

Supplementary Materials

Supplementary Table 1. Model parameters for long-term, post-treatment peer recovery support services cost-effectiveness analysis.

Variable	Base Case	Low	High	Source	Model
Tpp - Peer worker reimbursement per 15 minutes	\$8.97	\$3.66	\$24.49	(Bureau of Labor Statistics, 2022; Videka et al., 2019)	H,S
Tpu - PRSS service utilization (in 15 minute increments)	212	76	472	(Health and Human Services Commission, 2020; Videka et al., 2019)	H,S
Tt - Cost of specialty SUD treatment	\$17,203.74	\$10,623.54	\$23,783.94	(Alexandre et al., 2012; Bureau of Labor Statistics, 2021; French et al., 2008)	H,S
Nt – Total receiving specialty SUD treatment in Texas	2,572,000	2,423,000	2,721,000	(Substance Abuse and Mental Health Services Administration, 2020)	H,S
Api – per-person averted medical costs under PRSS [^]	\$1,186.66	\$949.32	\$1,423.99	(Mangrum et al., 2018)	H
Ati – per-person averted medical costs under treatment only [^]	\$913.05	\$730.44	\$1,095.66	(Morse and Bride, 2016)	H
Ci – per-person averted societal costs among those in recovery (PRSS or treatment only) [^]	\$7,690.77	\$6,152.62	\$9,228.92	(National Drug Intelligence Center, 2011; Sacks et al., 2015)	S
Pp – Per-person, per-episode patient time costs for participating in PRSS	\$1,479.23	\$530.29	\$3,293.38	(Ashford et al., 2021; Bureau of Labor Statistics, 2019; Health and Human Services Commission, 2020)	S
<i>Proportions</i>					
Rp – Return to chaotic substance use prevalence among those receiving PRSS, year 1	17%	9%	50%	(Ashford et al., 2021; Mangrum et al., 2018)	H,S
Rt – Return to chaotic substance use among those receiving treatment only, year 1	50%	40%	87%	(Dutra et al., 2008; McLellan et al., 2000)	H,S
Retp – Retention of participants in long-term PRSS to completion/ graduation/ 1 year. [^]	70%	10%	90%	(Mangrum et al., 2018)	H,S

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Variable	Base Case	Low	High	Source	Model
<i>Utility Weights</i>					
Recovery utility [^]	0.8	0.5	1	(Nyman et al., 2007; Whiteford et al., 2013)	H,S
SUD utility	0.586	0.359	0.741	(Whiteford et al., 2013)	H,S

H = Health System Perspective Model

S = Societal Perspective Model

[^] = Estimated range of variation not available in the literature, so examined an arbitrarily-selected range of variation, typically +/- 20%.

Supplementary Table 2. Stage transition probabilities for probabilistic sensitivity analysis.

Health state	Year 1 Prob.	Year 2 Prob.	Year 3 Prob.	Source
Recovery to recovery, PRSS	0.83	0.66	0.86	(Dennis et al., 2007; Mangrum et al., 2018)
Recovery to recovery, treatment only	0.5	0.66	0.86	(Dennis et al., 2007; Dutra et al., 2008; McLellan et al., 2000)
Recovery to chaotic use	Remaining probability when recovery to recovery and mortality probabilities are subtracted from 1.			
<i>Background Mortality by Age Category</i>				
Age Category	Recovery	SUD	(Decker et al., 2017; Eddie et al., 2019; Kochanek et al., 2020; Lindblad et al., 2016)	
20-24	0.010916	0.010916		
25-29	0.011751	0.014951		
30-34	0.012541	0.015741		
35-39	0.014886	0.014746		
40-44	0.018992	0.018852		
45-49	0.024862	0.027682		
50-54	0.032653	0.035473		
55-59	0.044558	0.068778		
60-64	0.065021	0.089241		
65-69	0.093287	0.117507		
70-74	0.137072	0.161292		
75-79	0.204364	0.228584		
80-84	0.305685	0.329905		
85-90	0.430047	0.454267		
90-95	0.586341	0.610561		
95-100	0.743793	0.768013		

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Supplementary Table 3. Probability distributions assigned to variables for the probabilistic sensitivity analysis.

<i>Probability Distributions by Variable Category</i>	
Effects (QALYs, people in recovery at 3 years) PRSS utilization (Tpu)	Triangle
Retention in long-term PRSS (RetP) Return to chaotic substance use in PRSS and TAU (Rp, Rt) Rate of SUD treatment among people with SUD	Beta
Peer worker hourly pay (Tpp) Cost of specialty SUD treatment episode (Tt) Societal costs, per person (Ci) Patient time costs per hour (used to estimate Pp together with Tpu) Averted medical costs under PRSS, per person (Api) Averted medical costs under TAU, per person (Ati)	Gamma

Parameter References

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I. Health System Perspective Formulas

Intervention Costs

The total cost of a PRSS episode

$$T_{pp} * T_{pu} * Nt$$

Is added to the total cost of those needing specialty SUD treatment again under the PRSS condition. We assume that only 10% of those who need treatment in a given year receive it in the US (rate is from the National Survey on Drug Use and Health, SAMHSA, 2020).

$$(Nt * Retp * Rp * 0.1 * Tt) + (Nt * (1 - Retp) * Rt * 0.1 * Tt)$$

We then subtract averted medical costs attributable to those who are retained in recovery under the PRSS condition and those who drop out of PRSS prematurely (they save the same amount that those in the treatment only condition save per person).

$$(Api * Retp * (1 - Rp) * Nt) + (Ati * (1 - Retp) * (1 - Rt) * Nt)$$

Treatment as Usual Costs

The total cost of the initial treatment episode is not included in the model, because we modeled our population as all starting in specialty SUD treatment, thus the same total cost would be in both the PRSS and Treatment sides of the numerator equation, and would zero out. Instead, we start with the cost of those receiving specialty SUD treatment again under the treatment as usual condition, using the same assumption described above for PRSS. As above, we assume that only 10% of those who need treatment in a given year receive it in the US.

$$Nt * Rt * 0.1 * Tt$$

Averted medical costs attributable to treatment as usual are subtracted from re-treatment costs.

$$Ati * (1 - Rt) * Nt$$

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II. Societal Perspective Formulas

Intervention Costs

The total cost of a PRSS episode

$$T_{pp} * T_{pu} * N_t$$

Is added to the total cost of those needing specialty SUD treatment again under the PRSS condition. As above, we assume that only 10% of those who need treatment in a given year receive it in the US.

$$(N_t * Retp * Rp * 0.1 * Tt) + (N_t * (1 - Retp) * Rt * 0.1 * Tt)$$

We then add total patient time for PRSS:

$$Pp * T_{pu} * N_t * Retp$$

Finally, the total societal cost savings attributable to those who are retained in recovery under the PRSS condition and the societal cost savings that would be realized by treatment alone (for the proportion who drop out of PRSS prematurely) is subtracted from PRSS episode and PRSS patient time costs:

$$(Ci * Retp * (1 - Rp) * N_t) + (Ci * (1 - Retp) * (1 - Rt) * N_t)$$

Treatment as Usual Costs

The total cost of the initial treatment episode is not included in the model, because we modeled our population as all starting in specialty SUD treatment, thus the same total cost would be in both the PRSS and Treatment sides of the numerator equation, and would zero out. Instead, we start with the cost of those receiving specialty SUD treatment again under the treatment as usual condition, using the same assumption described above for PRSS.

$$N_t * Rt * 0.1 * Tt$$

Patient time costs are not included for the treatment as usual condition because untreated SUD has serious impacts on an individual's ability to work or engage in other productive activities. This provides an underestimate of treatment as usual costs. Instead, societal cost savings attributable to treatment as usual are subtracted from re-treatment costs.

$$Ci * (1 - Rt) * N_t$$

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III. Effect Estimation

Quality-adjusted life expectancy and people retained in recovery at 3 years were estimated using an Excel-based Markov chain created by the research team (HSB) using the transition matrices and mortality rates described in the model parameter tables. The tool can be made available upon request to the corresponding author.