

## Supplementary Online Content

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**eTable 1.** State-Level Differences in Opioid Overdose Mortality, Medicaid Expansion, and MOUD Prescribing Restrictions for Medicaid Reimbursement

**eTable 2.** Characteristics of Residential Treatment Facilities Offering Extended-Release Naltrexone

**eTable 3.** Characteristics of Residential Treatment Facilities Offering Buprenorphine

**eTable 4.** Unadjusted Predicted Probabilities for Residential Facility Models

**eTable 5.** Adjusted Predicted Probabilities for Residential Facility Models

**eTable 6.** Unadjusted and Adjusted Predicted Probabilities for Treatment Admissions Models

This supplementary material has been provided by the authors to give readers additional information about their work.

**eTable 1. State-Level Differences in Opioid Overdose Mortality, Medicaid Expansion, and MOUD Prescribing Restrictions for Medicaid Reimbursement**

State	Abbreviation	Geographic Census Region (Division)	Opioid Overdose Death Rate per 100,000 People (KFF)	Opioid Overdose Death Rate per 100,000 People (NIH Standards)	States Expanding Medicaid (1=yes, 0=no)	Any Medicaid Prescribing Restriction (1=yes, 0=no)
Alabama	AL	East South Central	9.0	NI	0	1
Alaska	AK	Pacific	13.9	13.9	1	NR
Arizona	AZ	Mountain	13.5	13.5	1	0
Arkansas	AR	West South Central	6.5	NI	1	NR
California	CA	Pacific	5.3	5.3	1	0
Colorado	CO	Mountain	10.0	10.0	1	0
Connecticut	CT	New England	27.7	27.7	1	1
Delaware	DE	South Atlantic	27.8	NI	1	1
Florida	FL	South Atlantic	16.3	NI	0	1
Georgia	GA	South Atlantic	9.7	9.7	0	0
Hawaii	HI	Pacific	3.4	3.4	1	0
Idaho	ID	Mountain	6.2	NI	0	NR
Illinois	IL	East North Central	17.2	17.2	1	NR
Indiana	IN	East North Central	18.8	NI	1	1
Iowa	IA	West North central	6.9	6.9	1	NR
Kansas	KS	West North central	5.1	NI	0	0
Kentucky	KY	East South Central	27.9	27.9	1	1
Louisiana	LA	West South Central	9.3	NI	1	0
Maine	ME	New England	29.9	29.9	1	1
Maryland	MD	South Atlantic	32.2	32.2	1	0
Massachusetts	MA	New England	28.2	28.2	1	0
Michigan	MI	East North Central	21.2	21.2	1	0
Minnesota	MN	West North central	7.8	7.8	1	NR
Mississippi	MS	East South Central	6.4	NI	0	1

Missouri	MO	West North central	16.5	16.5	0	0
Montana	MT	Mountain	3.6	NI	1	0
Nebraska	NE	West North central	3.1	NI	0	0
Nevada	NV	Mountain	13.3	13.3	1	0
New Hampshire	NH	New England	34.0	34.0	1	1
New Jersey	NJ	Middle Atlantic	22.0	NI	1	0
New Mexico	NM	Mountain	16.7	16.7	1	0
New York	NY	Middle Atlantic	16.1	16.1	1	NR
North Carolina	NC	South Atlantic	19.8	19.8	0	NR
North Dakota	ND	West North central	4.8	NI	1	0
Ohio	OH	East North Central	39.2	39.2	1	1
Oklahoma	OK	West South Central	10.2	10.2	0	1
Oregon	OR	Pacific	8.1	8.1	1	0
Pennsylvania	PA	Middle Atlantic	21.2	NI	1	1
Rhode Island	RI	New England	26.9	26.9	1	0
South Carolina	SC	South Atlantic	15.5	15.5	0	NR
South Dakota	SD	West North central	4	NI	0	NR
Tennessee	TN	East South Central	19.3	19.3	0	NR
Texas	TX	West South Central	5.1	5.1	0	1
Utah	UT	Mountain	15.5	15.5	0	1
Vermont	VT	New England	20	20.0	1	0
Virginia	VA	South Atlantic	14.8	14.8	1	0
Washington	WA	Pacific	9.6	9.6	1	1
Washington D.C.	DC	South Atlantic	34.7	34.7	1	0
West Virginia	WV	South Atlantic	49.6	49.6	1	0
Wisconsin	WI	East North Central	16.9	16.9	0	1
Wyoming	WY	Mountain	8.7	NI	0	1

KFF= Kaiser Family Foundation; NIH = National Institutes of Health; NI = not included; NR = not reported; MOUD = medications for opioid use disorder.

<b>eTable 2. Characteristics of Residential Treatment Facilities Offering Extended-Release Naltrexone</b>						
	<u>Descriptive Statistics</u>		<u>Unadjusted Analyses</u>		<u>Multivariable Analyses</u>	
<b>Residential Facility Characteristics</b>	All Residential Facilities n (%)	Offering XR-NTX n (%) <sup>a</sup>	OR	95% CI	AOR	95% CI
<b>Among All Facilities</b>	2,095 (100)	592 (28.3)				
<b><u>Other Pharmacotherapies</u></b>						
Methadone	39 (1.9)	28 (71.8)	<b>6.73***</b>	3.33 - 13.62	<b>3.38**</b>	1.43 - 8.00
Buprenorphine	661 (31.6)	461 (69.7)	<b>22.93***</b>	17.95 - 29.28	<b>10.55***</b>	8.02 - 13.88
XR-NTX	NA	NA	NA	NA	NA	NA
Psychiatric medications	1,038 (49.5)	525 (50.6)	<b>15.12***</b>	11.48 - 19.92	<b>5.45***</b>	3.96 - 7.51
<b><u>Accepted Payment</u></b>						
Cash/self-pay	1,786 (85.3)	541 (30.3)	<b>2.20***</b>	1.6 - 3.02	1.21	0.73 - 1.98
Medicare	313 (14.9)	84 (26.8)	0.92	0.70 - 1.21	0.87	0.59 - 1.28
Medicaid	967 (46.2)	294 (30.4)	<b>1.22*</b>	1.01 - 1.47	1.19	0.85 - 1.66
State-financed insurance	736 (35.1)	230 (31.3)	<b>1.25*</b>	1.03 - 1.52	<b>0.63**</b>	0.45 - 0.87
Federal military insurance	359 (17.1)	130 (36.2)	<b>1.57***</b>	1.23 - 1.99	0.96	0.67 - 1.36
Private insurance	1,196 (57.1)	466 (39.0)	<b>3.92***</b>	3.14 - 4.89	1.34	0.88 - 2.04
IHS/638 contract	323 (15.4)	100 (31.0)	1.17	0.90 - 1.51	1.03	0.72 - 1.48
Cash-only facility	342 (16.3)	32 (9.4)	<b>0.22***</b>	0.15 - 0.32	0.78	0.42 - 1.46
<b><u>License/Accreditation</u></b>						
Hospital or State authority	1,914 (91.4)	563 (29.4)	<b>2.18***</b>	1.45 - 3.29	1.29	0.73 - 2.28
JCAHO/CARF/NCQA/COA/HFAP	1,037 (49.5)	426 (41.1)	<b>3.75***</b>	3.05 - 4.61	<b>1.84***</b>	1.39 - 2.44
<b><u>Long-term residential treatment offered (&gt;28 days)</u></b>	1,743 (83.2)	447 (25.6)	<b>0.49***</b>	0.39 - 0.62	1.12	0.81 - 1.56

Supplemental Table 1 displays the percent of facilities offering extended-release naltrexone that also offer other medications, specialty programs, the type of payments accepted, and license/accreditation (n=2,095 facilities with complete data). Unadjusted odds ratios, adjusted odds ratios, and 95% confidence intervals determined via univariate and multivariable logistic regression are presented. Note: Boldface indicates statistical significance (p<0.05) i.e. 95% confidence intervals that do not cross 1. XR-NTX = extended-release naltrexone; OR = unadjusted odds ratios; AOR = adjusted odds ratios; CI = confidence intervals; MOUD = medications for opioid use disorder; HIS/638 = Indian Health Service federal contract; JCAHO = Joint Commission of Healthcare Organizations; CARF = Commission on Accreditation of Rehabilitation Facilities; NCQA = National Committee for Quality Assurance; COA = Council on Accreditation; HFAP = Healthcare Facilities Accreditation Program.

<sup>a</sup> Percent of facilities offering No MOUD based on the number of facilities offering No MOUD divided by all facilities within each category (e.g. Offered Psychiatric Medications). Unadjusted and adjusted predicted probabilities can be found in Supplemental Tables 4 and 5.

\* p < .05; \*\* p < .01; \*\*\* p < .001

<b>eTable 3. Characteristics of Residential Treatment Facilities Offering Buprenorphine</b>						
	<u>Descriptive Statistics</u>		<u>Unadjusted Analyses</u>		<u>Multivariable Analyses</u>	
<b>Residential Facility Characteristics</b>	All Residential Facilities n (%)	Offering Buprenorphine n (%) <sup>a</sup>	OR	95% CI	AOR	95% CI
<b>Among All Facilities</b>	2,095 (100)	661 (31.6)				
<b><u>Other Pharmacotherapies</u></b>						
Methadone	39 (1.9)	29 (74.4)	<b>6.53***</b>	3.17 - 13.49	<b>4.12**</b>	1.57 - 10.83
Buprenorphine	NA	NA			NA	NA
XR-NTX	592 (28.3)	461 (77.9)	<b>22.93***</b>	17.95 - 29.28	<b>10.43***</b>	7.93 - 13.71
Psychiatric medications	1,038 (49.5)	579 (55.8)	<b>15.00***</b>	11.61 - 19.38	<b>6.08***</b>	4.50 - 8.22
<b><u>Accepted Payment</u></b>						
Cash/self-pay	1,786 (85.3)	604 (33.8)	<b>2.26***</b>	1.67 - 3.06	1.31	0.81 - 2.12
Medicare	313 (14.9)	96 (30.7)	0.95	0.73 - 1.24	0.97	0.66 - 1.42
Medicaid	967 (46.2)	315 (32.6)	1.09	0.91 - 1.31	<b>0.48***</b>	0.34 - 0.66
State-financed insurance	736 (35.1)	272 (37.0)	<b>1.46***</b>	1.21 - 1.77	1.21	0.88 - 1.67
Federal military insurance	359 (17.1)	150 (41.8)	<b>1.72***</b>	1.36 - 2.17	1.02	0.71 - 1.45
Private insurance	1,196 (57.1)	530 (44.3)	<b>4.67***</b>	3.75 - 5.80	<b>1.63*</b>	1.09 - 2.44
IHS/638 contract	323 (15.4)	113 (35.0)	1.20	0.94 - 1.54	0.91	0.63 - 1.30
Cash-only facility	342 (16.3)	31 (9.1)	<b>0.18***</b>	0.12 - 0.26	<b>0.43**</b>	0.23 - 0.79
<b><u>License/Accreditation</u></b>						
Hospital or State authority	1,914 (91.4)	630 (32.9)	<b>2.37***</b>	1.59 - 3.54	1.76	0.99 - 3.12
JCAHO/CARF/NCQA/COA/HFAP	1,037 (49.5)	457 (44.1)	<b>3.30***</b>	2.71 - 4.01	1.10	0.83 - 1.46
<b><u>Long-term residential treatment offered (&gt;28 days)</u></b>	1,743 (83.2)	480 (27.5)	<b>0.36***</b>	0.28 - 0.45	<b>0.48***</b>	0.34 - 0.66

Supplemental Table 2 displays the percent of facilities offering buprenorphine that also offer other medications, specialty programs, the type of payments accepted, and license/accreditation (n=2,095 facilities with complete data). Unadjusted odds ratios, adjusted odds ratios, and 95% confidence intervals determined via univariate and multivariable logistic regression are presented. Note: Boldface indicates statistical significance (p<0.05) i.e. 95% confidence intervals that do not cross 1. XR-NTX = extended-release naltrexone; OR = unadjusted odds ratios; AOR = adjusted odds ratios; CI = confidence intervals; MOUD = medications for opioid use disorder; HIS/638 = Indian Health Service federal contract; JCAHO = Joint Commission of Healthcare Organizations; CARF = Commission on Accreditation of Rehabilitation Facilities; NCQA = National Committee for Quality Assurance; COA = Council on Accreditation; HFAP = Healthcare Facilities Accreditation Program.

<sup>a</sup> Percent of facilities offering No MOUD based on the number of facilities offering No MOUD divided by all facilities within each category (e.g. Offered Psychiatric Medications). Unadjusted and adjusted predicted probabilities can be found in Supplemental Tables 4 and 5.

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

<b>eTable 4. Unadjusted Predicted Probabilities for Residential Facility Models</b>			
	<u>Offering No MOUD</u>	<u>Offering XR-NTX</u>	<u>Offering Buprenorphine</u>
<b>Residential Facility Characteristics</b>	Unadjusted Predicted Probability (% [95% CI]) vs. Null	Unadjusted Predicted Probability (% [95% CI]) vs. Null	Unadjusted Predicted Probability (% [95% CI]) vs. Null
<b><u>Other Pharmacotherapies</u></b>			
Methadone	NA	71.8 (55.9, 83.6) vs. 27.4	74.4 (58.6, 85.6) vs. 30.7
Buprenorphine	NA	69.7 (66.1, 73.1) vs. 9.1	NA
XR-NTX	NA	NA	77.9 (74.3, 81.0) vs. 13.3
Psychiatric medications	34.3 (31.5, 37.2) vs. 89.3	50.6 (47.5, 53.6) vs. 6.3	58.8 (52.7, 58.8) vs. 9.5
<b><u>Accepted Payment</u></b>			
Cash/self-pay	59.6 (57.3, 61.8) vs. 76.4	30.3 (28.2, 32.5) vs. 16.5	33.8 (31.7, 36.0) vs. 18.4
Medicare	62.0 (56.5, 67.2) vs. 62.1	26.8 (22.2, 32.0) vs. 28.5	30.7 (25.8, 36.0) vs. 31.7
Medicaid	58.9 (55.8, 62.0) vs. 64.7	30.4 (27.6, 33.4) vs. 26.4	32.6 (29.7, 35.6) vs. 30.7
State-financed insurance	57.5 (53.9, 61.0) vs. 64.5	31.3 (28.0, 34.7) vs. 26.6	37.0 (33.5, 40.5) vs. 28.6
Federal military insurance	52.1 (46.9, 57.2) vs. 64.1	36.2 (24.6, 28.7) vs. 26.6	41.8 (36.8, 47.0) vs. 29.4
Private insurance	48.7 (45.8, 51.5) vs. 79.9	39.0 (36.2, 41.8) vs. 14.0	44.3 (41.5, 47.1) vs. 14.6
IHS/638 contract	60.7 (55.2, 65.9) vs. 62.3	31.0 (26.2, 36.2) vs. 27.8	35.0 (30.0, 40.3) vs. 30.9
Cash-only facility	86.5 (82.5, 89.8) vs. 57.3	9.4 (6.7, 12.9) vs. 31.9	9.1 (6.4, 12.6) vs. 35.9
<b><u>License/Accreditation</u></b>			
Hospital or State authority	60.4 (58.2, 62.6) vs. 79.6	29.4 (27.4, 31.5) vs. 16.0	32.9 (30.8, 35.1) vs. 17.1
JCAHO/CARF/NCQA/COA/HFAP	47.3 (44.3, 50.4) vs. 47.3	41.1 (38.1, 44.1) vs. 15.7	44.1 (41.1, 47.1) vs. 19.3
<b><u>Long-term residential treatment offered (&gt;28 days)</u></b>			
	66.1 (63.8, 68.3) vs. 42.0	25.6 (23.6, 27.7) vs. 41.2	27.5 (25.5, 29.7) vs. 51.4
Supplemental Table 3 displays the predicted probabilities of each outcome variable according to unadjusted logistic regression equations. Displayed are predicted probabilities and 95% confidence intervals for when the indicated characteristic was present versus absent. XR-NTX = extended-release naltrexone; OR = unadjusted odds ratios; AOR = adjusted odds ratios; CI = confidence intervals; MOUD = medications for opioid use disorder; HIS/638 = Indian Health Service federal contract; JCAHO = Joint Commission of Healthcare Organizations; CARF = Commission on Accreditation of Rehabilitation Facilities; NCQA = National Committee for Quality Assurance; COA = Council on Accreditation; HFAP = Healthcare Facilities Accreditation Program			

<b>eTable 5. Adjusted Predicted Probabilities for Residential Facility Models</b>			
	<u>Offering No MOUD</u>	<u>Offering XR-NTX</u>	<u>Offering Buprenorphine</u>
<b>Residential Facility Characteristics</b>	Adjusted Predicted Probability (% [95% CI])	Adjusted Predicted Probability (% [95% CI])	Adjusted Predicted Probability (% [95% CI])
Average Model (Average for All Predictors)	69.3 (66.6, 71.9)	17.1 (14.9, 19.6)	21.5 (19.1, 24.2)
<b><u>Other Pharmacotherapies</u></b>			
Methadone	NA	24.5 (12.0, 43.6)	52.4 (29.7, 74.1)
Buprenorphine	NA	50.9 (45.4, 56.3)	NA
XR-NTX	NA	NA	59.6 (53.8, 65.1)
Psychiatric medications	38.5 (35.3, 41.9)	32.7 (29.0, 36.6)	40.5 (36.6, 44.6)
<b><u>Accepted Payment</u></b>			
Cash/self-pay	67.8 (64.8, 70.7)	17.5 (15.1, 20.2)	22.2 (19.4, 25.2)
Medicare	69.2 (62.4, 75.3)	15.5 (11.2, 21.0)	21.0 (15.7, 27.6)
Medicaid	73.1 (69.0, 76.7)	18.5 (15.2, 22.2)	15.5 (12.6, 18.9)
State-financed insurance	74.1 (69.6, 78.2)	13.3 (10.4, 16.8)	23.7 (19.4, 28.6)
Federal military insurance	70.3 (64.0, 75.9)	16.6 (12.5, 21.8)	21.7 (16.6, 27.9)
Private insurance	64.4 (59.9, 68.6)	19.0 (15.6, 22.9)	25.3 (21.3, 29.7)
IHS/638 contract	73.3 (67.2, 78.7)	17.5 (13.1, 23.0)	20.1 (15.2, 26.1)
Cash-only facility	81.4 (73.6, 87.2)	14.4 (8.8, 22.6)	11.9 (7.2, 19.0)
<b><u>License/Accreditation</u></b>			
Hospital or State authority	68.0 (65.2, 70.7)	17.4 (15.1, 20.0)	22.4 (19.8, 25.2)
JCAHO/CARF/NCQA/COA/HFAP	62.7 (58.7, 66.5)	21.9 (18.6, 25.6)	22.4 (19.0, 26.2)
<b><u>Long-term residential treatment offered (&gt;28 days)</u></b>	71.4 (68.6, 74.1)	17.4 (15.0, 20.0)	19.5 (17.0, 22.2)

Supplemental Table 4 displays the predicted probabilities of each outcome variable according to adjusted logistic regression equations. Displayed are predicted probabilities and 95% confidence intervals for when the indicated characteristic was present with all other variables set to their average value (all predictor variables set to average is also displayed as the Average Model in the first row). XR-NTX = extended-release naltrexone; OR = unadjusted odds ratios; AOR = adjusted odds ratios; CI = confidence intervals; MOUD = medications for opioid use disorder; HIS/638 = Indian Health Service federal contract; JCAHO = Joint Commission of Healthcare Organizations; CARF = Commission on Accreditation of Rehabilitation Facilities; NCQA = National Committee for Quality Assurance; COA = Council on Accreditation; HFAP = Healthcare Facilities Accreditation Program

<b>eTable 6. Unadjusted and Adjusted Predicted Probabilities for Treatment Admissions Models</b>		
<b>Patient Characteristics</b>	<b>Unadjusted Predicted Probability (% [95% CI]) vs. Null</b>	<b>Adjusted Predicted Probability (% [95% CI])</b>
Average Model	NA	16.0 (15.8, 16.2)
<b>Sex (Male)</b>	15.7 (15.5, 15.9) vs. 17.3	15.4 (15.2, 15.6)
<b>Race</b>		
Caucasian/White	Ref	Ref
African American/Black	11.8 (11.4, 12.3) vs. 15.9	16.2 (16.0, 16.4)
All other	20.2 (19.8, 20.7) vs. 15.9	21.6 (20.6, 22.6)
<b>Age</b>		
Under 25	Ref	Ref
25-54	16.2 (16.0, 16.4) vs. 15.2	11.7 (11.3, 12.2)
55 and Older	19.7 (18.9, 20.4) vs. 15.2	19.5 (19.1, 19.9)
<b>Veteran Status (Yes)</b>	15.2 (14.1, 16.3) vs. 16.3	15.0 (13.9, 16.1)
<b>Referral from Justice System (Yes)</b>	11.9 (11.5, 12.4) vs. 16.8	11.8 (11.4, 12.3)
Supplemental Table 5 displays the predicted probabilities of each outcome variable according to unadjusted and adjusted logistic regression equations. Unadjusted predicted probabilities are displayed as predicted probabilities and 95% confidence intervals for when the indicated characteristic was present versus absent. Adjusted predicted probabilities are displayed as predicted probabilities and 95% confidence intervals for when the indicated characteristic was present with all other variables set to their average value (all predictor variables set to average is also displayed as the Average Model in the first row).		