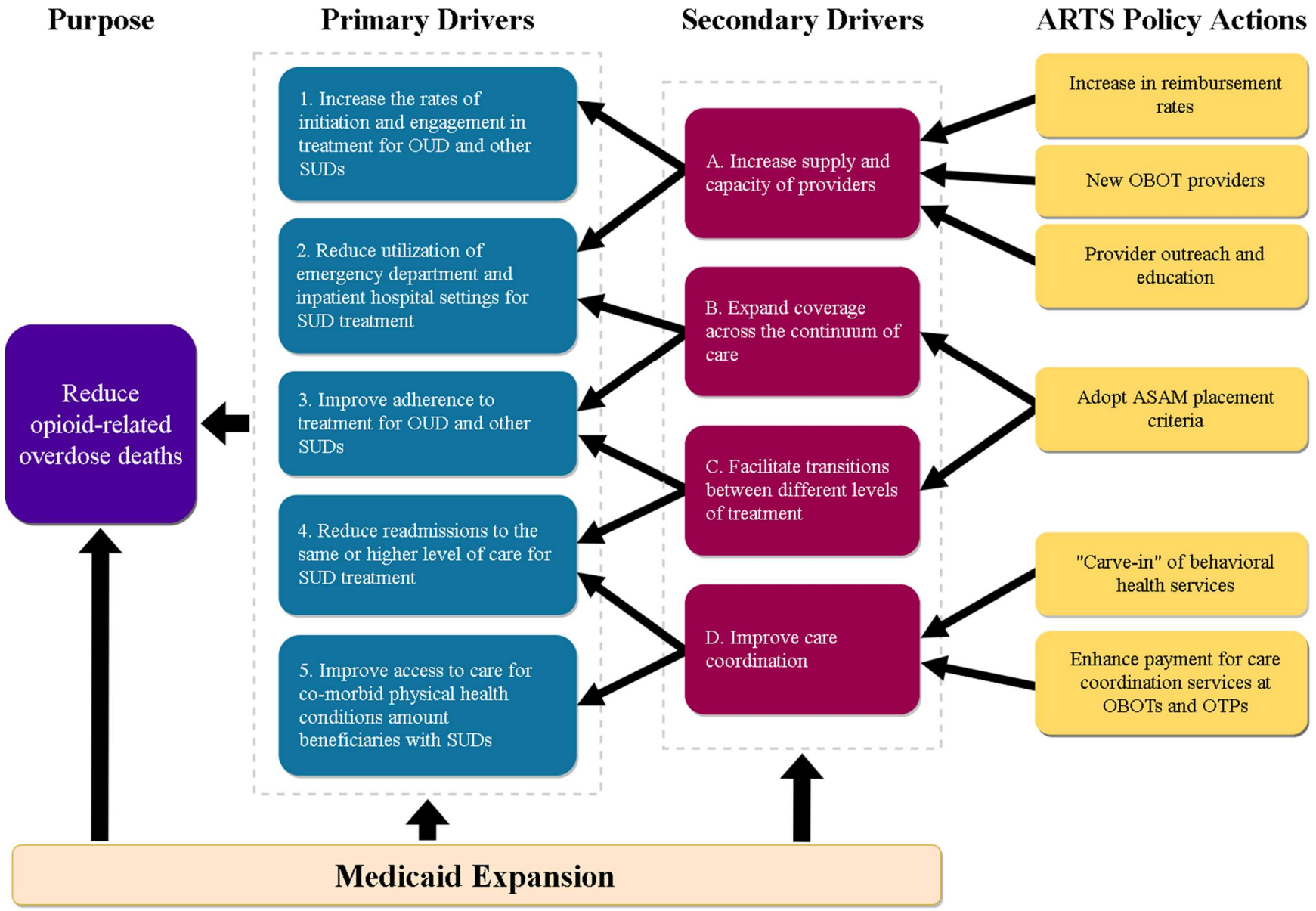

Table 1. Research questions and hypotheses

Driver	Measure description	Measure steward, endorsement	Numerator	Denominator	Data source	Analytic approach
Evaluation Question 1: Does the demonstration increase access to and utilization of SUD treatment services?						
Demonstration Goal: Increased rates of initiation and engagement in treatment for OUD and other SUDS **Evaluation Hypothesis:** The demonstration will increase the percentage of beneficiaries who are referred and engage in treatment for OUD and other SUDs						
Primary Driver 1 (Increase rates of IET for OUD and other SUDs)	Initiation and engagement with alcohol and other drug dependence treatment	NQF #0004	Number of members who initiated treatment through inpatient, intensive outpatient, residential, outpatient, telehealth, or MOUD within 14 days of diagnosis	Members who were diagnosed with a new episode of alcohol or drug dependency during the first 10.5 months of the measurement year	MODRN (claims data)	Summary statistics with comparisons to MODRN states
Secondary Driver A (Increase supply and capacity of Medicaid treatment system)	Supply of buprenorphine waivered prescribers relative to the state population	None	Number of providers (physicians, nurse practitioners, and physician assistants) who received DATA 2000 waivers from DEA to prescribe buprenorphine	Total population of state	DEA list of waivered prescribers	Difference-in-difference approach that controls for Medicaid expansion across states
	Supply of buprenorphine waivered prescribers who treat Medicaid patients	None	Number of providers (physicians, nurse practitioners, and physician assistants) who received DATA 2000 waivers from DEA to prescribe buprenorphine, and had at least one claim for Medicaid prescription	Number of Medicaid members	DEA list of waivered prescribers linked to Medicaid claims data	Interrupted time-series
	Number of specialty treatment providers who accept Medicaid payment	None	Number of facilities who accept Medicaid payment	Total number of facilities	National Survey of Substance Abuse Treatment Services (N-SSATS)	Difference-in-difference approach that controls for Medicaid expansion across states

Driver	Measure description	Measure steward, endorsement	Numerator	Denominator	Data source	Analytic approach
	Number of providers who are providing services at each ASAM level of care	None	Number of unique providers billing for ARTS services at different ASAM levels		Medicaid claims data	Interrupted time series
	Number of buprenorphine waivered prescribers with patient limits at 75, 100, and 250	None	Number of providers (physicians, nurse practitioners, and physician assistants) who received waivers from DEA to prescribe buprenorphine at patient limits of 75, 100, and 250	Total population of state	DEA list of prescribers linked to Medicaid claims data	Difference-in-difference approach that controls for Medicaid expansion across states
	Median number of Medicaid members receiving prescriptions per prescriber who accepts Medicaid	None	Total number of Medicaid patients receiving buprenorphine prescriptions from waivered prescribers	Total number of waivered prescribers who had any Medicaid patients	DEA list of prescribers linked to Medicaid claims data	Interrupted time-series

Driver	Measure description	Measure steward, endorsement	Numerator	Denominator	Data source	Analytic approach
Demonstration Goal: Reduce utilization of emergency departments and inpatient hospital settings through improved access to a continuum of services **Evaluation Hypothesis:** The demonstration will decrease the rate of emergency department and acute inpatient stays.						
Primary Driver 2 (Reduced utilization of emergency department and inpatient hospital	Emergency department visits for SUD and OUD, per 1000 member months	MODRN	The number of ED visits with SUD/OUD in any diagnosis field during the measurement period	Cumulative number of months members enrolled in Medicaid during the measurement period	MODRN (Medicaid claims data)	Summary statistics with comparisons to MODRN states

settings for SUD treatment						
	Inpatient admissions for SUD and OUD, per 1000 member months	MODRN	The number of inpatient admissions with SUD/OUD in any diagnosis field during the measurement period	Cumulative number of months members enrolled in Medicaid during the measurement period	MODRN (Medicaid claims data)	Summary statistics with comparisons to MODRN states
	Rate of SUD-related admissions for the population	None	Number of inpatient admissions with SUD/OUD in any diagnosis field during the year	Number of people in the state	HCUP Fast Stats	Difference-in-difference approach that controls for Medicaid expansion across states
Secondary Driver B (Expand coverage across continuum of care)	Percent of members with SUD/OUD using ARTS services, by type of service	None	Number of members using ARTS services by ASAM level and type of service (based on billing code)	Number of members with OUD	Medicaid claims data	Interrupted time-series
	Percent of members with OUD who receive MOUD treatment	CMS Adult Core Measures	Members with OUD who received MOUD treatment	Members with OUD	MODRN (Medicaid claims data	Summary statistics with comparisons to MODRN states
Driver	**Measure description**	**Measure steward, endorsement**	**Numerator**	**Denominator**	**Data source**	**Analytic approach**
Demonstration Goal: Increase adherence to and retention in treatment **Evaluation Hypothesis:** The demonstration will increase adherence to and retention in treatment						
Primary Driver 3 (Increase adherence to and retention in treatment)	Continuity of pharmacotherapy for OUD	NQF #3175	Number of members who have at least 180 days of continuous pharmacotherapy with a medication prescribed for OUD without a gap of more than 7 days	Individuals who had a diagnosis of OUD and at least one claim for an OUD medication	MODRN (Medicaid claims data)	Summary statistics with comparisons to MODRN states

	Length of an episode of outpatient treatment	None	Total number of days in treatment for an episode, defined as having at least 2 treatment claims in a month. Start and end of an episode based on not having any treatment claims in 3 months prior to start or 3 months after last claim for an episode	Number of members receiving treatment	Claims data	Interrupted time series
	Average length of stay in treatment, by service setting	None	Number of days in treatment between admission and discharge date	Number of treatment episodes	Treatment Episode Data Set	Difference-in-difference approach that controls for Medicaid expansion across states
	Percent of episodes in which treatment was completed	None	Number of discharges in which the reason for discharge was "treatment completed"	Number of discharges	Treatment Episode Data Set	Difference-in-difference approach that controls for Medicaid expansion across states

Driver	**Measure description**	**Measure steward, endorsement**	**Numerator**	**Denominator**	**Data source**	**Analytic approach**
Evaluation Question 2: Does the demonstration improve quality of treatment through improved care coordination of services						
Demonstration Goal: Reduce readmissions to the same or higher levels of care **Evaluation Hypothesis:** The demonstration will decrease the rate of readmissions to the same or higher level of care						
Primary Driver *4* (Reduce readmissions to the same or higher level care for SUD	30 day readmission rates to same ASAM level 3 service or higher	None	Number of members admitted to ASAM 3 or 4 level of care within 30 days of discharge from a prior stay at the same level	Members who were discharged from ASAM 3 level of care for SUD	Claims	Interrupted time-series
Secondary Driver C (Improved transitions between	Number of members discharged from ASAM 3 services who receive	None	Number of members who received any lower level of ASAM care or pharmacotherapy within	Members who were discharged from ASAM 3	Claims	Interrupted time-series

Driver	Measure description	Measure steward, endorsement	Numerator	Denominator	Data source	Analytic approach
different levels of care)	followup care within 30 days of discharge		30 days of discharge from ASAM 3 stay	level of care for SUD		
	Number of members discharged from ASAM level 4 service who receive followup care within 30 days of discharge	None	Number of members who received any lower level of ASAM care or pharmacotherapy within 30 days of discharge from ASAM 4 stay	Members who were discharged from ASAM 4 level of care for SUD		Interrupted time-series
	Number of members with SUD/OUD-related emergency department visit who receive followup care within 7 and 30 days	NCQA-FUA-AD	Number of ED visits with a principal diagnosis of SUD/OUD that had a followup visit for treatment with a primary diagnosis of SUD/OUD with 7 (and 30) days of the visit	Number of ED visits with a principal diagnosis of SUD/ OUD	MODRN (Medicaid claims)	Summary statistics with comparisons to MODRN states
Demonstration Goal: Improve access to care for physical health conditions among beneficiaries **Evaluation Hypothesis:** The demonstration will increase the percentage of beneficiaries with SUD who receive treatment for co-morbid conditions						
Primary Driver *5* (Improve access to care for co-morbid physical health conditions among beneficiaries with SUD	Any use of ambulatory or preventive care services	None	Members who had an ambulatory care or preventive care visit without a principal or secondary diagnosis of SUD/OUD	Members with a diagnosis of SUD/OUD	Claims	Interrupted-time series
	Controlling high blood pressure	NCQA (CMS Core indicators)	Members with OUD/SUD who received treatment for high blood	Members with a diagnosis of SUD/OUD	Claims	Interrupted-time series
	Comprehensive diabetes care	NCQA (CMS Core Indicators)	Members with OUD/SUD who received treatment for diabetes	Members with a diagnosis of SUD/OUD	Claims	Interrupted-time series
	Diabetes short-term complications admission rate	NCQA (CMS Core Indicators)	Members with OUD/SUD who had inpatient admission related to	Members with a diagnosis of SUD/OUD	Claims	Interrupted-time series

Driver	Measure description	Measure steward, endorsement	Numerator	Denominator	Data source	Analytic approach
			complications from diabetes			
	Members with flu vaccinations	NCQA (CMS Core indicators)	Members with OUD/SUD who received flu vaccination	Members with a diagnosis of SUD/OUD	Claims	Interrupted-time series
	Screening for HIV, HCV, HBV among enrollees with an OUD diagnosis	MODRN	Members with SUD/OUD who have at least one claim for HIV/HBV/HCV screening during the measurement year	Members with a diagnosis of SUD/OUD	MODRN (Medicaid claims)	Summary statistics with comparisons to MODRN states
	Received counseling or psychotherapy for mental health condition	None	Members with SUD/OUD with visit for counseling/psychotherapy for mental health condition other than SUD/OUD	Members with a diagnosis of SUD/OUD	Claims	Interrupted-time series
Secondary Driver D (Greater use of care coordination services among treatment providers)	Number of members with claim for care coordination or case management service related to SUD	None	Number of members with SUD/OUD who had a claim for care coordination or case management	Number of members with SUD/OUD	Claims	Interrupted-time series analysis
	Members who received help with other health and social needs	None	Members who reported receiving help with other medical problem, mental health problem, or assistance with food or housing at their SUD treatment provider	Members with SUD who are receiving treatment	ARTS member survey	Cross-sectional analysis

Driver	Measure description	Measure steward, endorsement	Numerator	Denominator	Data source	Analytic approach
Evaluation Question 3: Are rates of opioid-related overdose deaths impacted by the demonstration?						
Demonstration Goal: Reduction in overdose deaths, particularly those due to opioids. **Evaluation Hypothesis:** The demonstration will decrease the rate of overdose deaths due to opioids.						
Purpose (Reduce overdose fatalities related to SUD)	Rate of opioid-related overdose deaths, among people with Medicaid coverage in past year	None	Number of fatal drug overdoses due to opioids among people enrolled in Medicaid	Number of Medicaid members	Cause of death data linked to claims	Difference-in-difference analysis comparing within state Medicaid overdose rate to non-Medicaid overdose rate
	Rate of overdose deaths due to other substances among people with Medicaid coverage in past year	None	Number of fatal overdoses due to substances other than opioids	Number of Medicaid members	Cause of death data linked to claims	Difference-in-difference analysis comparing within state Medicaid overdose rate to non-Medicaid overdose rate
	Rate of drug overdoses in the Virginia population	None	Number of fatal overdoses due to drugs and alcohol	State population	Vital Statistics from the Center for Disease Control	Difference-in-difference approach that controls for Medicaid expansion across states

Evaluation Question 4: How do costs for SUD-related and non-SUD-related services change over the evaluation period?						
Evaluation Hypothesis: The demonstration will increase IMD SUD costs and outpatient SUD treatment costs and decrease SUD-related emergency room visit and inpatient stay costs						
	Total costs per-member per month (PMPM). Total and federal costs will be calculated	CMS SUD Evaluation Design Guidance, Appendix C	Total costs for members from claims data (inpatient, outpatient, pharmacy, long-term care, and capitated payments to managed care organizations); costs from Institutions for Mental Diseases (IMD); and administrative costs.	Total member months in quarter	Claims	Interrupted-time series analysis
	Total costs PMPM related to diagnosis and treatment for SUD	CMS SUD Evaluation Design Guidance, Appendix C	Total payments summed across all diagnosis and treatment-related claims in quarter. Total costs will be the sum of SUD-IMD costs, other SUD costs, and non-SUD costs.	Total member months in quarter	Claims	Interrupted-time series analysis
	Total costs PMPM for residential SUD treatment (IMD)	CMS SUD Evaluation Design Guidance, Appendix C	IMD costs reported by states with SUD diagnosis and/or procedure codes	Total member months in quarter	Claims	Interrupted-time series analysis
	Total costs PMPM for non-IMD SUD treatment	CMS SUD Evaluation Design Guidance, Appendix C	Costs with SUD diagnosis and/or procedure codes relating to	Total member months in quarter	Claims	Interrupted-time series analysis

Evaluation Question 4: How do costs for SUD-related and non-SUD-related services change over the evaluation period?						
Evaluation Hypothesis: The demonstration will increase IMD SUD costs and outpatient SUD treatment costs and decrease SUD-related emergency room visit and inpatient stay costs						
			outpatient treatment, inpatient treatment, pharmacy, and long-term care			
	Total non-SUD costs PMPM	CMS SUD Evaluation Design Guidance, Appendix C	Costs without SUD diagnosis and/or procedure codes relating to outpatient treatment, inpatient treatment, pharmacy, and long-term care	Total member months in quarter	Claims	Interrupted-time series analysis
	Source of treatment cost drivers – Total PMPM	CMS SUD Evaluation Design Guidance, Appendix C	Total source of treatment costs drivers include the sum of: non-ED outpatient costs, ED outpatient costs, inpatient costs, pharmacy costs, and long-term care costs.	Total member months in quarter	Claims	Interrupted-time series analysis
	Source of treatment cost drivers – *Non-ED outpatient* costs PMPM	CMS SUD Evaluation Design Guidance, Appendix C	Costs with or without SUD diagnosis and/or procedure codes relating to non-ED outpatient treatment	Total member months in quarter	Claims	Interrupted-time series analysis
	Source of treatment cost drivers –*ED outpatient* costs PMPM	CMS SUD Evaluation Design Guidance, Appendix C	Costs with or without SUD diagnosis and/or procedure codes relating to ED outpatient treatment	Total member months in quarter	Claims	Interrupted-time series analysis

Evaluation Question 4: How do costs for SUD-related and non-SUD-related services change over the evaluation period?						
Evaluation Hypothesis: The demonstration will increase IMD SUD costs and outpatient SUD treatment costs and decrease SUD-related emergency room visit and inpatient stay costs						
	Source of treatment cost drivers – *Inpatient* costs PMPM	CMS SUD Evaluation Design Guidance, Appendix C	Costs with or without SUD diagnosis and/or procedure codes relating to inpatient treatment	Total member months in quarter	Claims	Interrupted-time series analysis
	Source of treatment cost drivers – *Pharmacy* costs PMPM	CMS SUD Evaluation Design Guidance, Appendix C	Costs with or without SUD diagnosis and/or procedure codes relating to pharmacy utilization	Total member months in quarter	Claims	Interrupted-time series analysis
	Source of treatment cost drivers – *Long-term care* costs PMPM	CMS SUD Evaluation Design Guidance, Appendix C	Costs with or without SUD diagnosis and/or procedure codes relating to long-term care utilization	Total member months in quarter	Claims	Interrupted-time series analysis
	Total costs PMPM for SUD-related treatment services, by ASAM level of care	None	Total payments summed across claims stratified by ASAM level of care	Total member months in quarter	Claims	Interrupted-time series analysis
	Total costs PMPM for MOUD treatment	None	Total payments summed across claims for MOUD treatment services	Total member months in quarter	Claims	Interrupted-time series analysis
	Total costs PMPM for SUD-related acute inpatient and ED services	None	Total payments across claims for acute inpatient and ED services with a diagnosis of SUD	Total member months in quarter	Claims	Interrupted-time series analysis

3.0 METHODOLOGY

3.1 Overview of Design and Data Sources

As stated above, the evaluation of the ARTS demonstration renewal has three main goals: 1) to extend the evaluation of the ARTS demonstration beyond the first two years after implementation (April 2017 through March 2019) to include the years 2019-2024; 2) to strengthen conclusions about the impact of ARTS by comparing the trends before and after ARTS implementation to those of other states that did not implement similar programs; and 3) to examine the cumulative impact of ARTS and Medicaid expansion on addiction treatment services in Virginia. Below we summarize the approach to each of these goals and how they relate to the hypotheses and research questions described in Section 2.0. Section 3.2 describes in greater detail the analytical approaches that will be used to address each of the goals described below.

Goal 1: Examine the impact of ARTS beyond the first two years of the demonstration.

Under the original ARTS demonstration, our evaluation examined changes in measures of SUD treatment access, utilization, provider supply, and outcomes between the year prior to ARTS implementation (April 1, 2016 to March 30, 2017) and the two years following implementation of ARTS (April 1, 2017 through March 30, 2019). We will extend the post-implementation period of the evaluation to include the years 2019 through 2024 for selected measures. To simplify the analysis, and to also ensure consistency across measures and with other aspects of the evaluation described below, we will examine change based on a calendar year (that is, annual, semi-annual, or quarterly measures of utilization based on a calendar year) rather than based on the "ARTS year", which overlapped with two calendar years.

Most analyses during the first two years of the demonstration were based on an analysis of Virginia Medicaid claims data to observe trends in SUD treatment access, utilization, and outcomes. For measures in which it is difficult or infeasible to obtain within-state or cross-state comparison groups, we will use interrupted time-series analyses (described below) to examine changes between the ARTS pre-implementation period (2015 and 2016) and the post implementation period (2018 to 2023). This approach will be used primarily to assess the following components of the evaluation:

- Secondary Driver B (Expand coverage across the entire continuum of care): Number of providers billing for ARTS services at each ASAM level; member utilization by ASAM level of care.

- Primary Driver 4 (Reduce readmissions to the same or higher level of care): 30 day readmission rates to same ASAM level 3 or higher

- Secondary Driver C (Facilitate transitions between different levels of treatment): Number of members discharged from ASAM 3 or ASAM 4 services who receive follow-up care within 30 days of discharge).

- Primary Driver 5 (Improve access to co-morbid physical health conditions): Use of primary or preventive for selected chronic conditions.

- Secondary Driver D (Improve care coordination): Number of members with a claim for care coordination or case management services.

As Virginia expanded eligibility for Medicaid coverage on January 1, 2019 to include adults with family incomes at 138 percent of poverty or less, our analysis will also account for the fact that the Virginia Medicaid population changed substantially in both size and composition in 2019. Our evaluation will track changes in the overall increase in the number of Medicaid members with a SUD diagnosis and the number utilizing various ARTS services resulting from Medicaid expansion in 2019.

More importantly, the evaluation will also account for the fact that members enrolled in Medicaid expansion could differ from other Medicaid members in ways that could affect estimates of the rate of Medicaid members receiving SUD treatment as well as other measures in Table 1. For example, analysis based on the first three months of Medicaid expansion in Virginia shows that Medicaid expansion members with SUD are more likely to be male, somewhat younger in age, and less likely to have physical or mental health co-morbidities compared to adult Medicaid members with SUD from other eligibility groups. Interrupted time-series analyses of the impact of ARTS on rates of access, utilization, and outcomes for the Medicaid population will account for potential changes in the characteristics of the Medicaid population resulting from expanded eligibility in 2019.

The current evaluation builds upon prior evaluation work by also incorporating cost information to understand whether the ARTS benefit increased SUD-related outpatient treatment costs and reduced SUD-related emergency room visit and inpatient stay costs. Following CMS SUD Evaluation Design, Appendix C, total costs, costs related to SUD diagnosis and treatment, and sources of treatment cost drivers for members in the target population will be analyzed. Generally, managed care organization paid amounts from Medicaid claims data will be used as the measure of costs for each type of service (e.g., inpatient, long-term care). For each of these services costs will include total payments for all claims related to the service.

Goal 2 – Strengthen conclusions about the causal impact of ARTS by comparing Medicaid members in Virginia to Medicaid members in other states.

Although prior evaluation results showed large increases in access to and utilization of addiction treatment services in the two years following implementation of ARTS, most of the analysis did not include the use of comparison groups – that is, individuals either within or outside of the state that are similar to Virginia Medicaid members with SUD, but who are unaffected by the ARTS reforms. The inclusion of such comparison groups can greatly strengthen conclusions about the impact of ARTS because they permit an estimate of the counterfactual, or how SUD treatment and access would have changed for Virginia Medicaid had ARTS not been implemented. Such comparisons are difficult because: 1) ARTS was implemented statewide and for all Medicaid members on April 1, 2017, thereby greatly limiting the use of within-state comparisons; 2) lack of available data on Medicaid members in other states with which to make comparisons on measures of SUD treatment access and utilization during the same time period; and 3) difficulty in identifying states that are similar to Virginia prior to ARTS implementation, but who remained static in terms of SUD policy throughout the ARTS evaluation period.

One exception was an analysis of the impact of ARTS on acute hospital emergency department and inpatient utilization, which utilized Virginia Medicaid members who did not

have SUD as a comparison group.[5] While our analysis showed that this was a reasonable comparison for this particular analysis, the non-SUD Medicaid population in Virginia is a limited comparison group that is unlikely to be useful for other analyses described in this evaluation plan.

Since the initial evaluation plan was developed in 2016, other data sources have become available that permit more informative comparisons with other states. For this evaluation, we will leverage Virginia's participation in the Medicaid Outcomes Distributed Research Network (MODRN) to compare changes on key measures of SUD treatment access, utilization, and quality of care for Virginia with Medicaid members in other states. MODRN is a multi-state collaborative effort consisting of 13 Medicaid state agencies and university partners to facilitate standardized measures based on state Medicaid claims data for facilitating cross-state comparisons of opioid-related research. In addition to Virginia, MODRN states include: Delaware, Kentucky, Maine, Maryland, Massachusetts, Michigan, North Carolina, Ohio, Pennsylvania, Tennessee, West Virginia, and Wisconsin. With the exception of Tennessee and North Carolina, all MODRN states have expanded Medicaid, with Virginia, expanding in 2019, the most recent to expand. Approximately one-in-four Medicaid members in the United States are enrolled in Medicaid programs participating in the MODRN collaborative with the 11 initial MODRN states accounting for 16.3 million (22%) Medicaid enrollees. MODRN states are largely contiguous and include 6/10 states ranking highest in overdose deaths in the country (e.g., Ohio, West Virginia). Moreover, most of states in the MODRN collaborative have SUD waivers approved or pending.

MODRN includes a number of common quality and performance metrics developed by the National Quality Forum and other sources that are being constructed for each year starting with 2014. The following measures being proposed for this evaluation will be based on MODRN:

- Initiation and engagement with treatment for alcohol, opioid, and other drug use dependence (Primary Driver #1).
- Utilization of emergency department and inpatient hospital settings for SUD (Primary Driver #2).
- Rates of Medications for Opioid Use Disorder (MOUD) use for members with OUD (Primary Driver #3).
- Continuity of pharmacotherapy (Primary Driver #3)
- Screening for HIV, HCV, HBV among members with OUD diagnosis (Primary Driver #5)
- Follow-up care within 7 and 30 days of an emergency department visit related to SUD (Secondary Driver C).

MODRN facilitates cross-state comparisons of these measures through a common data model that standardizes the definition and construction of these measures across states. Thus, MODRN permits comparisons of changes in these measures in Virginia before and after implementation of the ARTS demonstration with changes on the same measures in other states. These comparisons will allow for stronger conclusions about the impact of ARTS on SUD treatment access and quality. A more detailed discussion of the analysis conducted through the MODRN is provided below.

[5] Barnes et al., *op cit*

Goal 3. Examine the cumulative impact of ARTS and Medicaid expansion on addiction treatment services in Virginia.

Virginia is unique among state Medicaid programs in that a comprehensive reform of addiction treatment services in 2017 was followed by expanded eligibility for Medicaid in 2019. The combination of expanded Medicaid coverage of addiction treatment services and expanded eligibility for Medicaid is expected to have substantial effects on population-level estimates of SUD treatment access, utilization, and outcomes for Virginia. Using Medicaid-only data sources (such as claims data) does not permit a complete assessment of the impact of Medicaid expansion on the Virginia population, since these data only reflect people enrolled in Medicaid before and after expansion. Data sources that are representative of the entire population – including uninsured people -- are necessary to assess the impact on SUD treatment when uninsured people gain coverage. Therefore, we will utilize national data sources to examine the combined impact of ARTS and Medicaid expansion on population-level estimates of supply of SUD providers, access to treatment, quality of treatment, and outcomes by comparing the changes in these measures for Virginia relative to other states and the overall U.S.

We will assess the combined impact of ARTS and Medicaid expansion on supply and capacity of buprenorphine prescribers (Secondary Driver A) through the Drug Enforcement Administration (DEA) database on providers who received waivers to prescribe buprenorphine through the 2000 Drug Addiction Treatment Act (DATA); we have obtained the complete DEA list of all providers that had waivers from 2002 (the beginning of the program) through 2020. These data include counts of waivered prescribers at different patient limits (30, 100, 275), license type (including nurse practitioners and physician assistants since 2017), and location. To assess changes in supply and capacity of waivered prescribers, we will construct state and county-level measures of the number of waivered prescribers relative to the population, as well as total patient capacity of waivered prescribers.

Secondary driver A will also be addressed with the National Survey of Substance Use Treatment Services (N-SSATS), an annual census of treatment providers conducted by the Substance Abuse and Mental Health Services Association (SAMHSA). Information is collected on the location, organization, structure, services, payers (including Medicaid) and utilization of substance abuse treatment facilities in the United States. State identifiers are included on public use files, permitting a comparison of trends in Virginia with other states and the overall U.S. We have already acquired data for 2015 through 2019, and will acquire data for 2020 when it becomes available (likely in Fall, 2021). To assess changes in the supply of treatment facilities we will construct state-level measures of the number of SUD treatment facilities of different types (e,g, residential, IOP, outpatient), the number of treatment facilities offering MOUD treatment, and the number of treatment facilities accepting Medicaid payment. NSSATS data in the odd years (2015, 2017, 2019) provide more detail on number of beds and use rates (number of patients in treatment / number of beds) which we will use to assess changes in treatment capacity.

The Treatment Episode Data Set (TEDS) will be used to examine the combined impact of ARTS and Medicaid expansion on quality of treatment services. Compiled by SAMHSA, TEDS summarizes information about the characteristics and outcomes of treatment for alcohol and/or drug use among clients aged 12 years and older in facilities that report to individual state administrative data systems. To address Primary Driver 3 (improve adherence to treatment for OUD and other SUDs), we will use the TEDS to assess the combined impact of ARTS and Medicaid expansion on changes in the length of treatment episodes and the rate at which

treatment is completed. Using data from the TEDS discharge file, we will construct state-level measures of the average length of stay, as well as the percent of discharges where the reason for treatment was "treatment completed", and a second indicator for "dropped out of treatment." The analysis will control for changes in other characteristics of treatment episodes using information from the TEDS admission and discharge files, such as patient characteristics, treatment setting, and other characteristics of treatment. Due to the lag in the availability of the TEDS data, it is anticipated that this analysis will be completed in 2023, when 2019 data become publicly available.

The combined impact of ARTS and Medicaid expansion on OUD-related inpatient use (Primary Driver 2) will be assessed using the "Fast Stats" online data tool from the Health Care Cost and Utilization Project (HCUP). This tool provides state-level estimates of the rates of inpatient utilization (per 100,000 people) since 2010 by quarter. Estimates include all inpatient stays (for all payers) as well as for specific types of inpatient stays, including those related to an OUD diagnosis. Using this tool, we will construct a database of state and quarter specific estimates of the rate of OUD-related inpatient stays between 2016-2019. We will also link state-level information from the American Community Survey (to control for changes in population characteristics), and state-level estimates of self-reported OUD prevalence from the National Survey of Drug Use and Health (to control for changes in prevalence) that are publicly available. Availability of state-level inpatient admissions data through the HCUP Fast Stats varies by state. As of this writing, data through the first quarter of 2019 are available for Virginia. We will begin analysis when Virginia and at least 10-15 other states (non-expansion as well as selected others) have data available through 2019, likely in late 2022 or early 2023.

Finally, we will assess the combined impact of ARTS and Medicaid expansion on rates of fatal drug overdoses in Virginia by obtaining data from National Vital Statistics System maintained by the Center for Disease Control and Prevention on numbers and rates of fatal drug overdoses by state and year. As geographic identifiers are not available on public use files, we will apply to the National Center for Health Statistics to the restricted use files for the multiple cause of death (MCOD) micro-data files. These will permit a comparison of quarterly changes in the rate of fatal drug overdoses for Virginia (and Virginia counties) with other comparison states. Data are currently available for 2016 through 2019. We will apply to obtain the restricted use files in 2021.

3.2 Analytic Approaches**

Goal 1*: *Interrupted Time Series Analyses. As described above, measures for which we have data only on Virginia Medicaid members, including claims-based measures of utilization and costs that are specific to Virginia Medicaid, will rely primarily on a summary-level interrupted time series analyses (ITS) with the unit of time measured in quarters to allow for sufficient variation in outcomes prior to ARTS implementation (~8 quarters) and post (~30 quarters). For these analyses, the unit of analysis is the summary measure (e.g. a ratio or percentage) at a given time period rather than individual's outcome at the given time period. Assume an outcome of interest Y, across $t = 0$ ….., $_m$ time periods. Let Y_t represent the outcome at time t, T represents the time elapsed, and W_t represent an indicator variable specifying whether or not time T is part of the post-ARTS intervention period in Virginia. The interrupted time series model is given by:

$$Y_t = \beta_0 + \beta_1 T + \beta_2 W_t + \beta_3 W_t * T + \varepsilon_t$$

where β_0 and β_1 represent the pre-ARTS intercept and slope respectively, and β_2 and β_3 represent the change in the intercept and slope respectively during the post-intervention period.

The parameter ε_t represents random error in the time series at time *t*. The estimates β_2 and β_3 are the causal parameters of the interest in the model.

As discussed above, Medicaid expansion (beginning in January 1, 2019) will likely affect rates of SUD treatment access and quality because expansion enrollees differ in important ways from members enrolled through traditional eligibility criteria. To account for this, the framework will be extended to examine changes in three time periods in Virginia to consider post-expansion effects (i.e., pre-ARTS, post-ARTS but pre-expansion, and post-ARTS and post-expansion). In this case, additional parameters for the change in intercept and slope in the third time period would also be estimated giving the model the following form:

$$Y_t = \beta_0 + \beta_1 T + \beta_2 W_{1t} + \beta_3 W_{1t}*T + \beta_4 W_2 t + \beta_5 W_2 t*T + \varepsilon_t$$

Where W_{1t} and W_{2t} are indicators of the second (post-ARTS but pre-expansion) and third (post-ARTS and post-expansion) time periods. The coefficients β_2 and β_3 represent the changes in the second time period relative to the first (post-ARTS but pre-expansion versus pre-ARTS) and β_4 and β_5 represent the changes in the third time period relative to the first (post-ARTS and post-expansion versus pre-ARTS). To account for autocorrelation, Newey-West standard errors will be used in ITS models [ref].[6]

Goal 1: Cross-sectional analyses of ARTS member survey data. An example of the cross-sectional analyses the evaluators will conduct from ARTS member survey data follows. To assess whether members receiving ARTS services report receiving care coordination, specifically help with other health and other social needs as the ARTS intervention progresses (Secondary Driver E, Table 1), responses from multiple waves of the ARTS member survey will be pooled (see below for more detailed description of ARTS member survey). To date, two survey periods have already been fielded (Wave 1 – January – March 2020; Wave 2 October 2020 – March 2021), and subsequent waves are expected to be fielded in 2022 and 2023. Each wave is a cross-section of members receiving ARTS services who are randomly sampled and then sent mail surveys. As there is no pre-intervention survey data, descriptive (non-experimental) analyses will be required. Examples of cross-sectional analyses that will be leveraged from these data include linear probability models/logistic regressions estimating the adjusted probability/likelihood of whether or not members receiving ARTS services also report receiving assistance with other health and social needs (outcomes; Y_{it}).

$$Y_{it} = \beta_1 X_{it} + YEAR_t + \varepsilon_{it}$$

These analyses will be adjusted for covariates (X_{it}) including member characteristics (sex, race/ethnicity, eligibility group, age), education, psychological distress, polysubstance use, employment, housing and food insecurity, and survey time period ($YEAR_t$). Importantly, the first wave of the ARTS member survey was fielded immediately prior to the outbreak of the COVID-19 pandemic, with the second wave fielded during the pandemic allowing for comparisons in care coordination for non-substance use services before and during the pandemic.

[6] Newey, W. K., & West, K. D. (1986). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix.

Goal 1: Difference-in-difference analysis comparing within state Medicaid overdose rate to non-Medicaid overdose rates. To evaluate whether the ARTS intervention shifted rates of opioid and non-opioid overdose deaths in Virginia, a difference-in-difference design will be used. Medicaid claims will be linked to Virginia Department of Health cause of death data to identify overdose deaths among members covered by Medicaid in the previous year creating a binary Medicaid coverage variable (covered by Medicaid in the past year; not covered by Medicaid in the past year). Data will be aggregated at the quarter level and differences in overdose deaths across Medicaid coverage vs. no Medicaid coverage, pre vs. post ARTs intervention period, and the interaction of the two will be estimated separately for opioid and non-opioid related overdose deaths. Control variables available on death certificates in Virginia include sex, age, race/ethnicity, and marital status. These and other potential confounders that can be included in the analyses will be adjusted for.

Our difference-in-difference approach to estimate reductions in overdose rates (Y_{it}) in the pre vs. post ARTS benefit period ($ARTS_t$) were higher among those with Medicaid coverage ($Medicaid_{it}$) than those without will take the following form where *i* denotes the individual and *t* denotes year:

$$Y_{it} = \beta_1 ARTS_t + \beta_2 Medicaid_{it} + \beta_3 ARTS_t * Medicaid_{it} \quad \beta_4 X_{it} + YEAR_t + \varepsilon_{it}$$

The coefficient β_3 is the difference-in-difference estimate of the mean difference in overdoses between those in Virginia Medicaid and those not covered by Mediciad in the post-ARTS period compared to the pre-ARTS period and X_{ist} denotes individual-level demographic characteristics described above.

Goal 2: Summary statistics using MODRN to compare Virginia with other states

Although a difference-in-differences analysis is the conventional approach to examining the impact of a state policy or program relative to that of a comparison group, this approach requires linkages of person-level data for both the intervention and comparison groups. The sharing of person-level data is not permitted in the MODRN collaborative as data use agreements among the states in MODRN permit only aggregate level comparisons across the participating states. Additionally, as noted above, 11 of the 13 MODRN states have expanded Medicaid and most of states in the MODRN collaborative have SUD waivers approved or pending, adding additional challenges beyond the inability to obtain person-level data, to using MODRN states as a counterfactual in a traditional difference-in-difference approach. Therefore, a summary statistics will be used to compare SUD/OUD service utilization and quality measures between Virginia and other MODRN states. These summary statistics can be adjusted in each MODRN state for treatment group, age group, gender, race ethnicity, rural, and eligibility category, among other covariates. A table detailing hypothetical state adjusted averages in the pre- vs. post-ARTS period in Virginia and two other states (State A, State B) in quarterly rates of OUD-related emergency department use is presented below. Rather than be used to generate causal estimates per se, the proposed analytic approach using MODRN data will help strengthen other causal models proposed in this evaluation (e.g., difference-in-difference approach controlling for Medicaid expansion) by allowing the evaluators to descriptively compare performance pre- and post-ARTS in Virginia to the average performance in these periods across all other MODRN states.

Table 1. Example of hypothetical results of pre- vs post-ARTS adjusted summary statistics.

State	Treatment	Quarterly rate of OUD-related ED Use	SE	p
Virginia	Pre-ARTS	Ref		
	Post-ARTS	-1.2900	-0.0561	0.0001
MODRN State A	Pre-ARTS	Ref		
	Post-ARTS	-0.1131	-0.0476	0.0051
MODRN State B	Pre-ARTS	Ref		
	Post-ARTS	-0.8519	-0.0435	0.0001

Goal 3. Using a difference-in-difference approach that controls for Medicaid expansion across states to estimate the combined impact of ARTS and Medicaid expansion on SUD treatment access and outcomes for the Virginia population.

We will use a difference-in-difference approach that controls for Medicaid expansion across states to assess the combined impact of ARTS and Medicaid expansion on access to addiction treatment services in Virginia. As described above, these analyses will be based on national data sources that include the entire population, and not just the population enrolled in Medicaid. Our primary empirical model will take the following form:

$$Y_{ist} = \beta_1 ARTS_{st} + \beta_2 Expansion_{st} + \beta_3 Expansion_{st} * ARTS_{st} + \beta_4 X_{ist} + STATE_s + YEAR_t + \varepsilon_{ist}$$

where i denotes the individual, s denotes the state, and t denotes year. In this model, $ARTS_{st}$ is an interaction represented as a binary variable equal to 1 if the individual lives in Virginia, the only state with the ARTS policy, and was observed in the data in 2017, when the policy was implemented, or later. Similarly, $Expansion_{st}$ is an interaction equal 1 if the individual was observed in state s that adopted the ACA's Medicaid expansion in year t. The variable $Expansion_{st} * ARTS_{st}$ indicates whether an individual lives in Virginia in 2019 or after. X_{ist} denotes individual-level demographic characteristics. State and year fixed effects are denoted by the terms $STATE_s$ and $YEAR_t$.

The estimated coefficient for β_1 represents the mean difference in outcomes between Virginia and other states in the post ARTS period compared to the pre ARTS period, adjusted for individual-level covariates and state and year fixed effects. The coefficients for β_2 provides the mean difference in outcomes between expansion and non-expansion states during the post-expansion period, as compared with the period before expansion. Finally, β_3 is a difference-in-difference coefficient that controls for Medicaid expansion across states and is an estimate of the mean difference in outcomes between Virginia in the post-ARTS, post-expansion period compared to the post-ARTS, pre-expansion period.

We will use linear regression models to facilitate a direct interpretation of the coefficients and estimated Huber–White robust standard errors clustered according to state. Based on these models, we will derive adjusted estimates for Virginia and other comparison groups. For example, an analysis treatment length and completion rates using the TEDS may result in the following table (Table 2) where average length of treatment increases 1.3 days in Virginia ($p<0.05$) after ARTS, relative to the pre ARTS period and compared to changes in other states during the same time. The difference-in-difference approach that controls for Medicaid expansion across states will also be able to test for differences in ARTS effects before versus after Medicaid expansion in Virginia. In the example table below, average length of treatment increases 0.5 days ($p<0.05$) after Virginia's expansion compared to the post ARTS, pre expansion period in Virginia. Across all states, Medicaid expansion, in this example, increases average length of treatment by 1.2 days ($p<0.05$), relative to non-expansion states. Examples using other outcomes (Average MOUD length of treatment, percent completed a treatment episode) available in TEDS are also presented in the table below.

Table 2. Example of estimates to be generated from the difference-in-difference approach that controls for Medicaid expansion across states of the combined impact of ARTS and Medicaid expansion on SUD quality of treatment.

	Average length of treatment (days)	Average length of MOUD treatment (days)	Percent completed an episode of treatment
ARTS	1.3*	2.0*	31%*
Expansion	1.2*	1.3*	23%*
*ARTS*Expansion*	0.5*	0.9*	8%*

*p<0.05. Source: Treatment Episode Data Set, 2015-2020

3.3. Primary Data Collection

Patient experience survey. We will complement the analysis of Medicaid claims and other secondary data with a survey of Medicaid members who use ARTS services. Such a survey is currently being conducted for 2020 and 2021 and includes a stratified random sample of Medicaid members who had a diagnosis for OUD. The main objectives of the ARTS member survey are to: (1) assess patient experiences with the treatment they are receiving, and to understand how these experiences differ by treatment setting (e.g. OBOT, OTP, other outpatient providers); (2) to understand how patient experience with treatment differs by patient factors, such as race/ethnicity, co-morbid mental health problems, and social factors such as food and housing insecurity, social support, and experience with the criminal justice system, and; (3) to better understand the reasons why some members receive a diagnosis of OUD, but do not utilize Medicaid-covered OUD treatment services. An additional goal of the survey that has emerged recently is to assess the impact of the COVID-19 pandemic on members' access to treatment services, and their experience with treatment services.

The current member survey is being fielded in two waves: (1) From January to March, 2020; and; (2) From October 2020 to March 2021. Each wave includes an initial sample of about 5,000 members, with an expected 1,000 completed interviews in each wave (about a 20 percent response rate). A stratified random sample was performed in order to obtain representative samples of members ages 21 and over with diagnosed OUD based on four types of

ARTS service utilization in the previous six months, as identified in the Medicaid claims data: (1) Members diagnosed with an OUD who had at least two claims related to the use of OBOT providers; (2) Members diagnosed with an OUD who did not use OBOT providers, but had at least two claims at OTP providers; (3) Members diagnosed with an OUD who did not use OBOT or OTP providers, but used other outpatient providers for ASAM 1 services; (4) Members who had any diagnosis for OUD in the previous year, but had no claims for any ARTS or other OUD treatment services in the past year. The sample is roughly equally split between the four sampling strata.

The survey questionnaire includes questions from the CAHPS Experience of Care and Health Outcomes (ECHO), which was developed specifically to identify experiences with behavioral health services provided by managed care organizations, as well as other questions designed to understand barriers to treatment, reasons for discontinuing treatment, and the benefits of treatment to member's personal, family, and employment circumstances. We also adapted questions from a survey conducted in Pennsylvania to assess Centers of Excellence providers. These questions assess how the treatment they received affected their ability to stay off drugs or alcohol, their ability to work, relationships with family and friends, social activities, and their ability to find stable housing. Other survey questions assessed their current level of psychiatric distress (using the Kessler 6 index), food and housing security, levels of social support, and experience with the criminal justice system in the previous 12 months.

In addition, since the second wave of the survey began after the onset of the COVID-19 pandemic, we included questions in the second wave that are designed to explicitly assess how the pandemic has affected their ability to get treatment services, including their utilization and access to telehealth services.

Postal addresses are the most consistently reported and accurate contact information in the enrollment data, while telephone numbers are either missing or considered inaccurate for the majority of members. Therefore, the survey is being conducted by mail. Respondents are provided with a $5 incentive in the survey packet that is mailed to them, as well as a stamped envelope with which to return the completed survey. Survey responses are entered into a REDcap database, and converted to SAS datafiles for the purpose of analysis.

The first wave of the survey achieved a response rate of slightly over 20 percent. Differences between survey respondents and nonrespondents on a range of member demographic and claims-based service utilization measures will be assessed to identify potential nonresponse bias. To at least partially correct for any nonresponse bias, survey weights will be constructed using the propensity cell weighting method.

A similar design will be used to field a third wave of the member survey in late 2022 and early 2023, approximately two years after the second wave of the survey is completed. The primary purpose of the third wave of the survey is to assess changes in patient experiences with treatment services since 2020-21, at the height of the COVID-19 pandemic. Of particular interest is whether any changes in member-reported problems with access to care, dis-satisfaction with providers and treatment, psychological distress, and food and housing security experienced during the COVID-19 pandemic have been restored to their pre-pandemic levels (the first wave in early 2020). We will also assess whether disparities in patient experience by treatment setting, race/ethnicity, and other patient factors have narrowed or increased since the first and second waves. We will also consider additional questions on pandemic-related changes to treatment services that are maintained after the end of the pandemic, such as the use of telehealth.

To maximize the ability to assess changes in patient experiences with previous waves, we will use similar sampling and data collection methods as described above, including a mail-based survey with at least 1,000 completed interviews among members with an OUD diagnosis. Although we will allow for some changes to the survey questionnaire to address new areas of interest, the overall structure and length of the questionnaire will be similar to the first two waves in order to minimize the potential that changes in survey responses from previous waves are due to changes in survey design.

Semi-structured interviews with MCO care coordinators. As mentioned above, the ARTS demonstration included a change from a "carve-out" to a "carve-in" model of care for behavioral health services in order to increase coordination between behavioral and physical health services. To facilitate this coordination, the six MCOs employ licensed care coordinators to assist members with identifying addiction treatment services, encouraging follow-up after discharge from acute hospital and residential treatment facilities, and coordinating other physical and social needs of members. To understand the processes and mechanisms by which MCOs managing and coordinating SUD treatment services for Medicaid members, we will conduct a series of semi-structured interviews with licensed care coordinators who are employed by the MCOs. We will interview the care coordinators who are tasked specifically with connecting members to SUD treatment services and facilitating transitions between different levels of treatment. The interviews will focus on four areas: (1) transitions between different levels of ASAM treatment, (2) retaining members in treatment once initiated; (3) coordination of SUD with other behavioral, physical health, and social needs; (4) how care coordination from the MCOs complements, conflicts with, or overlaps with care coordination services provided by many treatment providers, such as Preferred OBOTs.

Semi-structured interviews will be conducted due to the relatively small number of MCO care coordinators that have been identified by DMAS (n=23). We will interview a minimum of 3-4 care coordinators from each of the six MCOs, for a total of 18-20 interviews. Contact information for the care coordinators will be provided by DMAS. In addition, we will interview about 10-12 treatment providers to understand their perspectives on the role of MCO care coordinators in the treatment process, as well as their views on the effectiveness of these roles. We will identify providers likely to have had substantial interactions with MCO care coordinators, such as high volume OBOTs and residential treatment facilities.

All interviews will be recorded and transcribed. Using qualitative research software, transcriptions will be coded by topic, question, MCO, respondent type, geographic area, and other information important for the analysis, and entered into a database. The coding of responses will facilitate analysis by allowing us to query the database to identify responses based on question, topic, and stratified by key respondent characteristics.

3.3 Target and Comparison Populations.

The use of comparison states is being proposed for Goals 2 and 3 of the evaluation. Identifying "ideal" comparison states is difficult because most states have been active throughout the evaluation period in using Medicaid programs to address the opioid epidemic, including changes in benefits and covered services, increasing the supply and capacity of treatment providers, and modifying regulations regarding MOUD treatment. In addition, an increasing number of states have used Section 1115 demonstration waivers for SUD to allow federal Medicaid payments for residential treatment centers that have 16 or more beds, which otherwise

is prohibited under the Institution for Mental Disease (IMD) exclusion. The activity of state Medicaid programs in this area makes it difficult to select an ideal comparison group to represent the "counterfactual", that is, what would have happened in Virginia if the ARTS demonstration had not been implemented.

At the same time, Virginia's ARTS program is unique in that a comprehensive reform and expansion of addiction treatment services for Medicaid members was combined with a Section 1115 waiver, making all Medicaid members eligible April 1, 2017. While other states have implemented similar reforms, they have generally done so over much longer time periods, or prior to the evaluation period for this project. We are not aware of any other states that have combined a Section 1115 Demonstration Waiver for SUD with a comprehension reform of services that was implemented simultaneously and that covered the entire Medicaid population throughout the state.

Use of the MODRN allows us to compare Virginia with other states who differ from Virginia on a number of domains, such as the timing of Section 1115 waiver adoption and implementation, changes made to covered SUD benefits, regulation of MOUD treatment (e.g. use of prior authorization for buprenorphine), as well as changes to other policies related to SUD.

As part of the MODRN project, a detailed inventory of Medicaid policies relating to SUD treatment and outcomes has been conducted for each of the participating states, which will facilitate identification of states in MODRN that are most optimal as comparison groups. For example, while most states in MODRN have adopted SUD demonstration waivers, Virginia was one of the early adopters (implemented in April, 2017), while most other states did not implement their waivers until late 2018 or early 2019. In sum, instead of using a single state that would likely be an imperfect comparison to Virginia, we will use a number of states in MODRN that did not implement reforms on the same timing and scale of ARTS, but may have implemented a number of smaller scale reforms over a longer time period or prior to the evaluation period.

The expansion of Medicaid eligibility less than 2 years after ARTS implementation further distinguishes Virginia from all other states. For the analysis of the combined impact of ARTS and Medicaid expansion, we will have a broader group of states with which to select comparison groups, as the data for this analysis is based on national data sources. As with the analysis of MODRN, we will try to limit comparison states to those that have not implemented large-scale reforms of their Medicaid addiction treatment systems during the evaluation period.

3.4. Assessing the impact of COVID-19

The COVID-19 pandemic has likely had major impacts on Medicaid enrollment, the number of Medicaid members with diagnosed SUD, and utilization of treatment services and outcomes. It is important to assess COVID-19 effects, not only to understand how the pandemic has affected Medicaid members with SUD, but also to understand how COVID-19 affected the demonstration and the ability of this evaluation to assess the impact of the demonstration and Medicaid expansion. We will assess the impact of COVID-19 in several ways/

First, we will split the post-Medicaid expansion period into roughly three periods: (1) 2019, the first year of Medicaid expansion and before the start of the pandemic; (2) 2020-2021, the years of the COVID-19 pandemic at its height, and; (3) 2022-2024, the expected post-pandemic time period. These time periods will be adjusted based on further evidence of when COVID-19 began to affect utilization (e.g. the first quarter of 2020), and when the pandemic is

considered to have largely ended. To assess the cumulative impact of ARTS and Medicaid expansion as described in Section 3.2 above, we will initially limit the post-expansion period to 2019 (and possibly the first quarter of 2020) in order to avoid the confounding effects of COVID-19.

To understand how COVID-19 affected Medicaid members and the demonstration, we will assess changes in the number of Medicaid members, the diagnosed prevalence of SUD and OUD, characteristics of Medicaid members with SUD and OUD, indicators of treatment utilization, quality, and outcomes between the pre-pandemic period (2019), the COVID-19 period (2020-2021), and the post-COVID-19 period (2022-2024). While these analyses will mostly be cross-sectional in nature, we will also examine a cohort of Medicaid members who initiated treatment in late 2019 or early 2020 (prior to the start of the pandemic) to examine the impact of the COVID-19 pandemic on their treatment utilization and outcomes, relative to a cohort of Medicaid members who initiated treatment in 2018 and completed at least one year of treatment prior to the start of COVID-19. Comparing cohorts that received treatment before and during COVID-19 should allow for strong conclusions about how access to and treatment for SUD changed during the pandemic. We

As described above, the three waves of the ARTS member survey are timed (coincidentally) to assess changes in the patient experience with treatment, specifically the pre-pandemic period (January – March 2020), the pandemic period (October 2020 – March 2021) and post-pandemic period (likely late 2022 and early 2023). In addition to changes in measures of patient satisfaction, social and personal outcomes of treatment, and access to services, the survey will also allow us to assess changes in (and control for) indicators of mental health, food and housing insecurity, social support, experience with the criminal justice system, and other patient characteristics among members who use ARTS services.

3.5 Evaluation Period

Our analysis will be organized around three key dates: April 1, 2017 when the ARTS demonstration was first implemented, January 1, 2019 when Medicaid eligibility was expanded to include adults up to ages 138% of the federal poverty level, and December 31, 2024 when the evaluation period ends under the current waiver. Our evaluation will cover roughly two time periods:

- 2015-2016 (pre-ARTS period) to 2017-18 (the post-ARTS period but before Medicaid expansion)
- 2017-2018 (the post-ARTS period prior to expansion) to 2019-2024 (the post-ARTS, post-Medicaid expansion period.
- As described above, the 2019-2024 period will be subdivided into 2019, 2020-2021, and 2022-2024 to address the potential effects of COVID-19.

3.6 Subgroup Analyses

We will conduct analysis of subgroups that are high priority to the Commonwealth of Virginia, including differences by region, urban/rural residence, racial and ethnic disparities, pregnant women, and different age groups. We will also explore how results differ by measures of community well-being using Virginia's Health Opportunity Index, a novel method that

quantifies community well-being and social determinants of health at the census tract level along dimensions of access to care, economic, educational, and environmental factors.[7]

4.0 METHODOLOGICAL LIMITATIONS

There are two major methodological limitations to this evaluation. First, the ARTS demonstration waiver along with the entire package of reforms contained within the program was implemented statewide on April 1, 2017, including expanded coverage of services, increases in reimbursement rates, and the switch to a "carve-in" model for behavioral health services. It will be difficult to test the impact of these specific components on outcomes, such as SUD-related hospital use and fatal drug overdoses. Although the evaluation will assess changes in the supply of providers, access to and utilization of services, and coordination with physical and mental health services that are addressed by specific provisions of ARTS, major conclusions will be based on the overall impact of the ARTS demonstration, rather than specific provisions.

As mentioned above, we do not believe it is possible to identify ideal comparison groups or states with which to serve as a true counterfactual to Virginia Medicaid during the evaluation period, especially an evaluation period that extends from 2015 through 2023. However, because the ARTS demonstration combined with Medicaid expansion is unique among states, we can restrict comparison states to those that did not implement reforms on the same scale and timeframe as the ARTS demonstration. While not ideal, using MODRN and national data sources to identify comparison groups greatly strengthens the evaluation design (relative to using only Virginia data), and will permit stronger conclusions about the impact of ARTS.

[7] Viriginia Department of Health. *Virginia Health Opportunity Index*. Available at: https://apps.vdh.virginia.gov/omhhe/hoi/.

5.0 EVALUATION OF FORMER FOSTER CARE YOUTH WHO AGED OUT OF FOSTER CARE IN ANOTHER STATE

5.1 Background.

As mentioned above, a September 2017 amendment to the demonstration added coverage for former foster care youth (FFCY) who aged out of foster care under the responsibility of another state and are now applying for Medicaid in the Commonwealth of Virginia. The Affordable Care Act included provisions to allow youth to maintain coverage under their parents' or guardian's health insurance plan until age 26, as well as for youth in foster care who have Medicaid coverage to continue with Medicaid coverage up to age 26.

A final rule published by CMS on November 21, 2016 allows Medicaid coverage of former foster care youth only in the state for which they received Medicaid coverage while in foster care. However, section 1115 demonstration authority allows states the option of providing coverage to youth who were in foster care and Medicaid in a different state. The September, 2017 amendment to the demonstration – now called the "Building and Transforming Coverage, Services, and Supports for a Healthier Virginia" – is intended for this purpose. As required by the section 1115 demonstration authority, the state must conduct a separate evaluation of the FFCY provision, and provide regular and annual monitoring reports to CMS to inform policy decisions.

5.2 Demonstration goals regarding former foster care youth age aged out of foster care in another state.

1) Ensure access to Medicaid services for former foster care youth between the ages of 18 and 26, who previously resided in another state and are now covered through Virginia Medicaid through the former foster care youth eligibility group.

2) Improve or maintain health outcomes for the demonstration population.

5.3 Evaluation Questions and Hypotheses.

A summary of the demonstration's core evaluation questions, hypotheses, data sources, and analytical approaches are provided in the table below. CMS guidance on the evaluation design for the FFCY demonstration suggests including both "process" and "outcome" measures. Process measures include enrollment and basic measures of utilization that will allow us to track and monitor the number of members who are benefitting from the demonstration.

Outcome measures would allow for a more comprehensive assessment of the impact of the demonstration. However, because the number of members expected to be affected by the demonstration is small (less than 100, see below), we do not think it is possible to assess outcomes or draw any meaningful conclusions about outcomes based on the measures suggested by CMS. Therefore, the evaluation will be limited to an assessment of process measures.

Summary of Key Evaluation Questions, Hypotheses, Data Sources, and Analytic Approaches

Demonstration Goal 1: Expand access to Medicaid for former foster care youth who were in foster care and Medicaid in another state and are now applying for Medicaid in the state in which they live.					
Evaluation Component	**Evaluation Question**	**Evaluation Hypotheses**	**Measure [Reported for each Demonstration Year]**	**Recommended Data Source**	**Analytic Approach**
Process	Does the demonstration provide continuous health insurance coverage?	Beneficiaries will be continuously enrolled for 12 months.	Number of beneficiaries continuously enrolled/ total number of enrollees	Administrative data – enrollment data	Descriptive statistics (frequency and percentage)
	How did beneficiaries utilize health services?	Beneficiaries will access health services.	Number of beneficiaries who had an ambulatory care visit/ Total number of beneficiaries	Administrative data – Medicaid claims	Descriptive statistics (frequencies and percentages)
			Number of beneficiaries who had an emergency department visit/ Total number of beneficiaries		
			Number of beneficiaries who had an inpatient visit/ Total number of beneficiaries		
			Number of beneficiaries who had a behavioral health encounter /Total number of beneficiaries		

5.4 Methodology

a) Evaluation design: The evaluation will use a post-only assessment, as it is expected that less than 500 members will be enrolled in Medicaid through the demonstration (see below). The timeframe for the post-only period will begin when the demonstration begins, and ends when the demonstration ends.

b) Data collection and sources: The former foster care youth demonstration population will be identified through Medicaid enrollment files. Monthly enrollment by eligibility group is tracked for all Medicaid members, and there are specific eligibility codes for those enrolled through the former foster care youth program. The enrollment files do not specifically identify whether enrollees were in foster care and Medicaid in a different state before they enrolled in Virginia Medicaid. To identify the demonstration population, we will identify those enrolled in Medicaid through the former foster care youth program who were not continuously enrolled in Medicaid in the year prior to their 18th birthday. The evaluation team will extract enrollment and claims data for the demonstration population annually. All data will be collected retrospectively through administrative data.

c) Data Analysis Strategy. Quantitative methods based on descriptive analyses will be used to analyze the data.

5.5 Justification for Excluding Comparison Groups and Baseline Data

In 2019, there were an estimated 65 Medicaid enrollees covered under the demonstration. This falls well short of the criteria for having at least 500 potential enrollees needed to include a comparison group in the evaluation, based on CMS' Modified Evaluation Design for the Section 1115 Demonstration on Former Foster Care Youth Who Were in Foster Care and Medicaid in a Different State.

Also, the state does not have information on Medicaid enrollment of the demonstration population before they enrolled in Virginia Medicaid, and therefore is lacking baseline data on the demonstration population (that is, Medicaid enrollment before the demonstration began). However, the evaluators will be able to track Medicaid enrollment and utilization on a monthly basis since their enrollment began, beginning with the start of the demonstration in September, 2017.

ATTACHMENTS

A. Independent Evaluator

This demonstration waiver will be evaluated by an independent party. The Department of Health Behavior of Policy (HBP) is part of the Virginia Commonwealth University School of Medicine and is a separate entity from DMAS. The HBP department is comprised of 16 faculty from multiple disciplines including health economics, social epidemiology, sociology, and health psychology. HBP addresses the behavioral, social, organizational, and policy factors affecting the health of individuals and populations using rigorous quantitative and qualitative methods. The department includes two doctoral programs – one in Health Care Policy and Research, and a second Ph.D. program in Social and Behavioral Sciences.

Along with the Department of Biostatistics and Division of Epidemiology in the Department of Family Medicine, HBP is one of the core public health departments within the VCU School of Medicine. HBP faculty actively collaborate with faculty in other departments and centers within both the School of Medicine and other VCU departments, including the Department of Health Administration, the Department of Family Medicine and Population Health, the Massey Cancer Center, the Wright Center for Clinical and Translational Research, the Institute for Drug and Alcohol Studies, and the Center for the Study of Tobacco Products.

Drs. Peter Cunningham and Andrew Barnes (Principal Investigator and Co-Principal Investigators for this project, respectively) have been leading the evaluation of the ARTS demonstration since it began in 2017, which is part of a broader partnership they have established with DMAS. In addition to the evaluation of ARTS, Drs. Barnes and Cunningham are the university partners for Virginia for the Medicaid Outcomes Distributed Research Network. They have also partnered with DMAS on a needs assessment for Virginia's SUPPORT Act grant, and are leading two other state-funded evaluations of Medicaid programs. Through their partnership with DMAS, they have access to Medicaid enrollment and claims data that are necessary to complete the evaluation work. As part of the VCU School of Medicine, they are able to draw on the clinical and research expertise related to substance use disorders of other faculty and researchers within VCU. Dr. Cunningham has over 30 years of experience in health services and health policy research, including 19 years at Mathematica Policy Research, Inc., 7 years at the Agency for Healthcare Research and Quality, and 7 years at VCU. Dr. Barnes is a health policy researcher and health economist with 10 years of experience on faculty at VCU. He also serves on advisory roles with AcademyHealth's State Research and Policy Interest Group and AcademyHealth's State-University Partnership Learning Network.

B. Conflict of interest statement

HBP agrees that no agency, employment, joint venture, or partnership has been or will be created between DMAS and HBP. HBP further agrees that as an independent entity, it assumes all responsibility for any federal, state, municipal or other tax liabilities along with workers compensation, unemployment compensation, and insurance premiums that may accrue as a result of funds received pursuant to this work. HBP agrees that it is an independent entity for all purposes including, but not limited to, the application of the Fair Labor Standards Act, the Social Security Act, the Federal Unemployment Tax Act, the Federal Insurance Contribution Act, provisions of the Internal Revenue Code, Virginia tax law, Workers Compensation law, and Unemployment Insurance law.

HBP will maintain communication with DMAS staff throughout the evaluation period to better understand policy and program implementation, and to obtain DMAS' assistance with access to administrative data. HBP will make independent decisions about the evaluation itself, including methodology, analytical strategy, analysis of evaluation data, and presentation of results.

C. Timeline and Major Milestones

Milestone	Date
Completion of first interim report under demonstration renewal, submitted to DMAS	12/2020
Revised evaluation plan submitted to CMS	2/2021
Completion of ARTS member survey, wave 2	4/2021
Ongoing analysis of claims and survey data	1/2021 to 12/2021
Analysis of cumulative impact of ARTS and Medicaid expansion on provider supply using DEA waivered prescriber data and N-SSATS	5/2021 to 12/2021
Completion of second interim report under demonstration renewal, including separate report on FFCY who aged out of foster care in another state	12/2021
Ongoing analysis of claims and survey data	1/2022 to 12/2022
Semi-structured interviews with MCO care coordinators	3/2022 to 9/2022
ARTS member survey, wave 3	10/2022 to 3/2023
Analysis of cumulative impact of ARTS and Medicaid expansion on SUD-related hospital inpatient admissions	5/2022 to 12/2022
Completion of third interim report under demonstration renewal, including separate report on FFCY who aged out of foster care in another state.	12/2022
Ongoing analysis of claims and survey data	1/2023 to 12/2023
Analysis of cumulative impact of ARTS and Medicaid expansion on access to and quality of treatment services for the Virginia population (based on analysis of TEDS)	7/2023 to 6/2024
Completion of fourth interim report under demonstration renewal, including separate report on FFCY who aged out of foster care in another state	12/2023
Ongoing analysis of claims, completion of all analytical tasks	1/2024 to 12/2024
Completion of final report	12/2024

Total Budget for Addiction and Recovery Treatment Services Evaluation

PROJECT YEAR	PROJECT COST
Year 1: FY2020	
Total Direct Costs	$154,545
F&A 10%	$15,455
Total Costs - Year 1	**$170,000**
Year 2: FY2021	
Total Direct Costs	$154,482
F&A 10%	$15,448
Total Costs - Year 2	**$169,930**
Year 3: FY2022	
Total Direct Costs	$154,482
F&A 10%	$15,448
Total Costs - Year 3	**$169,930**
Year 4: FY2023	
Total Direct Costs	$154,482
F&A 10%	$15,448
Total Costs - Year 4	**$169,930**
Year 5: FY2024	
Total Direct Costs	$154,482
F&A 10%	$15,448
Total Costs - Year 5	**$169,930**
TOTAL FOR ARTS	**$849,720**

FY2020 Budget for Addiction and Recovery Treatment Services Evaluation

PERSONNEL	TITLE	Responsibilities	% EFFORT	PROJECT SALARY	PROJECT COST
Task 1: ARTS Year 2 Report					
Dr. Peter Cunningham	Principal Investigator	Oversee analysis and production of 2 year report	5%	$12,112	$12,112
Dr. Andrew Barnes	Co-Investigator	Assist with production and quality control of report	3%	$4,755	$4,755
Megan Mueller	Data Analyst	Statistical programming of Medicaid claims data, preparation of report tables	10%	$5,500	$5,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$8,969
Production of reports and copy editing					$950
Total Direct Costs					$32,286
F&A 10%					$3,229
Total Costs - Task 1					**$35,515**
Task 2: ARTS Member Experience Survey					
Dr. Peter Cunningham	Principal Investigator	Oversee design, fielding, and analysis of member survey	5%	$12,112	$12,112
Lauren Guerra	Research Assistant	Manage data collection, including preparation and mailing of surveys, and data entry	25%	$8,445	$8,445
Huyen Pham	Research Assistant	Lead the analysis of the member survey	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$8,243
Incentives		3000x$2.00			$6,000
Paper and postage		4000x$3.50			$14,000
Total Direct Costs					$56,300
F&A 10%					$5,630
Total Costs - Task 2					**$61,930**
Task 3: Effectiveness of ARTS Treatment Options					
Dr. Peter Cunningham	Principal Investigator	Oversee analysis and preparation of reports	8.5%	$20,590	$20,590
Dr. Andrew Barnes	Co-Investigator	Develop economic modeling, assist in report preparation	2%	$3,170	$3,170
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports, and assistance with report production	15%	$8,240	$8,240
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$12,836
Total Direct Costs					$44,836
F&A 10%					$4,484
Total Costs - Task 3					**$49,320**
Task 4: Qualitative Analysis of Member Experiences in ARTS Sub-Populations					
Dr. Marshall Brooks	Principal Investigator	Oversee and lead qualitative data collection, production of report	10%	$11,330	$11,330
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$4,543
Incentives		50x$5.00			$250
Transcription		50x$100			$5,000
Total Direct Costs					$21,123
F&A 10%					$2,112
Total Costs - Task 4					**$23,235**
TOTAL FOR ARTS					**$170,000**

FY2021 Budget for Addiction and Recovery Treatment Services Evaluation

PERSONNEL	TITLE	Responsibilities	% EFFORT	PROJECT SALARY	PROJECT COST
Task 1: Analysis of ARTS Member Survey					
Dr. Andrew Barnes	Co-Principal Investigator	Oversee analysis	5%	$7,925	$7,925
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports	10%	$5,500	$5,500
Lauren Guerra	Research Assistant	Assistance with tables and report preparation	20%	$8,200	$8,200
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$8,672
Total Direct Costs					$30,297
F&A 10%					$3,030
Total Costs - Task 1					**$33,327**
Task 2: Analysis of episodes of care at OBOTs					
Dr. Peter Cunningham	Principal Investigator	Leads and oversees analysis	5%	$12,112	$12,112
Erin Britton	Data Analyst	Statistical analysis and programming of Medicaid claims data	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$4,857
Total Direct Costs					$24,469
F&A 10%					$2,447
Total Costs - Task 2					**$26,916**
Task 3: Update analysis of claims data for trends in SUD prevalence and untilization					
Dr. Peter Cunningham	Principal Investigator	Oversee analysis and preparation of reports	5%	$12,112	$12,112
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports, and assistance with report preparation	25%	$13,750	$13,750
Erin Britton	Data Analyst	Assistance with statistical programming of Medicaid claims data	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$10,371
Total Direct Costs					$43,733
F&A 10%					$4,373
Total Costs - Task 3					**$48,106**
Task 4: Using MODRN to compare SUD access and treatment in Virginia to other states					
Dr. Andrew Barnes	Co-Principal Investigator	Oversee and lead qualitative data collection, production of report	5%	$7,925	$7,925
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports	15%	$8,250	$8,250
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$6,486
Total Direct Costs					$22,661
F&A 10%					$2,266
Total Costs - Task 4					**$24,927**
Task 5: Assess combined impact of ARTS and Medicaid expansionon supply of treatment providers					
Dr. Peter Cunningham	Principal Investigator	Oversees project design and analysis	4.4%	$10,658	$10,658
Heather Saunders	Research Assistant	Leads the statistical programming for the analysis	30%	$9,000	$9,000
Lauren Guerra	Research Assistant	Assists with the analysis and preparation of tables for reports	15%	$6,150	$6,150
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$7,514
Total Direct Costs					$33,322
F&A 10%					$3,332
Total Costs - Task 5					**$36,654**
TOTAL FOR ARTS					**$169,930**

FY2022 Budget for Addiction and Recovery Treatment Services Evaluation

PERSONNEL	TITLE	Responsibilities	% EFFORT	PROJECT SALARY	PROJECT COST
Task 1: Analysis of ARTS Member Survey					
Dr. Andrew Barnes	Co-Principal Investigator	Oversee analysis	5%	$7,925	$7,925
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports	10%	$5,500	$5,500
Lauren Guerra	Research Assistant	Assistance with tables and report preparation	20%	$8,200	$8,200
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$8,672
Total Direct Costs					$30,297
F&A 10%					$3,030
Total Costs - Task 1					**$33,327**
Task 2: Analysis of episodes of care at OBOTs					
Dr. Peter Cunningham	Principal Investigator	Leads and oversees analysis	5%	$12,112	$12,112
Erin Britton	Data Analyst	Statistical analysis and programming of Medicaid claims data	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$4,857
Total Direct Costs					$24,469
F&A 10%					$2,447
Total Costs - Task 2					**$26,916**
Task 3: Update analysis of claims data for trends in SUD prevalence and untilization					
Dr. Peter Cunningham	Principal Investigator	Oversee analysis and preparation of reports	5%	$12,112	$12,112
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports, and assistance with report preparation	25%	$13,750	$13,750
Erin Britton	Data Analyst	Assistance with statistical programming of Medicaid claims data	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$10,371
Total Direct Costs					$43,733
F&A 10%					$4,373
Total Costs - Task 3					**$48,106**
Task 4: Using MODRN to compare SUD access and treatment in Virginia to other states					
Dr. Andrew Barnes	Co-Principal Investigator	Oversee and lead qualitative data collection, production of report	5%	$7,925	$7,925
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports	15%	$8,250	$8,250
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$6,486
Total Direct Costs					$22,661
F&A 10%					$2,266
Total Costs - Task 4					**$24,927**
Task 5: Assess combined impact of ARTS and Medicaid expansionon supply of treatment providers					
Dr. Peter Cunningham	Principal Investigator	Oversees project design and analysis	4.4%	$10,658	$10,658
Heather Saunders	Research Assistant	Leads the statistical programming for the analysis	30%	$9,000	$9,000
Lauren Guerra	Research Assistant	Assists with the analysis and preparation of tables for reports	15%	$6,150	$6,150
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$7,514
Total Direct Costs					$33,322
F&A 10%					$3,332
Total Costs - Task 5					**$36,654**
TOTAL FOR ARTS					**$169,930**

FY2023 Budget for Addiction and Recovery Treatment Services Evaluation

PERSONNEL	TITLE	Responsibilities	% EFFORT	PROJECT SALARY	PROJECT COST
Task 1: Analysis of ARTS Member Survey					
Dr. Andrew Barnes	Co-Principal Investigator	Oversee analysis	5%	$7,925	$7,925
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports	10%	$5,500	$5,500
Lauren Guerra	Research Assistant	Assistance with tables and report preparation	20%	$8,200	$8,200
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$8,672
Total Direct Costs					$30,297
F&A 10%					$3,030
Total Costs - Task 1					**$33,327**
Task 2: Analysis of episodes of care at OBOTs					
Dr. Peter Cunningham	Principal Investigator	Leads and oversees analysis	5%	$12,112	$12,112
Erin Britton	Data Analyst	Statistical analysis and programming of Medicaid claims data	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$4,857
Total Direct Costs					$24,469
F&A 10%					$2,447
Total Costs - Task 2					**$26,916**
Task 3: Update analysis of claims data for trends in SUD prevalence and untilization					
Dr. Peter Cunningham	Principal Investigator	Oversee analysis and preparation of reports	5%	$12,112	$12,112
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports, and assistance with report preparation	25%	$13,750	$13,750
Erin Britton	Data Analyst	Assistance with statistical programming of Medicaid claims data	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$10,371
Total Direct Costs					$43,733
F&A 10%					$4,373
Total Costs - Task 3					**$48,106**
Task 4: Using MODRN to compare SUD access and treatment in Virginia to other states					
Dr. Andrew Barnes	Co-Principal Investigator	Oversee and lead qualitative data collection, production of report	5%	$7,925	$7,925
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports	15%	$8,250	$8,250
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$6,486
Total Direct Costs					$22,661
F&A 10%					$2,266
Total Costs - Task 4					**$24,927**
Task 5: Assess combined impact of ARTS and Medicaid expansionon supply of treatment providers					
Dr. Peter Cunningham	Principal Investigator	Oversees project design and analysis	4.4%	$10,658	$10,658
Heather Saunders	Research Assistant	Leads the statistical programming for the analysis	30%	$9,000	$9,000
Lauren Guerra	Research Assistant	Assists with the analysis and preparation of tables for reports	15%	$6,150	$6,150
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$7,514
Total Direct Costs					$33,322
F&A 10%					$3,332
Total Costs - Task 5					**$36,654**
TOTAL FOR ARTS					**$169,930**

FY2024 Budget for Addiction and Recovery Treatment Services Evaluation

PERSONNEL	TITLE	Responsibilities	% EFFORT	PROJECT SALARY	PROJECT COST
Task 1: Analysis of ARTS Member Survey					
Dr. Andrew Barnes	Co-Principal Investigator	Oversee analysis	5%	$7,925	$7,925
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports	10%	$5,500	$5,500
Lauren Guerra	Research Assistant	Assistance with tables and report preparation	20%	$8,200	$8,200
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$8,672
Total Direct Costs					$30,297
F&A 10%					$3,030
Total Costs - Task 1					**$33,327**
Task 2: Analysis of episodes of care at OBOTs					
Dr. Peter Cunningham	Principal Investigator	Leads and oversees analysis	5%	$12,112	$12,112
Erin Britton	Data Analyst	Statistical analysis and programming of Medicaid claims data	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$4,857
Total Direct Costs					$24,469
F&A 10%					$2,447
Total Costs - Task 2					**$26,916**
Task 3: Update analysis of claims data for trends in SUD prevalence and untilization					
Dr. Peter Cunningham	Principal Investigator	Oversee analysis and preparation of reports	5%	$12,112	$12,112
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports, and assistance with report preparation	25%	$13,750	$13,750
Erin Britton	Data Analyst	Assistance with statistical programming of Medicaid claims data	25%	$7,500	$7,500
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$10,371
Total Direct Costs					$43,733
F&A 10%					$4,373
Total Costs - Task 3					**$48,106**
Task 4: Using MODRN to compare SUD access and treatment in Virginia to other states					
Dr. Andrew Barnes	Co-Principal Investigator	Oversee and lead qualitative data collection, production of report	5%	$7,925	$7,925
Megan Mueller	Data Analyst	Statistical programming, preparation of tables for reports	15%	$8,250	$8,250
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$6,486
Total Direct Costs					$22,661
F&A 10%					$2,266
Total Costs - Task 4					**$24,927**
Task 5: Assess combined impact of ARTS and Medicaid expansionon supply of treatment providers					
Dr. Peter Cunningham	Principal Investigator	Oversees project design and analysis	4.4%	$10,658	$10,658
Heather Saunders	Research Assistant	Leads the statistical programming for the analysis	30%	$9,000	$9,000
Lauren Guerra	Research Assistant	Assists with the analysis and preparation of tables for reports	15%	$6,150	$6,150
Fringe Benefits		40.1% for FT faculty and staff; 8.6% for PT			$7,514
Total Direct Costs					$33,322
F&A 10%					$3,332
Total Costs - Task 5					**$36,654**
TOTAL FOR ARTS					**$169,930**