SUPPLEMENTARY MATERIAL

Additional Information on Outcome Assessment:

Receipt of medication-assisted treatment (MAT) was defined as having an active prescription for a buprenorphine product indicated for opioid use disorder (OUD) treatment on a given day. Buprenorphine products indicated for pain treatment were not included. We also included any mention of Current Procedural Terminology (CPT) code H0020 for methadone treatment on a given day.

Overdose, was defined using the following International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes 960-979 or E-codes: E850-E858, E950.0-E950.5, E962.0, E980.0-E980.5. This definition was developed through a CDC-funded surveillance quality improvement initiative to improve injury surveillance for outcomes, such as overdoses. While this broad definition will include some overdoses that are not prescription opioid-related, research suggests that: [1] specific types of drugs involved in overdose events are often not recorded (and many of them are likely opioid-related) and [2] high-risk substance use often does not occur in isolation, so it is plausible that the program might impact a broader range of substance use behaviors and subsequent overdoses. The broader definition accounts for these issues. However, we also conducted sensitivity analyses with a narrower opioid-specific definition (Table S1). Finally, overdose-related claims occurring within 3 days of each other were assumed to refer to the same overdose event and counted only once in analyses.

Sensitivity analyses using the alternate, narrower definition of overdose resulted in inferences that were similar to our primary analyses. Point estimates suggested an elevated risk during lock-in and following release, compared to the pre-LIP eligibility period, and similar risks compared to post-LIP eligibility period; however, confidence intervals were wider, as fewer events were captured under this alternate definition.

TABLE S1. Average adjusted* daily risks and risk ratios of overdose, using narrower opioid-specific definition**, comparing "lock-in" program-related periods, July 2009-June 2013 (n=17,823)

		Reference period: pre-LIP eligibility period	Reference period: post-LIP eligibility period
Program-related period	Model-estimated daily risk per 1,000 pop (95% CI)^	Risk ratio (95% CI)	Risk ratio (95% CI)
Pre-LIP eligibility	0.03 (0.02, 0.05)	Ref	
Post-LIP eligibility	0.08 (0.05, 0.12)	6.01 (0.89, 40.43)	Ref
Lock-in	0.06 (0.05, 0.09)	5.60 (1.13, 27.82)	0.93 (0.58, 1.51)
Release	0.09 (0.05, 0.15)	9.64 (0.98, 94.85)	1.60 (0.80, 3.21)

CI=confidence interval; LIP="lock-in" program

*Inverse probability of enrollment weighted and adjusted for secular trend

** Definition: any mention of ICD-9-CM codes 965.00-965.09, E850.0-E850.2

^ Estimated from adjusted log-binomial GEE model, using median value of secular trend for each period

Propensity Score Methods:

We constructed propensity scores estimating the probability of LIP enrollment conditional on baseline covariates using logistic regression. Covariates included demographic characteristics, health care utilization, and medical diagnoses, including substance use-related characteristics. Demographic characteristics were assessed at the time of meeting LIP eligibility and included age, sex, race, urbanicity of county of residence, drug overdose death rate in county of residence, opioid prescribing rate in county of residence, Medicaid aid category, and Medicaid class code. Overall health care utilization and medical diagnoses were assessed using a 1 year lookback period from the date of meeting LIP eligibility. Variables included numbers of medical claims, emergency department visits, inpatient admissions, unique pharmacies visited, prescription claims, opioid prescriptions obtained during the period of first meeting LIP eligibility, and unique therapeutic classes from which prescriptions were obtained. Substance use-related covariates were also assessed and included history of alcohol or other substance use-related disorders, MAT, and overdose. Finally, we assessed history of specific pain-related diagnoses (e.g., arthritis, back), mental health-related diagnoses (e.g., depression, anxiety), and other co-morbidities (i.e., cancer, HIV, and Charlson comorbidity index).

Specific information on claims-related codes used to define characteristics have been previously described (see reference #18 in paper) and are also described below (Table S2), as is a figure displaying the propensity score distribution for LIP-enrolled and not enrolled groups (Figure S1). Covariate balance between LIP-enrolled and not enrolled groups before and after applying inverse probability of enrollment weights (constructed from the propensity scores) is displayed in Table S3.

TABLE S2. Claims related codes and details on covariates included in propensity score models

DEMOGRAPHICS	
Age	Measured in years at time of meeting "lock-in" program (LIP) eligibility. Categorized as 18-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, and 60-64 years.
Sex	Man or woman. Measured at time of meeting LIP eligibility.
Race	White, black, other, or unreported. "Other" included Asian, Hispanic, American Indian, Pacific Islander or Native, among others. Measured at time of meeting LIP eligibility.
Urbanicity of county of residence	The U.S. Department of Agriculture's 2013 rural-urban continuum codes were used to classify counties according to urbanicity. This classification system assigns categories to metropolitan counties based on their population size and assigns categories to nonmetropolitan counties based on their degree of urbanization and how close they are to a metropolitan area; there are nine categories. These nine categories were collapsed to four in our analysis: 1) counties in metropolitan areas of greater than or equal to 1 million people; 2) counties in metropolitan areas of less than 1 million people; 3) non-metropolitan, urban counties with a population of greater than or equal to 20,000 people; and 4) non-metropolitan, urban counties with a population of less than 20,000 people or rural counties. For more information, see: https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/. County of residence was measured at time of meeting LIP eligibility.
Overdose death rate in county of residence	County overdose death rates were obtained from the NC Division of Public Health. Death rates were averaged over the period of 2008 through 2013 and counties were grouped into quintiles according to their average rate. Death rates were reported as per 100,000 population per year. County of residence was measured at time of meeting LIP eligibility.
Opioid prescribing rate in county of residence	County opioid prescribing rate data were obtained from the Centers for Disease Control and Prevention. We obtained data for 2010 and counties were grouped into quintiles according to their prescribing rate. Prescribing rates were reported as prescriptions per 100 population per year. Additional data on prescribing rates can be found at: https://www.cdc.gov/drugoverdose/maps/rxrate-maps.html. County of residence was measured at time of meeting LIP eligibility.
Medicaid aid/ eligibility category	Medicaid eligibility categories provide information on criteria met to qualify for Medicaid benefits. Medicaid benefits are available to NC residents who are pregnant and have household incomes up to 196% of the federal poverty level; parents who have dependent children and have a household income up to 45% of the federal poverty level (e.g., for a family of three, income cannot exceed $667/month); blind persons; and persons under the age of 65 years who are unable to work due to a severe disability that is expected to last at least 12 months. In our analysis, categories were collapsed and defined as: 1) aid to families with dependent children; 2) aid to disabled; and 3) aid for other

	reasons (e.g., blind, pregnant women). For more information, see: https://dma.ncdhhs.gov/medicaid/get-started/eligibility-for-medicaid-or-health-choice. Measured at time of meeting LIP eligibility.
Medicaid class code	Provides further information on Medicaid qualification. Most Medicaid beneficiaries qualify for Medicaid under a "categorically needy" class code, indicating that certain income requirements were met as determined by the specific aid category (e.g., families with dependent children, disabled). However, other routes through which individuals may qualify include a "medically needy" classification in which a person may have not satisfied financial eligibility requirements (i.e., their income was too high) but significant medical expenses reduced their income below a certain level that then qualified them as "medically needy." Measured at time of meeting LIP eligibility.
HEALTH CARE UTILIZATION	
MEDICAL CARE UTILIZATION	
Medical claims	Count of all medical claims in the previous year. Measured using a one-year lookback period from time of meeting LIP eligibility.
Emergency department visits	Claims with the following revenue center codes RC450, RC451, RC456, RC459, RC981 or CPT codes 99281-99285 were flagged as emergency department-related. Multiple claims with the same header start date, header end date, and/or service date for a given beneficiary were counted only once to obtain a total number of *unique* emergency department visits (i.e., to avoid double-counting visits). Measured using a one-year lookback period from time of meeting LIP eligibility.
Inpatient admissions	Unique inpatient admissions were summed across the year prior to meeting LIP eligibility. Claims with a place of service code= "inpatient" were counted. Multiple claims with the same header start date, header end date, and/or service date for a given beneficiary were counted once only to obtain a total number of inpatient admissions (i.e., to avoid double-counting).
PHARMACY UTILIZATION	
Unique pharmacies visited	Includes all unique pharmacies that a beneficiary visited to obtain Medicaid-reimbursed prescriptions in the year prior to meeting LIP eligibility.
Prescription claims	Count of all prescription claims in the previous year. Measured using a one-year lookback period from time of meeting LIP eligibility.
Opioid prescriptions when LIP criteria met	Count of number of opioid prescriptions dispensed during period in which LIP criteria was first met.
Number of unique therapeutic classes of dispensed prescriptions	Count of number of unique therapeutic classes of drugs obtained in the previous year. Measured using a one-year lookback period from time of meeting LIP eligibility. The First Data Bank's

	therapeutic classes group drugs together with similar pharmacologic, therapeutic, and/or chemical characteristics.
MEDICATION-ASSISTED TREATMENT	
Methadone treatment	Any mention of Current Procedural Terminology (CPT) code H0020, "Alcohol and/or drug services; methadone administration and/or service (provision of the drug by a licensed program)." Measured using a one-year lookback period from time of meeting LIP eligibility.
Buprenorphine prescription dispensed	Any prescription claim for a buprenorphine product indicated for use of opioid use disorder treatment (e.g., Butrans, which is indicated for pain treatment, was not included). Measured using a one-year lookback period from time of meeting LIP eligibility.
MEDICAL DIAGNOSES	
PAIN-RELATED DIAGNOSES	
Any joint pain of arthritis	Required any mention of specific ICD-9-CM diagnosis codes: >=710 and <720 or >=725 and <740. See: Sullivan MD, Edlund MJ, Fan M-Y, et al. Trends in use of opioids for non-cancer pain conditions 2000-2005 in Commercial and Medicaid insurance plans: The TROUP study. *Pain* 2008;138:440-449 for additional details. Measured using a one-year lookback period from time of meeting LIP eligibility.
Back pain	Required any mention of specific ICD-9-CM diagnosis codes: 721.3x–721.9x, 722.2x, 722.30, 722.70, 722.80, 722.90, 722.32, 722.72, 722.82, 722.92, 722.33, 722.73, 722.83, 722.93, 724.xx, 737.1, 737.3, 738.4, 738.5, 739.2, 739.3, 739.4, 756.10, 756.11, 756.12, 756. 13, 756.19, 805.4, 805.8, 839.2, 839.42, 846, 846.0, 847.1, 847.3, 847.2, 847.9. See: Sullivan MD, Edlund MJ, Fan M-Y, et al. Trends in use of opioids for non-cancer pain conditions 2000-2005 in Commercial and Medicaid insurance plans: The TROUP study. *Pain* 2008;138:440-449 for additional details. Measured using a one-year lookback period from time of meeting LIP eligibility.
Neck pain	Required any mention of specific ICD-9-CM diagnosis codes: 721.0X, 721.1X, 722.0X, 722.31, 722.71, 722.81, 722.91, 723.XX, 839.0, 839.1, 847.0. See: Sullivan MD, Edlund MJ, Fan M-Y, et al. Trends in use of opioids for non-cancer pain conditions 2000-2005 in Commercial and Medicaid insurance plans: The TROUP study. *Pain* 2008;138:440-449 for additional details. Measured using a one-year lookback period from time of meeting LIP eligibility.
Headache/migraine pain	Required any mention of specific ICD-9-CM diagnosis codes: >=346 and <347, or 307.81. See: Sullivan MD, Edlund MJ, Fan M-Y, et al. Trends in use of opioids for non-cancer pain conditions 2000-2005 in Commercial and Medicaid insurance plans: The TROUP study. *Pain* 2008;138:440-449 for additional details. Measured using a one-year lookback period from time of meeting LIP eligibility.

Fibromyalgia, chronic pain, or fatigue	Centers for Medicare & Medicaid Services' (CMS) Chronic Conditions Data Warehouse (CCW) definition used. Definition required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes appearing more than once over a time span exceeding 30 days. Specific codes included: 338.2, 338.21, 338.22, 338.23, 338.29, 338.3, 338.4, 780.7, 780.71, 729.1, 729.2. For more information, see: https://www.ccwdata.org/web/guest/condition-categories. Measured using a one-year lookback period from time of meeting LIP eligibility.
Rheumatoid arthritis or osteoarthritis	Used CMS CCW definition with slight modification. Required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes appearing more than once over a time span exceeding 30 days. Specific codes included: 714.0, 714.1, 714.2, 714.30, 714.31, 714.32, 714.33, 715.00, 715.04, 715.09, 715.10, 715.11, 715.12, 715.13, 715.14, 715.15, 715.16, 715.17, 715.18, 715.20, 715.21, 715.22, 715.23, 715.24, 715.25, 715.26, 715.27, 715.28, 715.30, 715.31, 715.32, 715.33, 715.34, 715.35, 715.36, 715.37, 715.38, 715.80, 715.89, 715.90, 715.91, 715.92, 715.93, 715.94, 715.95, 715.96, 715.97, 715.98, 720.0, 721.0, 721.1, 721.2, 721.3, 721.90, 721.91. For more information, see: https://www.ccwdata.org/web/guest/condition-categories. Measured using a one-year lookback period from time of meeting LIP eligibility.
Sickle cell	Used definition consistent with AHRQ's CCS and the previous research (see: Reeves S, Garcia E, Kleyn M, et al. Identifying sickle cell disease cases using administrative claims. *Academic Pediatrics* 2014;14(5 Suppl):S61-67.). Required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes that appear more than once over a time span exceeding 30 days. Specific codes included: 28241 28242 28260 28261 28262 28263 28264 28268 28269. Measured using a one-year lookback period from time of meeting LIP eligibility.
MENTAL HEALTH-RELATED DIAGNOSES	
Depression	Used CMS CCW definition. Required at least 1 inpatient, skilled nursing facility, home health agency, hospital outpatient, or service/carrier claims with specific ICD-9-CM diagnosis codes. Specific codes included: 296.20, 296.21, 296.22, 296.23, 296.24, 296.25, 296.26, 296.30, 296.31, 296.32, 296.33, 296.34, 296.35, 296.36, 300.4, 311, V79.0. For more information, see "Original CCW Chronic Condition Algorithms" found at: https://www.ccwdata.org/web/guest/condition-categories. Measured using a one-year lookback period from time of meeting LIP eligibility.
Bipolar disorder	Used CMS CCW definitions. Required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes appearing more than once over a time span exceeding 30 days. Specific codes included: 296.00, 296.01, 296.02, 296.03, 296.04, 296.05, 296.06, 296.10, 296.11, 296.12, 296.13, 296.14, 296.15, 296.16, 296.40, 296.41, 296.42, 296.43, 296.44, 296.45, 296.46, 296.50, 296.51, 296.52, 296.53, 296.54, 296.55, 296.56, 296.60, 296.61, 296.62, 296.63, 296.64, 296.65,

	296.66, 296.7, 296.80, 296.81, 296.82, 296.89, 296.90, 296.99. For more information, see: https://www.ccwdata.org/web/guest/condition-categories. Measured using a one-year lookback period from time meeting of LIP eligibility.
Personality disorder	Used CMS CCW definitions. Required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes appearing more than once over a time span exceeding 30 days. Specific codes included: 301.0, 301.10, 301.11, 301.12, 301.13, 301.20, 301.21, 301.22, 301.3, 301.4, 301.50, 301.51, 301.59, 301.6, 301.7, 301.81, 301.82, 301.83, 301.84, 301.89, 301.9. For more information, see: https://www.ccwdata.org/web/guest/condition-categories. Measured using a one-year lookback period from time meeting of LIP eligibility.
Schizophrenia and other psychotic disorders	Used CMS CCW definitions. Required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes appearing more than once over a time span exceeding 30 days. Specific codes included: 293.81, 293.82, 295.00, 295.01, 295.02, 295.03, 295.04, 295.05, 295.10, 295.11, 295.12, 295.13, 295.14, 295.15, 295.20, 295.21, 295.22, 295.23, 295.24, 295.25, 295.30, 295.31, 295.32, 295.33, 295.34, 295.35, 295.40, 295.41, 295.42, 295.43, 295.44, 295.45, 295.50, 295.51, 295.52, 295.53, 295.54, 295.55, 295.60, 295.61, 295.62, 295.63, 295.64, 295.65, 295.70, 295.71, 295.72, 295.73, 295.74, 295.75, 295.80, 295.81, 295.82, 295.83, 295.84, 295.85, 295.90, 295.91, 295.92, 295.93, 295.94, 295.95, 297.0, 297.1, 297.2, 297.3, 297.8, 297.9, 298.0, 298.1, 298.2, 298.3, 298.4, 298.8, 298.9. For more information, see: https://www.ccwdata.org/web/guest/condition-categories. Measured using a one-year lookback period from time meeting of LIP eligibility.
Anxiety disorder	Used CMS CCW definition. Required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes appearing more than once over a time span exceeding 30 days. Specific codes included: 293.84, 300.00, 300.01, 300.02, 300.09, 300.10, 300.20, 300.21, 300.22, 300.23, 300.29, 300.3, 300.5, 300.89, 300.9, 308.0, 308.1, 308.2, 308.3, 308.4, 308.9, 309.81, 313.0, 313.1, 313.21, 313.22, 313.3, 313.82, 313.83. For more information, see: https://www.ccwdata.org/web/guest/condition-categories. Measured using a one-year lookback period from time meeting of LIP eligibility.
Post-traumatic stress disorder	Used CMS CCW definitions. Required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes appearing more than once over a time span exceeding 30 days. The specific code included was 309.81. For more information, see: https://www.ccwdata.org/web/guest/condition-categories. Measured using a one-year lookback period from time meeting of LIP eligibility.
SUBSTANCE USE-RELATED DIAGNOSES	

Any overdose	Used ICD-9-CM definition for medication and drug-related overdoses developed by the NC Division of Public Health, in collaboration with the University of North Carolina's Injury Prevention Research Center, through a Centers for Disease Control and Prevention-funded surveillance quality improvement initiative to improve injury surveillance for outcomes, such as overdoses. Definitions were developed using existing state and national organization definitions; advice from content experts in injury epidemiology, surveillance methods, and public health informatics; and end user feedback. Definition included any mention of the following ICD-9-CM diagnosis codes 960-979 or e-codes E850-E858, E950.0-E950.5, E962.0, E980.0-E980.5. For more information, see: http://www.injuryfreenc.ncdhhs.gov/DataSurveillance/Poisoning.htm. Measured using a one-year lookback period from time of LIP eligibility.
Alcohol-related disorder	Used Agency for Healthcare Research and Quality's (AHRQ) Clinical Classification Software (CCS) definition. Required at least 1 inpatient or 2 non-inpatient claims with specific International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes that appear more than once over a time span exceeding 30 days. Specific codes included: 291.0, 291.1, 291.2, 291.3, 291.4, 291.5, 291.8, 291.81, 291.82, 291.89, 291.9, 303.00, 303.01, 303.02, 303.03, 303.90, 303.91, 303.92, 303.93, 305.00, 305.01, 305.02, 305.03, 357.5, 425.5, 535.3, 535.30, 535.31, 571.0, 571.1, 571.2, 571.3, 760.71, 980.0. For more information, see: https://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Measured using a one-year lookback period from time of meeting LIP eligibility.
Other substance-related disorder	Used AHRQ's CCS definition. Required at least 1 inpatient or 2 non-inpatient claims with specific ICD-9-CM diagnosis codes that appear more than once over a time span exceeding 30 days. Specific codes included: 292.0, 292.11, 292.12, 292.2, 292.81, 292.82, 292.83, 292.84, 292.85, 292.89, 292.9, 304.00, 304.01, 304.02, 304.03, 304.10, 304.11, 304.12, 304.13, 304.20, 304.21, 304.22, 304.23, 304.30, 304.31, 304.32, 304.33, 304.40, 304.41, 304.42, 304.43, 304.50, 304.51, 304.52, 304.53, 304.60, 304.61, 304.62, 304.63, 304.70, 304.71, 304.72, 304.73, 304.80, 304.81, 304.82, 304.83, 304.90, 304.91, 304.92, 304.93, 305.20, 305.21, 305.22, 305.23, 305.30, 305.31, 305.32, 305.33, 305.40, 305.41, 305.42, 305.43, 305.50, 305.51, 305.52, 305.53, 305.60, 305.61, 305.62, 305.63, 305.70, 305.71, 305.72, 305.73, 305.80, 305.81, 305.82, 305.83, 305.90, 305.91, 305.92, 305.93, 648.30, 648.31, 648.32, 648.33, 648.34, 655.50, 655.51, 655.53, 760.72, 760.73, 760.75, 779.5, 965.00, 965.01, 965.02, 965.09, V65.42. For more information, see: https://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Measured using a one-year lookback period from time of meeting LIP eligibility.
OTHER COMORBID CONDITIONS	

Mean Charlson comorbidity index	The Charlson Comorbidity Index (CCI) is a method of categorizing comorbidities based on ICD codes. Each comorbidity is associated with a weight (from 1 to 6), and weights are based on the adjusted risk of mortality or resource use. CCI scores are calculated by summing an individual's weights; a score of zero indicates no comorbidities were detected. We used Quan's enhanced CCI macro which looks at 17 comorbidities. An individual comorbidity was considered present if there was at least 1 inpatient or 2 non-inpatient claims with the specific ICD-9-CM diagnosis codes that appeared more than once over a time span exceeding 30 days. Additional details on the index and specific comorbidities included can be found in: Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Medical Care* 2005;43(11):1130-1139.
Cancer	Used cancer definition from: Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Medical Care* 2005;43(11):1130-1139. Captured any malignancy, including lymphoma and leukemia, except for malignant neoplasms of the skin. Measured using a one-year lookback period from time of meeting LIP eligibility.
HIV	Used HIV definition from: Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Medical Care* 2005;43(11):1130-1139. Specific codes for HIV included: 042-044. Measured using a one-year lookback period from time of meeting LIP eligibility.

AHRQ= Agency for Healthcare Research and Quality; CCI= Charlson Comorbidity Index; CCS= Clinical Classification Software; CCW= Chronic Conditions Data Warehouse; CMS= Centers for Medicare & Medicaid Services; CPT= Current Procedural Terminology; CSRS= Controlled Substances Reporting System; ICD-9-CM= International Classification of Diseases, Ninth Revision, Clinical Modification; LIP= "Lock-in" program; NC= North Carolina

FIGURE S1. Propensity scores by “lock-in” program enrollment status

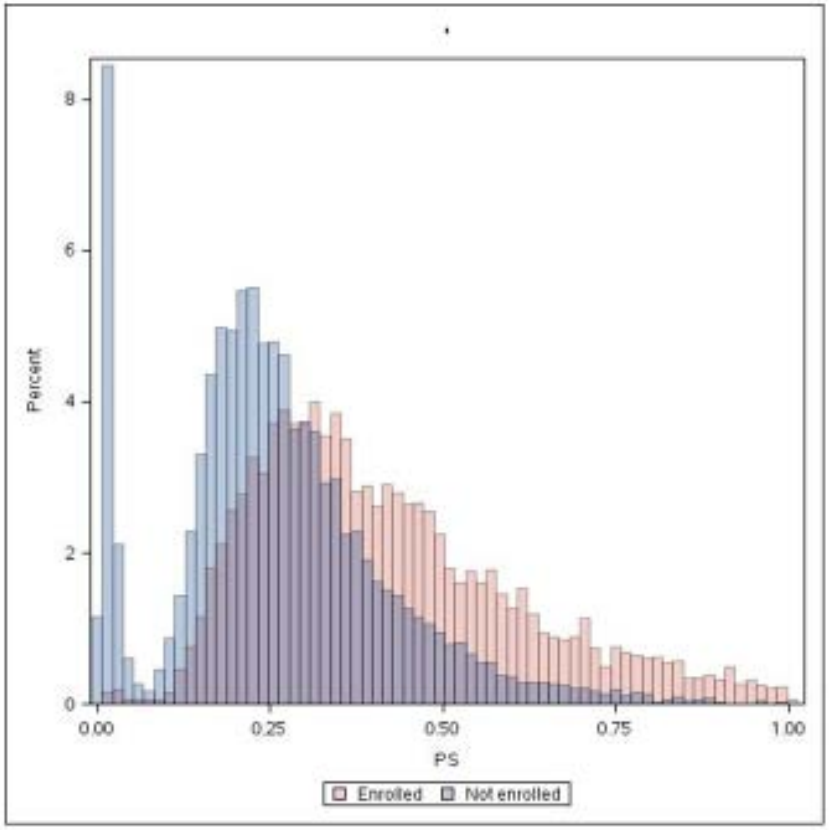

TABLE S3. Covariate balance by North Carolina Medicaid "lock-in" program enrollment status in overall and inverse probability of enrollment weighted populations

	Overall, unweighted (n=17,823)			Inverse probability of enrollment weighted (n=34,162*)		
	Enrolled (n= 5,479)	Not enrolled (n= 12,344)		Enrolled (n= 16,529*)	Not enrolled (n= 17,633*)	
	% or mean (SD)		Std. Diff	% or mean (SD)		Std. Diff
Demographics[†]						
Age group (years)			0.319			0.048
18-24	11.0	9.3		9.9	9.7	
25-29	16.8	12.4		15.0	15.0	
30-34	18.1	14.3		16.1	15.2	
35-39	15.4	13.3		14.0	14.1	
40-44	13.3	12.3		12.9	12.6	
45-49	10.4	12.2		11.4	11.5	
50-54	8.2	12.4		10.5	10.7	
55-59	4.8	9.0		6.4	7.4	
60-64	2.0	4.8		3.8	3.7	
Women	69.3	64.2	0.108	66.4	66.4	-0.001
Race			0.070			0.055
White	76.5	74.9		78.4	76.1	
Black	17.9	19.9		18.8	20.7	
Other (e.g., Asian, Pacific Islander)	3.4	2.6		2.8	3.2	
Unreported	2.2	2.6		-	-	
Urbanicity of county of residence			0.070			0.025
Metro areas of ≥ 1 million pop.	25.7	23.1		23.8	23.9	
Metro areas of < 1 million pop.	45.4	45.6		46.0	44.9	

Nonmetro, urban pop. of ≥ 20,000	16.4	17.7		17.8	18.5	
Nonmetro, urban pop. of <20,000 or rural	12.5	13.7		12.4	12.7	
Overdose death rate in county of residence (deaths per 100,000 person-years)			0.095			0.010
20.0-32.2	19.1	20.3		21.0	21.1	
15.0-19.9	22.7	25.7		24.7	24.8	
11.1-14.9	23.1	20.8		22.2	21.7	
8.7-11.0	21.0	20.8		20.1	20.2	
2.6-8.6	14.1	12.4		12.1	12.2	
Opioid prescribing rate in county of residence (prescriptions per 100 person-years)			0.051			0.045
>122	23.6	25.6		26.5	25.1	
106-122	17.5	17.2		17.4	17.6	
90-105	25.3	25.3		25.2	25.1	
70-89	15.3	14.6		14.5	14.4	
<70	17.4	16.5		16.3	17.7	
Unknown	0.9	0.9		-	-	
Medicaid aid category code			0.190			0.051
Aid to families with dependent children	61.3	52.2		56.6	54.2	
Aid to disabled	35.2	44.4		39.9	42.4	
Other (e.g., aid to blind)	3.5	3.5		3.5	3.4	
Medicaid class code			0.113			0.039
Categorically needy	93.3	91.0		92.7	91.6	
Medically needy	6.7	8.5		7.0	8.0	
Other (e.g., “qualified beneficiary” with Medicare & Medicaid benefits)	0.1	0.5		0.3	0.4	
Health care utilization‡						
Medical care utilization						
No. of medical claims	148.0 (137.3)	131.8 (122.6)	0.124	138.3 (230.5)	149.4 (188.3)	-0.053

No. of emergency department visits	7.4 (9.7)	3.9 (5.1)	0.453	5.3 (12.3)	6.2 (13.5)	-0.068
No. of inpatient admissions	3.6 (9.4)	3.5 (9.2)	0.008	3.9 (17.4)	3.8 (11.8)	0.007
Pharmacy utilization						
Unique pharmacies visited	3.9 (2.5)	2.8 (1.8)	0.500	3.2 (3.8)	3.3 (3.2)	-0.036
No. of prescription claims	51.3 (44.0)	49.0 (45.5)	0.052	51.3 (84.1)	50.2 (53.4)	0.014
No. of opioid prescriptions when LIP criteria met	8.0 (1.3)	7.6 (1.0)	0.316	7.7 (2.0)	7.8 (1.5)	-0.018
No. of unique therapeutic classes of dispensed prescriptions	12.0 (7.2)	11.3 (7.1)	0.091	11.8 (13.1)	11.7 (8.5)	0.009
Medication-assisted treatment						
Any methadone treatment	1.7	0.8	0.075	1.1	1.0	0.008
Any buprenorphine^ prescription dispensed	3.1	0.9	0.157	1.6	1.5	0.008
Medical diagnoses‡						
Pain-related diagnoses						
Any joint pain or arthritis	81.5	77.0	0.111	80.0	78.8	0.030
Back pain	74.7	61.2	0.293	68.5	66.4	0.043
Neck pain	32.8	26.2	0.143	29.1	28.2	0.020
Headache/migraine	18.4	13.5	0.135	15.8	15.7	0.002
Fibromyalgia, chronic pain, or fatigue	36.7	29.5	0.152	33.1	33.5	-0.008
Rheumatoid arthritis or osteoarthritis	17.2	15.9	0.034	17.6	16.1	0.040
Sickle cell	1.5	0.8	0.069	0.9	2.0	-0.088
Mental health diagnoses						
Depression	49.3	40.5	0.178	45.9	44.8	0.023
Bipolar disorder	15.4	10.4	0.151	12.9	13.3	-0.013
Personality disorder	2.8	1.3	0.109	2.1	1.8	0.022
Schizophrenia and other psychotic disorders	2.7	2.2	0.029	2.4	2.8	-0.021
Anxiety disorder	31.4	21.3	0.232	26.3	26.1	0.005
Post-traumatic stress disorder	5.2	3.1	0.106	3.8	3.7	0.006
Substance use-related diagnoses						
Any overdose	5.0	3.0	0.105	3.8	3.9	-0.003

Alcohol-related disorder	5.9	5.7	0.009	5.8	5.9	-0.002
Other substance-related disorder	20.6	12.0	0.234	15.9	16.3	-0.010
Other comorbid conditions						
Mean Charlson co-morbidity index	0.7 (1.4)	1.5 (2.7)	-0.358	1.1 (3.6)	1.2 (2.9)	-0.059
Cancer	0.6	12.9	-0.504	6.3	8.9	-0.097
HIV	1.0	1.1	-0.006	1.0	1.1	-0.014

LIP= “lock-in” program; SD=standard deviation; Std. diff= standardized difference

*Synthetic n values derived from weights

† Assessed at time of meeting LIP eligibility

‡ Assessed using a one-year look-back period from point of meeting LIP eligibility

^ Buprenorphine prescription indicated for treatment of substance use disorder

Key results from Table S3 regarding covariate balance:

Prior to weighting, LIP-enrolled beneficiaries tended to be younger (e.g., 46% ages 18-34 years vs. 36%), more often female (69% vs. 64%), less often received Medicaid benefits due to a disability (35% vs. 44%), had more ED visits (mean: 7.4 vs. 3.9) and visited more unique pharmacies (mean: 3.9 vs. 2.8) in the year prior to meeting LIP eligibility (see Table 2 in manuscript). LIP-enrolled beneficiaries also tended to have a higher prevalence of pain, mental health, and substance use-related diagnoses in the year prior to meeting LIP eligibility, including a higher prevalence of substance-related disorder diagnoses (20.6% vs. 12.0%). Finally, those enrolled had a lower mean co-morbidity index (0.7 vs. 1.5) and a lower prevalence of cancer diagnoses (0.6% vs. 12.9%). After applying inverse probability of enrollment weights, all covariates were balanced (standardized differences <0.10 for all) between the LIP-enrolled and not enrolled groups. We included stabilized inverse probability of LIP enrollment weights (calculated using the propensity scores described above) in models.

Summary figure of key study findings:

FIGURE S2. Daily risks of overdose and medication-assisted treatment per 1,000 population by program-related period