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Engagement in Vermont Recovery Services and Reported Quality of Life Among Adults with Substance Use Disorders

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1 **Engagement in Vermont Recovery Services and Reported Quality of Life**
2 **Among Adults with Substance Use Disorders**

3 Running title: Engagement in VT Recovery Services and Reported QoL

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8

9 Word count:

10 367 abstract

11 5073 manuscript

12

13 Figures: 2

14 Tables: 4

15

16 Key words: Vermont Recovery Network, Substance Use Disorder, Quality of Life, Recovery

17 Capital, Turning Point Centers, Peer Recovery Network

18

19 **Abstract**

20 Background

21 In 2019, the National Survey on Drug Use and Health (NSDUH) found that 19.3 million
22 people 18 or older were struggling with a substance use disorder in the United States¹. While
23 there are many models of substance use disorder treatment, community peer recovery centers
24 have become more widespread². Vermont has one of the leading recovery center networks in the
25 country, made up of 12 recovery centers called Turning Point Centers (TPCs)³. This study
26 utilized archived TPC Participant Surveys to evaluate the risk of high quality of life (QoL) with
27 increasing recovery capital, as measured by the Brief Assessment of Recovery Capital (BARC-
28 10)^{4,5}. Our second objective was to assess the utilization of TPCs resources across BARC-10
29 total score quartiles.

30 Hypothesis

31 It is hypothesized that higher scores of BARC-10 will impact QoL positively, and that
32 there will be an association between utilization of services and higher total scores on the BARC-
33 10.

34 Methods

35 We used the Vermont Recovery Network's Participant Surveys, including all participants
36 over the age of 18 and excluding surveys missing QoL. We utilized a modified Poisson
37 regression to estimate risk of high QoL for each 1 point higher total BARC-10 score⁶. Our
38 second analysis use descriptive statistics to assess the associations between utilization of TPC
39 services and level of BARC-10 total score.

40 Results

41 Of the 1,272 participant completed surveys, we excluded 48, leaving 1,224 in this
42 analysis. In the study population of 1,224, 69% of people (884) reported high QoL.

43

44 Our first analysis showed the risk of having high QoL was 5.6% higher for every one-
45 point higher in BARC-10 total score in our fully adjusted model (95% CI 1.047 to 1.064). Our
46 second analysis found there was a significantly higher number of reported total service
47 categories utilized in higher quartiles of BARC-10 total score.

48 Conclusions

49 In a cross-sectional analysis of adults with substance use disorder utilizing Vermont's
50 TPCs who completed surveys capturing QoL, a validated recovery capital metric, and service
51 pattern use, the risk of high QoL was greater among participants with higher recovery capital.
52 This study prompts further investigation into the causal relationship between TPC service use
53 and recovery capital, specifically on what types of TPC services are most effective for the
54 Vermont recovery community.

55 **Background**

56 In the United States, substance use disorders are often mishandled due to lack of
57 resources and community stigma⁷. Despite over 100,000 people dying between 2010 and 2018
58 because of psychoactive substance use related to mental and behavioral disorders⁸, a study
59 conducted in 2014 found that 49% of Americans opposed increased government spending on
60 drug addiction treatment programs⁹. Substance-related and addictive disorders compose an entire
61 chapter of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5)¹⁰, and yet the
62 public is less likely to endorse a neurobiological origin of substance use disorder when compared
63 to other mental illnesses, instead viewing it as a moral or character flaw¹¹.

64 The Vermont Recovery Network (VRN) is a collection of 9 recovery centers throughout
65 the state of Vermont serving adults with substance use disorders and is part of one of the leading
66 statewide peer networks for recovery and resiliency to date in the United States^{3,12}. These
67 recovery centers, called Turning Point Centers (TPCs), are designed to provide resources around
68 the four major pillars of recovery, as defined by the Substance Abuse and Mental Health
69 Services Administration (SAMHSA): Health, Home, Purpose, and Community¹³. It is important
70 to clarify the definition of recovery in order to understand the role that the Turning Point Centers
71 of Vermont play within the recovery community. Recovery is not defined just by abstinence, as
72 this has been shown to be a less sustainable and enduring measure, but by the improvement of
73 quality of life (QoL)¹⁴. The SAMHSA definition of recovery is “a process of change through
74 which individuals improve their health and wellness, live a self-directed life, and strive to reach
75 their full potential.”^{2,13}. The TPCs of Vermont strive to support and aid recovery by offering
76 numerous programs designed to address all parts of recovery, not simply uphold abstinence.

77 The first objective of this study was to assess the association between an elevated total
78 score on the Brief Assessment of Recovery Capital (BARC-10) and high QoL. It is hypothesized
79 that higher scores on the BARC-10 will correlate with QoL positively. The second objective was
80 to assess effects of TPC services on BARC-10 total scores as stratified by high and low QoL. It
81 is hypothesized that there will be an association between utilization of services and higher total
82 scores on the BARC-10.

83 **Methods**

84 Vermont Recovery Network (VRN) and Turning Point Centers (TPCs)

85 The VRN is a non-profit with 9 member TPCs and 3 affiliate recovery centers¹⁵. The
86 VRN consists of an executive council made of a board member from each TPC. The executive
87 council is responsible, per VT legislature, to advise the Alcohol and Drug Abuse Programs
88 (ADAP) division of the VT Department of Health on the prioritization of recovery services,
89 funding needs of TPCs, and to provide recommendations for disbursement of state funds to the
90 TPCs¹⁵. The VRN facilitates the collection of a minimum of 25 TPC Participant Surveys per
91 center quarterly, per the ADAP quota to receive VT Department of Health funds. The Participant
92 Surveys are stored in the software Recovery Data Platform (RDP).

93 TPCs are community-based recovery centers accessible to Vermont residents with a
94 history of substance use disorder who are actively seeking recovery from problematic use of
95 alcohol or drugs. These centers are primarily funded by ADAP. The TPCs of Vermont offer
96 multimodal non-clinical substance use disorder treatment options, including peer recovery
97 support, 12-step program meetings, and services to address unmet social determinants of health
98 such as housing, transportation, and employment¹⁶. Peer recovery support is a one-on-one
99 meeting with a staff member of the TPC who has been in recovery for over a year and is

100 designed to address pertinent issues related to recovery in the participant’s life. TPC participants
101 can also spend unstructured time in the TPC facility, which may include socializing, board
102 games, or computer use depending on the center. They also host a variety of workshops which
103 have been categorized as “Other Events” for our analysis. While these vary widely by center,
104 they typically are wellness, education, or job workshops. There are 12 TPCs in Vermont, one in
105 each county except Orange and Grand Isle.

106 Vermont Recovery Network Participant Survey Domains

107 In addition to assessing demographics including age, gender, highest education level, and
108 geographical location of the TPC, the Participant Survey includes 38 questions in several
109 domains.

110 **Quality of Life (QOL1)**⁴ is a self-reported measure of wellbeing that has been validated
111 against the World Health Organization’s WHOQOL-BREF in a substance use cohort. It consists
112 of a single question “How would you rate your quality of life?” which can be answered on a
113 Likert Scale ranging from 1-5. The Likert scale coding is as follows: 1 (Very Dissatisfied), 2
114 (Dissatisfied), 3 (Neither Satisfied nor Dissatisfied), 4 (Satisfied), 5 (Very Satisfied). The QOL1
115 is reported to have a convergent validity of .676 ($p < .001$) with the WHOQOL-BREF
116 physiological health domain⁴.

117 **Brief Assessment of Recovery Capital (BARC-10)**⁵ is a self-reported measure that
118 assesses the resources that support extended recovery and remission from SUD. These resources
119 include the personal, social, environmental and cultural situations that are important in aiding
120 recovery and have been coined “Recovery Capital”⁵. Items are presented on a Likert Scale as
121 follows: 1 (Strongly Disagree), 2 (Disagree), 3 (Somewhat disagree), 4 (Somewhat agree), 5
122 (Agree), 6 (Strongly Agree). The BARC-10 was developed from the Assessment of Recovery

123 Capital (ARC)¹⁷, a 50 item measure with 10 subcategories. In designing the BARC-10, one item
124 corresponds with each category of the original ARC⁵. The BARC-10 has an internal consistency
125 of $\alpha = .90$ with the concurrent validity at $r_{pb} = .90$ between the ARC and BARC-10⁵. A sample
126 item is “My living space has helped to drive my recovery journey.”⁵ A score of 47 has been
127 found to be associated with self-reported sustained remission and 12 months or more of
128 abstinence from alcohol and other drugs⁵.

129 **Use of TPC services** includes four categories: recovery meetings, peer recovery coach
130 meetings, “other” events such as job or wellness workshops and spending unstructured time at
131 the center. These four categories were considered interaction with the TPC and the sum of
132 individual categories of services was reflected in the variable “engagement”. Other domains of
133 the participant survey included use of recovery-related services outside of the center such as
134 outpatient counseling or medication assisted treatment (MAT), number of interactions with the
135 criminal justice system over the last 30 days, main drug of misuse, substance use patterns over
136 the last 30 days, smoking habits, mental illness over the past 30 days, current housing,
137 employment status, and highest level of education.

138 Study population

139 Participant surveys were distributed at random times in the centers by TPC staff to
140 participants who reported not completing one yet. All participants that were missing the QoL
141 measure were excluded. For individuals who completed multiple surveys, one was randomly
142 selected for inclusion.

143 Statistical analysis

144 Sociodemographics were tabulated by BARC-10 scores, using ANOVA to compare
145 continuous variables and Pearson’s χ^2 test for categorial and binary variables.

146 The first analysis included the dependent variable QoL, as dichotomized by low QoL
147 (Very Dissatisfied, Dissatisfied, or Neither Satisfied or Dissatisfied) or high QoL (Satisfied or
148 Very Satisfied). Primary exposure of interest was BARC-10 total score, which was calculated by
149 summing the responses to 10 questions. This ranged from 10 (lowest) to 60 (highest).

150 The unadjusted model used modified Poisson regression to estimate risk of high QoL for
151 each 1 point higher total BARC-10 score⁶. The fully adjusted model adjusted for age, education
152 level, gender, and geographical location of the TPC. These analyses accounted for missing
153 independent variables using multiple imputation by chained equations techniques (MICE)¹⁸.
154 Visualization of the relationship between BARC-10 total score and risk ratio (RR) for high QoL
155 was performed with restricted cubic splines relative to the median for both the unadjusted model
156 and the fully adjusted model. Age was imputed by linear regression for the visualization of the
157 fully adjusted model instead of MICE. Kernel density plots visualized the distribution of BARC-
158 10 total scores in those with high or low QoL.

159 The second analysis sought to use descriptive statistics to assess the associations between
160 utilization of TPC services and level of BARC-10 total score. For this analysis we stratified the
161 sample by high QoL and low QoL as defined above. Engagement with the TPCs was calculated
162 by use of services over the last 30 days, 0 representing no use of services and 4 representing use
163 of all four categories. Pearson's χ^2 compared proportions of participants reporting participation
164 in each of the four types of services by quartile of BARC-10 total score. For engagement, the
165 Kruskal-Wallis test was utilized to compare engagement across quartiles of BARC-10 scores.

166 Analyses used Stata SE 16.1 (StataCorp, College Station, TX). Analyses were performed
167 on a previously obtained dataset from the VRN and Vermont Department of Health. University
168 of Vermont Institutional Review Board deemed this research exempt on the basis of secondary

169 use of identifiable private information. We considered a two-tailed $P < 0.05$ to be statistically
170 significant.

171 **Results**

172 Study population

173 Between January 2018 and December 2019, 1,272 participant completed surveys, of
174 which 48 were excluded for missing QoL measures leaving 1,224 in this analysis.

175 Groups differed by BARC-10 score quartile as shown in **Table 1**. Those with no reported
176 BARC-10 total score were dropped from the table. There was no significant difference in age
177 between quartiles of BARC-10 total scores. This was likely due to the small sample size, about
178 15% (180/1,178) of the total sample. Gender was evenly distributed across BARC-10 total score
179 quartiles, with an overall percentage of 38%, ranging from 37% in the lowest quartile to 40% in
180 quartile 4. For education, 49% of the participants finished high school but did not receive more
181 training. The proportion of people with high school degrees steadily lowered from 57% to 36%
182 among higher quartiles, while the proportion with some college got higher from 23% to 36%. It
183 was not reported if college attendance was during recovery or while actively using drugs, which
184 may impact BARC-10 total score. Despite 23% of employment status data missing, 29% of TPC
185 participants reported being “other”, which included retired, disabled, incarcerated, homemaker,
186 and student. The proportion who reported being employed part or full time was overall 22% and
187 ranged from 12% in the lowest quartile to 32% in the highest quartile. The proportion of
188 unemployed people in each quartile was lower among higher quartiles of BARC-10 total score,
189 which may have been impacted by the recovery capital measure including a domain on
190 “meaningful activities”⁵. TPC location ranged from 5% to 10% in the sample. This reflects use
191 of the centers and TPC participant survey administration habits, as each TPC is required to

192 administer 25 participant surveys minimum per quarter but may have exceeded that quota during
 193 our sample timeframe. In the lowest quartile, Burlington TPC had the highest proportion of
 194 participants at 18% as compared with other centers, which ranged from 4% to 12%. The highest
 195 quartile ranged from 6% to 10% with no major outliers.

196 **Table 1:** Baseline characteristics and TPC location by BARC-10 total score quartile*

Variable	Total	Q1 10-46	Q2 47-50	Q3 51-54	Q4 55-60	P- value
	N=1,178	n=314	n=302	n=268	n=294	
Age, year	45 (15)	45 (15)	42 (14)	47 (15)	46 (15)	0.22
Gender (% female identifying)	436/1,150 (38%)	113/308 (37%)	108/293 (37%)	100/261 (38%)	115/288 (40%)	0.84
Highest level of education						<0.001
Highschool diploma	575/1,178 (49%)	178/314 (57%)	158/302 (52%)	133/268 (50%)	106/294 (36%)	
Vocational or technical diploma	43/1,178 (4%)	10/314 (3%)	7/302 (2%)	13/268 (5%)	13/294 (4%)	
Some college	326/1,178 (28%)	73/314 (23%)	76/302 (25%)	70/268 (26%)	107/294 (36%)	
Bachelors degree	95/1,178 (8%)	16/314 (5%)	23/302 (8%)	31/268 (12%)	25/294 (9%)	
Beyond a Bachelors	59/1,178 (5%)	5/314 (2%)	19/302 (6%)	12/268 (4%)	23/294 (8%)	
Missing	80/1,178 (7%)	32/314 (10%)	19/302 (6%)	9/268 (3%)	20/294 (7%)	
Employment status in past 30 days						<0.001
Employed	264/1,178 (22%)	37/314 (12%)	79/302 (26%)	55/268 (21%)	93/294 (32%)	
Unemployed	312/1,178 (26%)	114/314 (36%)	85/302 (28%)	66/268 (25%)	47/294 (16%)	
Other ie retired, disabled	336/1,178 (29%)	100/314 (32%)	72/302 (24%)	81/268 (30%)	83/294 (28%)	
Missing	266/1,178 (23%)	63/314 (20%)	66/302 (22%)	66/268 (25%)	71/294 (24%)	
Turning Point Center Location						<0.001
Barre	114/1,178 (10%)	31/314 (10%)	43/302 (14%)	19/268 (7%)	21/294 (7%)	
Bennington	95/1,178 (8%)	24/314 (8%)	23/302 (8%)	25/268 (9%)	23/294 (8%)	
Brattleboro	108/1,178 (9%)	23/314 (7%)	28/302 (9%)	28/268 (10%)	29/294 (10%)	
Burlington	116/1,178 (10%)	58/314 (18%)	24/302 (8%)	15/268 (6%)	19/294 (6%)	
Middlebury	114/1,178 (10%)	27/314 (9%)	34/302 (11%)	24/268 (9%)	29/294 (10%)	
Morrisville	95/1,178 (8%)	22/314 (7%)	29/302 (10%)	26/268 (10%)	18/294 (6%)	
Newport	90/1,178 (8%)	39/314 (12%)	12/302 (4%)	20/268 (7%)	19/294 (6%)	
Rutland	109/1,178 (9%)	18/314 (6%)	23/302 (8%)	40/268 (15%)	28/294 (10%)	
Saint Albans	96/1,178 (8%)	15/314 (5%)	26/302 (9%)	20/268 (7%)	35/294 (12%)	
Saint Johnsbury	60/1,178 (5%)	13/314 (4%)	13/302 (4%)	13/268 (5%)	21/294 (7%)	
Springfield	84/1,178 (7%)	28/314 (9%)	19/302 (6%)	16/268 (6%)	21/294 (7%)	
White River Junction	95/1,178 (8%)	16/314 (5%)	28/302 (9%)	22/268 (8%)	29/294 (10%)	
Missing	2/1,178 (<1%)	0/314 (<1%)	0/302 (<1%)	0/268 (<1%)	2/294 (1%)	

197 *Continuous variables are presented as mean (SD). Proportions are presented as number of
 198 participants in given condition/total number of participants who completed corresponding section

199 of survey and as N (%). Q indicates quartile. The numbers immediately below the quartile
 200 indicates the range of BARC-10 total scores within that quartile.

201
 202 High QoL in the study population

203 In the study population of 1,224, 69% of people (884) reported high QoL.

204 Association between BARC-10 and high QoL

205 In the unadjusted model, every one-point higher BARC-10 score was associated with a
 206 5.9% higher risk for high QoL, as shown in **Table 2**. As is shown in **Figure 1** kernel density
 207 plots, the distribution of BARC-10 total score varied by low vs high QoL. In the low QoL cohort,
 208 BARC-10 total score was more widely distributed with a peak density at approximately 46. This
 209 is compared to participants reporting high QoL with a peak density of BARC-10 total score at
 210 approximately 50. The restricted cubic spline of **Figure 1** displays the risk ratio across the 0.05th
 211 percentile to the 99.5th percentile of BARC-10 total scores relative to the median. There was a
 212 greater risk for high QoL above the median. Below the median BARC-10 total score, there is a
 213 50% higher risk of low QoL for a BARC-10 total score of less than 45.

214 In the fully adjusted model, the risk of having high QoL was 5.6% higher for every one-
 215 point higher in BARC-10 total score, as shown in **Table 2**. In the restricted cubic spline and
 216 kernel density plots for the fully adjusted model, results are nearly identical to the unadjusted
 217 model, as seen in **Figure 2**.

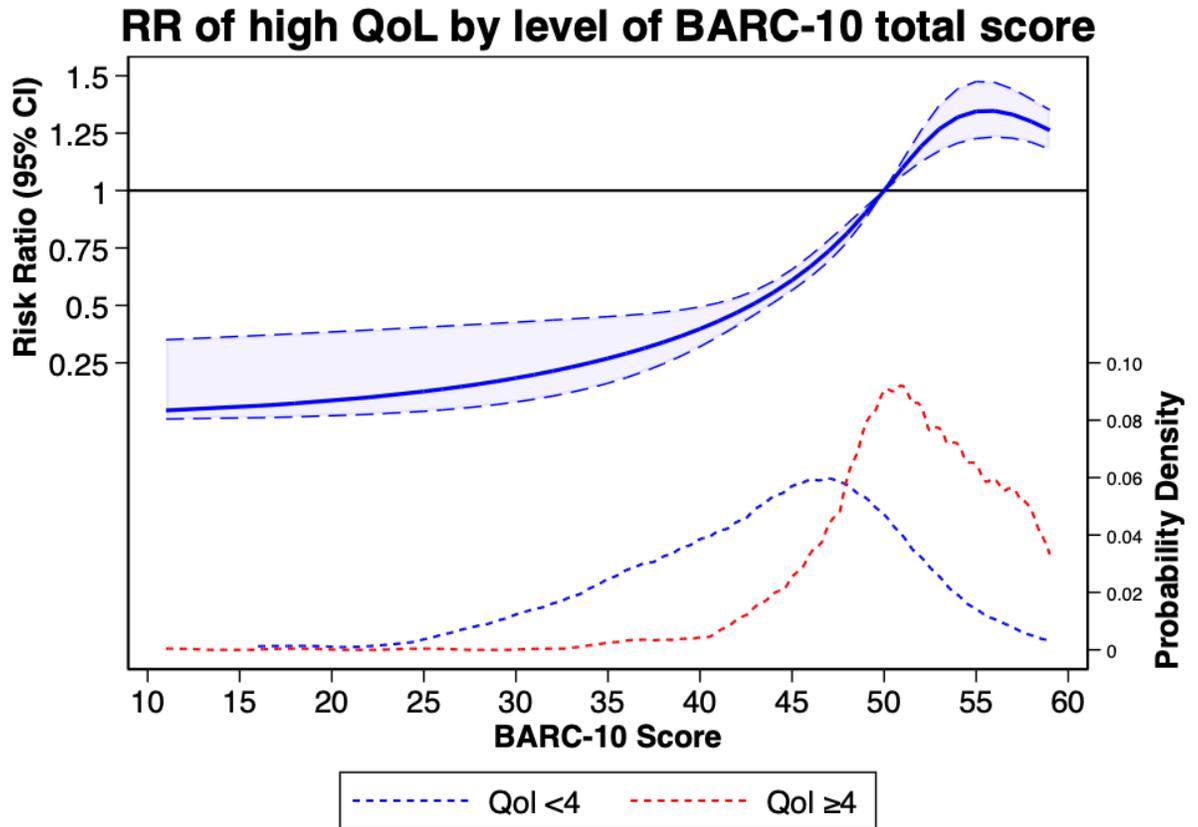
218 **Table 2:** RR and 95% CIs for High QoL per 1-point higher BARC-10 total score*

Covariate	β coefficient (95% confidence interval)	P-value
Unadjusted model		
BARC-10 total score	1.059 (1.051 to 1.067)	<0.001
Intercept	.036 (.024 to .0542)	<0.001
Fully adjusted model		
BARC-10 total score	1.055 (1.047 to 1.064)	<0.001
Age	0.999 (.997 to 1.002)	0.968
Gender	0.969 (.901 to 1.042)	0.400
Education level	1.035 (1.007 to 1.064)	0.012

TPC location (reference is Barre)		
Bennington	0.975 (.833 to 1.142)	0.760
Brattleboro	0.991 (.848 to 1.159)	0.918
Burlington	0.793 (.653 to .963)	0.019
Middlebury	0.843 (.709 to 1.003)	0.054
Morrisville	1.025 (.881 to 1.193)	0.742
Newport	1.021 (.862 to 1.207)	0.810
Rutland	.905 (.775 to 1.057)	0.209
Saint Albans	.944 (.810 to 1.099)	0.462
Saint Johnsbury	1.032 (.872 to 1.221)	0.710
Springfield	.905 (.758 to 1.079)	0.268
White River Junction	1.115 (.974 to 1.276)	0.113
Intercept	.044 (.027 to .070)	<0.001

219 *RR indicates risk ratio.

220 **Figure 1:** Restricted cubic spline plot for unadjusted model of RR of high QoL by level of
 221 BARC-10 total score and distribution of BARC-10 total score by low and high QoL with kernel
 222 density plots*

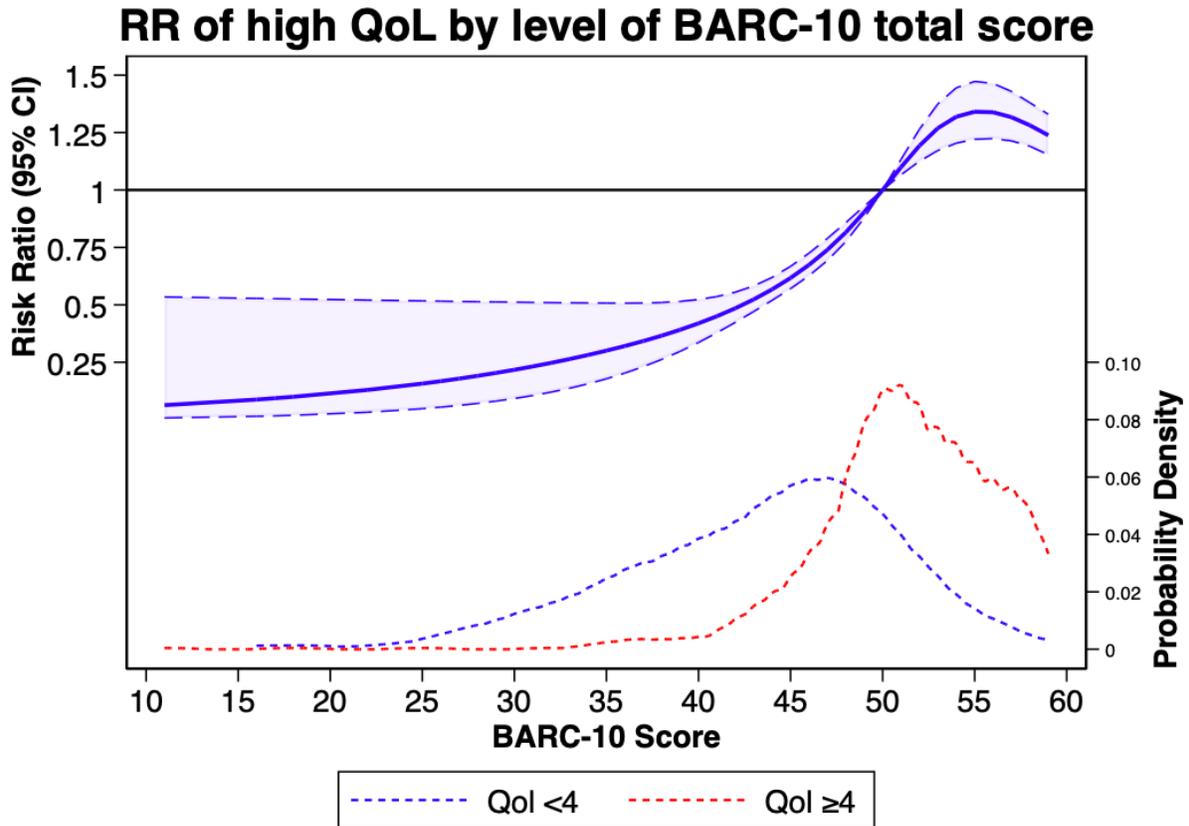


223

224 *This figure represents the unadjusted model for risk of high QoL by BARC-10 total score
 225 relative to the median BARC-10 total score. The shaded area represents 95% CIs. Knots placed

226 using Harrell's method¹⁹ at BARC-10 scores of 35, 48, 53 and 60. Plots were truncated at 99.5%
227 and 0.5% of BARC-10 score. Kernel density plots also display the total distribution of BARC-10
228 scores among those with high QoL (≥ 4 , red) and those with low QoL (< 4 , blue).
229

230 **Figure 2:** Restricted cubic spline plot for fully adjusted model of RR of high QoL by level of
231 BARC-10 total score and distribution of BARC-10 total score by low and high QoL with kernel
232 density plots*



233

234 *This figure represents the fully adjusted model for risk of high QoL by BARC-10 total score
235 relative to the median BARC-10 total score. The shaded area represents 95% CIs. Knots placed
236 using Harrell's method¹⁹ at BARC-10 scores of 35, 48, 53 and 60. Plots were truncated at 99.5%
237 and 0.5% of BARC-10 score. Kernel density plots also display the total distribution of BARC-10
238 scores among those with high QoL (≥ 4 , red) and those with low QoL (< 4 , blue). Age was
239 imputed by linear regression.
240

241 Use of TPC services and BARC-10 Quartile

242 Reported use of TPC services by quartile of BARC-10 total score in a cohort reporting

243 low QoL varied within the four specific services, as is shown in **Table 3**. There was no

244 significant difference in proportion of reported use over the last 30 days of TPC sponsored
 245 meetings, Recovery Coach interaction, and spending unstructured time at the TPC across the
 246 quartiles. The proportion who reported attending a TPC sponsored meeting in the past 30 days
 247 was overall 43% and ranged from 33% to 56% in the quartiles. The proportion who reported
 248 meeting with a TPC Recovery Coach or staff one-on-one in the past 30 days was overall 38%,
 249 ranging from 32% to 50% across quartiles. The proportion who reported spending unstructured
 250 time at the TPC over the last 30 days was overall 72% and ranged from 70% to 79% in the
 251 quartiles. However, for participants who attended a different event at the TPC over the last 30
 252 days, there was a larger proportion of those reporting participation in this activity among higher
 253 quartiles (P<0.001).

254 The median (IQR) number of services utilized in the low QoL cohort was 1 (1-3) overall.
 255 There was a significantly higher number of total TPC service categories used (engagement) in
 256 higher quartiles, with a median of 2 in Q3 (1-2) and Q4 (1-4) vs a median of 1 in Q1 (1-3) and 2
 257 in Q2 (0-3) (P=0.041).

258 **Table 3:** Use of services by BARC-10 Quartile in low QoL sample*

Category of TPC service	Total	Q1 10-46	Q2 47-50	Q3 51-54	Q4 55-60	P-value
	N=368	n=221	n=89	n=39	n=19	N=368
Attended a TPC sponsored peer recovery meeting in past 30 days	147/345 (43%)	83/209 (40%)	43/84 (51%)	12/36 (33%)	9/16 (56%)	0.13
Met with TPC staff member or Recovery Coach in past 30 days	129/338 (38%)	70/204 (34%)	39/81 (48%)	12/37 (32%)	8/16 (50%)	0.10
Attended other event at TPC in past 30 days	127/334 (38%)	64/201 (32%)	37/83 (45%)	15/35 (43%)	11/15 (73%)	0.005
Spent unstructured time at the TPC in past 30 days	216/302 (72%)	127/181 (70%)	56/76 (74%)	22/31 (71%)	11/14 (79%)	0.88
Engagement at TPC over last 30 days	1 (1-3)	1 (0-3)	2 (1-3)	2 (1-2)	2 (1-4)	0.041

259 *Proportions are presented as number of participants in given condition/total number of
 260 participants who completed corresponding section of survey and as N (%). Q indicates overall
 261 analytical population quartile. The numbers immediately below the quartile indicates the range
 262 of BARC-10 total scores within that quartile as defined by the distribution of the overall

263 analytical population. Engagement was reported 0-4 and indicates the sum of number of TPC
 264 service categories used over last 30 days.
 265 Reported use of TPC services by quartile of BARC-10 total score in a cohort reporting
 266 high QoL varied within the four specific services, as is shown in **Table 4**. There was no
 267 significant difference in proportion of reported use over the last 30 days of TPC sponsored
 268 meetings and Recovery Coach interaction. The proportion who reported attending a TPC
 269 sponsored meeting in the past 30 days was overall 38% and ranged from 33% to 44% across
 270 quartiles. The proportion who reported meeting with a TPC Recovery Coach or staff one-on-one
 271 in the past 30 days was overall 34%, ranging from 29% to 40% in the quartiles. However, for
 272 participants who attended a different event at the TPC over the last 30 days, there was a larger
 273 proportion of those reporting participation in this activity among higher quartiles (P<0.001).
 274 There was also a significant proportion who reported spending unstructured time at the TPC by
 275 higher quartile (P=0.024)

276 The median (IQR) number of services utilized in the high QoL cohort was 2 (0-3) overall.
 277 There was a significantly higher number of reported total service categories utilized in higher
 278 quartiles, with a median of 2 (1-3) in Q3 and Q4 vs a median of 2 in Q1 (0-4) and 1 in Q2 (0-2)
 279 (P=0.004).

280 **Table 4:** Use of services by BARC-10 Quartile in high QoL sample*

Category of TPC service	Total	Q1 10-46	Q2 47-50	Q3 51-54	Q4 55-60	P-value
	N=810	n=93	n=213	n=229	n=275	N=810
Attended a TPC sponsored peer recovery meeting in past 30 days	281/743 (38%)	36/82 (44%)	62/187 (33%)	85/216 (39%)	98/258 (38%)	0.36
Met with TPC staff member or Recovery Coach in past 30 days	261/762 (34%)	35/88 (40%)	58/198 (29%)	79/218 (36%)	89/258 (34%)	0.29
Attended other event at TPC in past 30 days	377/716 (53%)	42/80 (52%)	73/186 (39%)	116/206 (56%)	146/244 (60%)	<0.001
Spent unstructured time at the TPC in past 30 days	445/699 (64%)	50/78 (64%)	99/182 (54%)	132/197 (67%)	164/242 (68%)	0.024
Engagement at TPC over last 30 days	2 (0-3)	2 (0-4)	1 (0-2)	2 (1-3)	2 (1-3)	0.004

281 *Proportions are presented as number of participants in given condition/total number of
282 participants who completed corresponding section of survey and as N (%). Q indicates overall
283 analytical population quartile. The numbers immediately below the quartile indicates the range
284 of BARC-10 total scores within that quartile as defined by the distribution of the overall
285 analytical population. Engagement was reported 0-4 and indicates the sum of number of TPC
286 service categories used over last 30 days.
287

288 **Discussion**

289 In a cross-sectional analysis of adults with substance use disorder utilizing Vermont's
290 TPCs who completed surveys capturing QoL, a validated recovery capital metric, and service
291 pattern use, it was found that higher QoL correlates with higher BARC-10 total score, a measure
292 of recovery capital. This is important because the TPCs are designed to support different pillars
293 of recovery capital, including social connection, housing resources, job resources, and exercise.
294 Of those who filled out the participant survey and reported low QoL, participants who attended
295 "other" events, such as a painting class or social event, were significantly more likely to fall in a
296 higher BARC-10 total score quartile. This may be because "other" events are a proxy for the
297 amount of time a person is spending in the center, or because they are more diverse in the
298 support they offer. Of those who filled out the participant survey and reported high QoL,
299 participants who attended "other" events or spent unstructured time at the TPC were significantly
300 more likely to fall in a higher BARC-10 total score quartile, reflecting greater recovery capital.

301 Prior literature showed that QoL by a longer measure, EUROHIS-QOL, was correlated
302 with BARC-10 in a recovery community center cohort ($R^2=0.51, p < 0.05$).²⁰ Similar patterns
303 were found during the validation of ARC, specifically a statistically significant correlation
304 between the QoL measures in the Treatment Outcome Profile (TOP) and the longer-measure
305 ARC total score, from which the BARC-10 is derived ($r=0.4; P < 0.0001$)¹⁷. The prior studies did
306 not address utilization of recovery center services and their impact on BARC-10 total score. The
307 present findings are consistent with the prior literature as it was found that for every one-point

308 increase on BARC-10 total score risk of high QoL is 5.6% higher. These findings extend upon
309 prior literature through the examination of patterns of TPC service use and self-reported recovery
310 capital in high QoL and low QoL samples.

311 The primary literature is lacking in studies that evaluate the therapeutic benefits of
312 community recovery centers such as Vermont’s TPCs. While the TPCs combine many different
313 types of previously validated recovery resources, such as peer recovery meetings²¹ and peer-
314 based recovery coaches²², a study has not yet examined how engagement with services is
315 associated with recovery capital, as measured by the BARC-10. While no specific causal
316 relationship can be determined between recovery capital and participation in TPC services, this
317 study provides context for the Turning Point Centers of Vermont on what services are associated
318 with a higher QoL and increased self-evaluation of recovery capital. Among participants with
319 low QoL, those attending “other” events such as education and job workshops were shown to
320 have proportionally more recovery capital than their peers who were not. Going forward, the
321 centers should track participation and types of events which fall into the “other” category. A
322 cluster randomized controlled study of TPCs could be conducted to examine what specific types
323 of events contribute to higher recovery capital. An example would be: 3 centers promote job
324 workshops, 3 centers promote wellness clinics, 3 centers create education workshops and 3
325 centers would act as a control and offer no workshops that fall into the “other” category. A
326 hypothesis for this study would be that participants of the TPCs with workshops dedicated to
327 wellness or employment have higher reported BARC-10 total scores and higher reported QoL
328 than the TPCs with education workshops or no workshops that fall into the “other” category.

329 Of participants reporting high QoL, BARC-10 total scores were proportionally higher in
330 those who spent unstructured time in the TPC, as well as those participating in “other” events as

331 seen in the low QoL cohort. The layout of TPCs typically have a general room with tables, board
332 games, puzzles, and sometimes computers. Participants can choose to spend time in the center
333 without a structured task. This was associated with higher reported levels of recovery capital.
334 This may be because spending time in TPCs without a specific task leads to higher levels of
335 integration with the recovery community or contributes to higher levels of investment in
336 sobriety. In future studies, there should be a probe on why people spend unstructured time in the
337 center and what within the TPCs promotes tenants of recovery capital such as meaningful
338 activities, community involvement, or reduced risk-taking¹⁷.

339 There is a clear benefit to engaging in more categories of TPC services for the self-
340 assessment of higher recovery capital. This can contribute to the promotion of services within the
341 VT recovery community, as investment in a diverse range of TPC's services may lead to higher
342 reported recovery capital. In order to investigate this further, future studies should conduct a
343 baseline analysis of QoL and BARC-10 and then track participation in the center's services over
344 a 6- or 12-month period before reassessing. This would provide a clearer picture of causality and
345 how effective specific TPC services are.

346 The BARC-10 total score quartiles 2-4 fall above a total score of 47, which has been
347 found to be associated with self-reported abstinence of 12 months or more from alcohol and
348 other drugs⁵. While we did not have length of abstinence reported as part of the participant
349 survey, it is important to note that below a score of 47, there was a 25% higher risk of low QoL
350 relative to the median, as displayed in **Figure 2**. In the future, the participant survey could have
351 categories of length of recovery such as less than 1 month, 1-6 months, 6 months to 1 year, and
352 more than 1 year. We hypothesize that BARC-10 total score will increase as length of recovery
353 increases.

354 This study has limitations. Many of these records were stored heterogeneously due to the
355 formatting of data entry on RDP and the non-centralized data entry by individual TPCs. These
356 records were collected for funding purposes and were not originally intended for analysis.
357 Because of this, it is unknown how consistently the surveys were administered to participants,
358 for example if they were completed with a TPC staff member present. It is not known how
359 participants were selected by TPC staff to complete surveys. While TPCs communicate to
360 coordinate their services across the state, each TPC is a community-run recovery center and
361 varies in service offerings per town. While this is advantageous to the TPC participants as it
362 leads to more tailored resources, it is a limitation for inter-center comparisons.

363 The generalizability of this study is limited. We cannot extrapolate the findings to TPC
364 participants who did not fill out the participant survey, nor do we know how randomly
365 participants were selected. Age was reported in approximately 25% (245) of participants before
366 implementing MICE, which allowed for a sample of 1,111 records in the fully adjusted model of
367 RR of high QoL by level of BARC-10 total score. The cohort was also majority male-
368 identifying, at 62% (**Table 1**). Finally, the participant survey was a self-reported measure which
369 has potential for response bias. This limitation is magnified by the heterogeneous administration
370 methods which varied depending on center and TPC staff member.

371 In conclusion, a cross-sectional analysis of adults with substance use disorder utilizing
372 Vermont's TPCs who completed surveys capturing QoL, a validated recovery capital metric, and
373 service pattern use found that there is higher risk of high QoL with increasing scores on the
374 BARC-10, a measure of recovery capital. It also found a significantly greater number of reported
375 total service categories utilized in higher quartiles of BARC-10 total score across high and low
376 QoL cohorts.

377 **Acknowledgments**

378 I would like to thank Dr. Timothy Plante for his guidance on Stata and help with my
379 statistical analysis. I would also like to thank my advisor, Dr. Bryan Ballif, for believing in the
380 project even after numerous setbacks. I could not have completed this project without the help of
381 Erin Jenkins, who worked tirelessly to help me understand the structure of the VRN and VT
382 ADAP as well as track down old participant surveys from TPCs across the state. Thank you to
383 Fawn Montanye from the VRN and Kelly Morrill from ADAP for believing in the importance of
384 this project and for all the work you do to support VT's recovery community. Finally, thank you
385 to the Turning Point Center of Chittenden County and specifically Gary DeCarolis and Cam
386 Lauf, for inspiring a passion in the field of substance use disorders.

387

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