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**eAppendix.** Supplemental Methods

**eTable 1.** Differences in 3 Years Pre-Intervention Period Trends in Outcomes in Telepsychiatry vs. Control EDs (n=134 ED pairs)

**eTable 2.** Differential Change in Unadjusted Outcomes for Emergency Department Visits for Mental Illness at Telepsychiatry and Control EDs (n=134 ED pairs)

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

## eAppendix, Supplemental Methods

### Clinical Classification Software Codes:

Mental illnesses were categorized using the Agency for Healthcare Research and Quality Clinical Classification Software (CCS) for ICD-9-CM and ICD-10-CM diagnosis. Lower volume diagnoses were grouped into a single “other” category. The following CCS Codes were grouped into the “other” category: 650, 652, 655, 656, 658, 663, and 670.

CCS Code	CCS Category	ICD9 Diagnosis Codes	ICD10 Diagnosis Codes
651	Anxiety Disorders	29384 30000 30001 30002 30009 30010 30020 30021 30022 30023 30029 3003 3005 30089 3009 3080 3081 3082 3083 3084 3089 30981 3130 3131 31321 31322 3133 31382 31383	F064 F4000 F4001 F4002 F4010 F4011 F40210 F40218 F40220 F40228 F40230 F40231 F40232 F40233 F40240 F40241 F40242 F40243 F40248 F40290 F40291 F40298 F408 F409 F410 F411 F413 F418 F419 F42 F422 F423 F424 F428 F429 F430 F4310 F4311 F4312 F488 F489 R452 R453 R454 R455 R456 R457 R4581 R4582 R4583 R4584
657	Mood Disorders	29383 29600 29601 29602 29603 29604 29605 29606 29610 29611 29612 29613 29614 29615 29616 29620 29621 29622 29623 29624 29625 29626 29630 29631 29632 29633 29634 29635 29636 29640 29641 29642 29643 29644 29645 29646 29650 29651 29652 29653 29654 29655 29656 29660 29661 29662 29663 29664 29665 29666 2967 29680 29681 29682 29689 29690 29699 3004 311	F0630 F0631 F0632 F0633 F0634 F3010 F3011 F3012 F3013 F302 F303 F304 F308 F309 F310 F3110 F3111 F3112 F3113 F312 F3130 F3131 F3132 F314 F315 F3160 F3161 F3162 F3163 F3164 F3170 F3171 F3172 F3173 F3174 F3175 F3176 F3177 F3178 F3181 F3189 F319 F320 F321 F322 F323 F324 F325 F328 F3281 F3289 F329 F330 F331 F332 F333 F3340 F3341 F3342 F338 F339 F340 F341 F348 F3481 F3489 F349 F39 R4586
659	Schizophrenia and other psychotic disorders	29381 29382 29500 29501 29502 29503 29504 29505 29510 29511 29512 29513 29514 29515 29520 29521 29522 29523 29524 29525 29530 29531 29532 29533 29534 29535 29540 29541 29542 29543 29544 29545 29550 29551 29552 29553 29554 29555 29560 29561 29562 29563 29564 29565 29570 29571 29572 29573 29574 29575 29580 29581 29582 29583 29584 29585 29590 29591 29592 29593 29594 29595 2970 2971 2972 2973 2978 2979 2980 2981 2982 2983 2984 2988 2989	F060 F062 F200 F201 F202 F203 F205 F2081 F2089 F209 F21 F22 F23 F24 F250 F251 F258 F259 F28 F29
662	Suicide and intentional self-inflicted injury	E9500 E9501 E9502 E9503 E9504 E9505 E9506 E9507 E9508 E9509 E9510 E9511 E9518 E9520 E9521 E9528 E9529 E9530 E9531 E9538 E9539 E954 E9550 E9551 E9552 E9553 E9554 E9555 E9556 E9557 E9559 E956 E9570 E9571 E9572 E9579 E9580 E9581 E9582 E9583 E9584 E9585 E9586 E9587 E9588 E9589 E959 V6284	<a href="https://www.cdc.gov/nchs/data/nhsr/nhsr108.pdf">https://www.cdc.gov/nchs/data/nhsr/nhsr108.pdf</a>

650	Adjustment disorders	3090 3091 30922 30923 30924 30928 30929 3093 3094 30982 30983 30989 3099	F4320 F4321 F4322 F4323 F4324 F4325 F4329 F438 F439
652	Attention-deficit, conduct, and disruptive behavior disorders	31200 31201 31202 31203 31210 31211 31212 31213 31220 31221 31222 31223 3124 3128 31281 31282 31289 3129 31381 31400 31401 3141 3142 3148 3149	F900 F901 F902 F908 F909 F910 F911 F912 F913 F918 F919 R460 R461 R462 R463 R464 R465 R466 R467 R4681 R4689
655	Disorders usually diagnosed in infancy, childhood, or adolescence	29900 29901 29910 29911 29980 29981 29990 29991 30720 30721 30722 30723 3073 3076 3077 30921 31323 31389 3139	F642 F840 F842 F843 F845 F848 F849 F930 F938 F939 F940 F941 F942 F948 F949 F950 F951 F952 F958 F959 F980 F981 F9821 F9829 F983 F984 F988 F989
656	Impulse control disorders, NEC	31230 31231 31232 31233 31234 31235 31239	F630 F631 F632 F633 F6381 F6389 F639 R45850
658	Personality disorders	3010 30110 30111 30112 30113 30120 30121 30122 3013 3014 30150 30151 30159 3016 3017 30181 30182 30183 30184 30189 3019	F600 F601 F602 F603 F604 F605 F606 F607 F6081 F6089 F609 F69
663	Screening and history of mental health codes	V110 V111 V112 V114 V118 V119 V154 V1541 V1542 V1549 V6285 V663 V701 V702 V7101 V7102 V7109 V790 V792 V793 V798 V799	Z046 Z134 Z72810 Z72811 Z8651 Z8659 Z91410 Z91411 Z91412 Z91419 Z9149 Z0482 Z0489 Z1330 Z1331 Z1332 Z1339 Z1340 Z1341 Z1342 Z1349 Z9142
670	Miscellaneous mental health disorders	29389 2939 30011 30012 30013 30014 30015 30016 30019 3006 3007 30081 30082 3021 3022 3023 3024 30250 30251 30252 30253 3026 30270 30271 30272 30273 30274 30275 30276 30279 30281 30282 30283 30284 30285 30289 3029 3060 3061 3062 3063 3064 30650 30651 30652 30653 30659 3066 3067 3068 3069 3071 30740 30741 30742 30743 30744 30745 30746 30747 30748 30749 30750 30751 30752 30753 30754 30759 30780 30781 30789 3101 316 64840 64841 64842 64843 64844 V402 V403 V4031 V4039 V409 V673	F509 F5101 F5102 F5103 F5104 F5105 F5109 F5111 F5112 F5113 F5119 F513 F514 F515 F518 F519 F520 F521 F5221 F5222 F5231 F5232 F524 F525 F526 F528 F529 F53 F54 F59 F640 F641 F648 F649 F650 F651 F652 F653 F654 F6550 F6551 F6552 F6581 F6589 F659 F66 F6810 F6811 F6812 F6813 F688 F99 O906 R37 R4589 Z87890 Z9183 F530 F531 F68A

## Regression Specifications

Our main analysis estimated the following regression specification:

$$Outcome_i = \beta_0 + \beta_1(\text{Indicator of Telepsychiatry ED Capacity}_i) + \beta_2(\text{Indicator of Post-Period}_i) + \beta_3(\text{Telepsychiatry ED Capacity} \times \text{Post-Period}_i) + \beta_4(\text{Dual Medicaid Enrollment}_i) + \beta_5(\text{Age Category}_i) + \beta_6(\text{Gender}) + \beta_7(\text{Dual Medicaid Enrollment}_i) + \beta_8(\text{Original Reason for Medicare Enrollment}_i) + \beta_9(\text{Primary Diagnosis for Mental Illness ED Visit}_i) + \beta_{10}(\text{Having} \geq 1 \text{ Inpatient Stay in 90 days Prior to ED Visit}_i) + \beta_{11}(\text{Having} \geq 1 \text{ ED Visit in 90 days Prior to ED Visit}_i)$$
 indexing ED visit  $i$  and clustering at the hospital-level..

For readers interested in the results when we do not adjust for patient characteristics, we present the results of this regression in **eTable 2**:

$$Outcome_i = \beta_0 + \beta_1(\text{Indicator of Telepsychiatry ED Capacity}_i) + \beta_2(\text{Indicator of Post-Period}_i) + \beta_3(\text{Telepsychiatry ED Capacity} \times \text{Post-Period}_i)$$
 indexing ED visit  $i$  and clustering at the hospital-level.

## Testing Pre-Period Trends

To estimate pre-period trends in our outcomes, we used data from 2010-2016, specifically focusing on the 3-year pre-intervention period. There was no differential trend in the three years prior to telepsychiatry adoption for each outcome (see **eTable 1**). We used the following model specification for each outcome:

$$Outcome_i = \beta_0 + \beta_1(\text{Indicator of Telepsychiatry ED Capacity}_i) + \beta_2(\text{Indicator of Period}_i) + \beta_3(\text{Telepsychiatry ED Capacity} \times \text{Period}_i) + \beta_4(X_i)$$
 indexing ED visit  $i$  and clustering at the.

- $X_i$  are beneficiary characteristics as defined in Methods section.

### Prolonged ED Length of Stay Measurement

In the following table we provide examples of the different scenarios and how we captured prolonged ED length of stay ( $\geq 2$  midnights) in each of those.

Scenario	Claim Admission Day	ED Claim Discharge Day	First Professional Claim for Admission Note (CPT 99221-5)	Hospital Admission	ED Length of Stay ( $\geq 2$ midnights)
Discharged from ED	Monday	Wednesday	N/A	N/A	Yes
Transferred to Psychiatry Hospital or Med/Surg bed in a different hospital	Monday	Thursday	N/A	Thursday	Yes
Admitted to Psychiatry or Med/Surg Bed in same hospital	Monday	N/A because admitted	Tuesday	N/A	No

**eTable 1.** Differences in 3 Years Pre-Intervention Period Trends in Outcomes in Telepsychiatry vs. Control EDs (n=134 ED pairs)

Outcome	3 Year Pre-Intervention Period Trend Estimate vs. Control	p-value
Admission to a Psychiatric Bed	0.02	0.71
Admission to a Medical/Surgical Bed	-0.10	0.06
Prolonged ED Length of Stay	0.16	0.19
Mental Illness Spending	48	0.76
Mortality	-0.16	0.14
Mental Health Outpatient Follow-up Care	-0.15	0.20

**eTable 2.** Differential Change in Outcomes for Emergency Department Visits for Mental Illness at Telepsychiatry and Control EDs not adjusting for patient covariates (n=134 ED pairs)

	Adjusting for Patient Covariates			Not Adjusting for Patient Covariates		
	Difference-in-Differences	95% Confidence Interval	p-value for difference	Difference-in-Differences	95% Confidence Interval	p-value for difference
	<b>ED Visits that Result in Admission/Transfer to a Psychiatric Specialty Bed (%)</b>					
Telepsychiatry	4.3%	(3.5, 5.0)	<0.001	3.5%	(2.8, 4.2)	<0.001
Control						
	<b>ED Visits that Result in Admission/Transfer to a Medical Bed (%)</b>					
Telepsychiatry	-2.0%	(-2.8, -1.3)	<0.001	-1.6%	(-2.3, -0.8)	<0.001
Control						
	<b>Prolonged ED length of stay*^ (%)</b>					
Telepsychiatry	3.0%	(1.8, 4.1)	<0.001	2.7%	(1.6, 3.8)	<0.001
Control						
	<b>Spending on Mental Illness 90 Days (mean \$)</b>					
Telepsychiatry	\$292	(83, 501)	<0.01	\$417	(194, 639)	<0.01
Control						
	<b>Mortality in 90 Days following ED Presentation (%)</b>					
Telepsychiatry	0.2%	(-0.1, 0.4)	0.27	0.2%	(-0.1, 0.4)	0.33
Control						
	<b>Mental Health Outpatient Follow-up Care in 2 Weeks following ED Discharge* (%)</b>					
Telepsychiatry	-0.7%	(-3.3, 1.9)	0.54	-0.3%	(-2.9, 2.3)	0.73
Control						

\* Smaller sample, because only available in 20% random sample of Medicare beneficiaries

^ Excessive length of stay defined as a stay in ED that exceeds two midnights