

Original Report:
Achieving Impact:
Community Partners
in Care and Beyond

12-MONTH COST OUTCOMES OF COMMUNITY ENGAGEMENT VERSUS TECHNICAL ASSISTANCE FOR DEPRESSION QUALITY IMPROVEMENT: A PARTNERED, CLUSTER RANDOMIZED, COMPARATIVE-EFFECTIVENESS TRIAL

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Objective: To compare community engagement and planning (CEP) for coalition support to implement depression quality improvement (QI) to resources for services (RS) effects on service-use costs over a 12-month period.

Design: Matched health and community programs (N=93) were cluster-randomized within communities to CEP or RS.

Setting: Two Los Angeles communities.

Participants: Adults (N=1,013) with depressive symptoms (Patient Health Questionnaire (PHQ-8) ≥ 10); 85% African American and Latino.

Interventions: CEP and RS to support programs in depression QI.

Main outcome measures: Intervention training and service-use costs over 12 months.

Results: CEP planning and training costs were almost 3 times higher than RS, largely due to greater CEP provider training participation vs RS, with no significant differences in 12-month service-use costs.

Conclusions: Compared with RS, CEP had higher planning and training costs with similar service-use costs. *Ethn Dis.* 2018;28(Suppl 2):349-356; doi:10.18865/ed.28.S2.349.

Keywords: Depression, Community- Based Participatory Research, Racial Disparities, Cost Analysis, Collaborative Care, Mental Health Services

INTRODUCTION

Depression and depressive symptoms are main causes of disability in the United States and worldwide.¹⁻⁴ Depression is especially challenging in under-resourced communities,⁴⁻⁶ where racial disparities persist in access, quality, and outcomes of care. Collaborative care approaches to depression quality improvement (QI) in primary care can improve quality and outcomes of care for depressed adults and reduce racial disparities.⁷⁻¹⁰ Such models are less available in under-resourced communities, where individuals may receive support outside

of health care in alternative community services, suggesting that multi-sector coalitions may be an effective approach to deliver services. Limited data are available on cost feasibility of implementing coalition-based approaches to collaborative care for depression and costs of resulting services delivery, compared with an alternative such as more standard expert training for individual programs in collaborative care. Community Partners in Care (CPIC) compared the effectiveness of two depression collaborative care implementation approaches: 1) a coalition approach, Community Engagement and Plan-

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ning (CEP) that supported multi-sector coalitions in a 6-month planning process to collaborate in training and monitoring implementation of depression QI tailored to local communities; and 2) more traditional expert technical assistance to individual programs (Resources for Services, RS) through offering a series of webinars and individual primary care practice site visits.¹¹⁻¹³ A Cochrane re-

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view identified CPIC as the only US-based trial of coalition effectiveness relative to alternatives to improve the health of minority communities.¹⁴

Within under-resourced communities, individual health care and community-based programs (eg, faith-based, senior centers, barber shops) were randomized to CEP or RS, and participants who screened positive for depression were offered study enrollment. Enrolled study participants were offered self-report telephone surveys at baseline, 6-month, and 12-month follow-up.¹¹⁻¹³ At 6-month follow-up, compared with

RS, CEP was related to improved participant mental health-related quality of life (MHRQL) and improved several community-prioritized, secondary outcomes (increased physical activity and mental wellness, reduced risk factors for homelessness, and behavioral health hospitalizations).¹² At 12-month follow-up, primary analyses revealed improved MHRQL and reductions in behavioral health hospitalization were associated with CEP compared with RS.¹³ CPIC may be a potential model for integrated system approaches such as Center for Medicare and Medicaid's Accountable Health Communities.¹⁵ Nevertheless, feasibility of CEP's adoption may depend both on start-up intervention planning and training costs, as well as longer-term service use cost. Such costs have not previously been reported.

To address this knowledge gap, we estimated RS and CEP intervention planning and training costs, total service use costs and behavioral health service use costs across health care and social community sectors. We assumed CEP would have higher planning and training costs, but we were uncertain whether service-use costs would decrease under CEP, given prior mixed results in the collaborative care literature on costs and limited knowledge on collaborative care implementation outside of health care settings.^{16,17}

METHODS

Design Overview

The CPIC study and CEP intervention were implemented us-

ing community-partnered participatory research (CPPR), a variant of community-based participatory research (CBPR).^{18,19} CPPR principles of power-sharing, joint-planning, and transparency, as defined in its comprehensive manual,¹⁹ guided all research phases. The study was co-led by UCLA, RAND, Healthy African American Families II, Behavioral Health Services, and Queens Care Health and Faith Partnership. A council of academic and community members supported partnered workgroups to develop and implement action plans.^{11-13,19}

Setting, Participants, Randomization, and Interventions

The study settings were South Los Angeles (SLA) and Hollywood-Metro (HM). Participant sampling (program and client recruitment) and randomization are described in greater detail in prior publications.^{11-13,20} Of 974 participants, 733 (75.2%) participated in the 12-month follow-up. Our analytic sample comprises 1,013 (77% of eligible, 81% of enrolled; 6-month analytic sample minus 5 deceased participants) who completed baseline, or 6-month, or 12-month telephone follow-up surveys.

Both CEP and RS implementation interventions relied on the same evidence-based toolkits to promote depression QI (screening, patient education, care coordination), medication management, and depression cognitive behavioral therapy (CBT).⁹⁻¹³ All materials were available and introduced to program staff and the community-at-large.^{12,13}

before randomization at one-day conferences in SLA and HM.

RS programs were offered through 10 webinars and one site visit on care management, medication management, and CBT between December 2009 and July 2010. Between December 2009 and July 2011, CEP programs participated in partnered workgroups in SLA and HM to develop implementation plans that supported better integration and locally tailored depression QI materials and trainings (conferences; in-person, webinar, and phone-based sessions). CEP programs offered more training and experienced increased staff participation in training relative to RS.

Institutional review boards at RAND and participating agencies requiring separate review approved all research procedures. CPIC was registered as a clinical trial (Clinicaltrials.gov NCT01699789).

Main Outcome Measures

Six- and 12-month client outcomes have been described in prior publications.^{12,13} The primary outcomes for this study were intervention planning and training, as well as service-use costs over 12 months. Service use costs were based on client self-report telephone survey assessed at 6- and 12-month follow-ups. Intervention planning and training costs were based on study records as well as attendance logs from meetings and trainings. We estimated total services utilization costs across all sectors on which we had data: health care, specialty behavioral health, which included alcohol, drugs, and mental disorders (behavioral health); and other social community sectors.

In addition, we estimated behavioral health-specific service use costs across all sectors. Hospitalizations and medication use related to behavioral health were collected but not for other general health conditions.

Cost Measures

We report costs using a modified cost-consequence framework. Generally, cost-consequences analyses present direct and indirect costs as well as consequences in a disaggregated format.²¹ Due to limitations on available data, our modified cost-consequence analysis estimates direct and indirect costs of intervention planning and training and compared intervention effects on service use cost. Service use costs do not include total health care costs (including all inpatient and outpatient services) or total societal costs (including outcomes such as employment or justice involvement).

Intervention planning and training costs included the costs of pre-randomization activities such as screening, a kick-off conference to introduce the study and depression QI toolkits to each community; and post-randomization activities such as training activities (venue rental, travel, participant time, continuing education credits), intervention materials, participants' time for intervention development (estimated from study records as well as attendance logs at meetings and trainings). We calculated participant time costs by multiplying hourly wages by time spent at intervention planning and training activities; we estimated staff attendance through study activity sign-in sheets and time duration from agendas. Participant wages were based on national

averages from 2010 U.S. Department of Labor data.²² Suicide prevention calls (N=320) fielded by investigators under a study adverse event protocol were included in intervention costs because they might be needed in interventions outside of a study context. Pre-randomization activities and suicide calls costs were assigned equally to the interventions. Research-specific costs (research staff, data collection, analysis) were excluded.

We created an aggregate measure of estimated total service-use costs, as well as an estimate of behavioral health / depression-specific costs (eg counseling, education, therapy, psychotropic medications, referral to behavioral health care), based on client-reported visits by sector from baseline, 6-, and 12-month phone surveys. Within both total service use and behavioral health / depression service use costs, we sub-categorized costs associated with psychotropic medications, health care sector (ie, programs / agencies with Medicaid reimbursable services), and social-community sectors. Service use costs were assigned to client-reported visits based on sector type¹¹⁻¹³ using the following cost categories: 1) inpatient hospital nights for behavioral health; 2a) all emergency room visits; 2b) emergency room visits for behavioral health only; 3a) all outpatient primary care visits; 3b) outpatient primary care visits for depression only; 4a) all other social community service visits related to each program's scope (family preservation, prisoner re-entry, faith-based, parks and recreation, senior centers, hair salons, exercise clubs); 4b) other social service visits related to depression only;

and 5) psychotropic medications. The aggregate measure of estimated total service use costs included cost categories 1, 2a, 3a, 4a, 5. Behavioral health / depression-specific measure of service use costs included cost categories 1, 2b, 3b, 4b, 5. Hospitalization and medication data for general health conditions were not collected.

For service use, all costs were updated to 2010 dollars using the Consumer Price Index (Hospital and Related Services)²³ and assigned to client-reported health care use components from 2011 Center for Medicare and Medicaid Services (CMS) payment information for primary care and mental health visits and Diagnosis-Related Groups for behavioral health hospital nights.²⁴ Costs of service visits in community-based sectors were estimated from 2010 US Department of Labor national averages of staff wages (eg, substance abuse counselor, minister, hotline or self-help group volunteer, parks and recreations worker).²³ We calculated the mean costs of a behavioral health-related hospital night (\$898.72); night in residential treatment for alcohol / substance abuse (\$253.26); primary care visit (\$190.66); outpatient specialty mental health visit (\$112.03); emergency department visit (\$274.71); outpatient substance abuse agencies visit (\$42.00); attended self-help or family support groups for behavioral health problem, (\$42.00); calling a hotline for behavioral health problem (\$22.00); social service agency visit (\$59.98); faith-based visit (\$53.22); parks and recreation visit (\$37.06); and other community location (\$42.00). We multiplied client-reported visits by mean service use

visit costs to estimate total and behavioral health / depression-specific costs.

For psychotropic medications, we matched client-reported data on medication names to average daily doses from the World Health Organization's (WHO) Daily Defined Dose index.²⁵ For medications not listed at WHO, we utilized Micromedex to establish average daily dose²⁶ and used 2010 Redbook price data to calculate psychotropic medications costs.²⁷ We calculated indirect service-use costs by multiplying estimated client service-use time (travel, wait times) to an estimate of average client time: 16 hours for hospital nights, alcohol/substance abuse residential treatment, and emergency department visits; 3 hours for all other services. Study participants' time was valued at \$10.00/hour, 25% above California's minimum wage (\$8.00/hour).²⁸

Statistical Analyses

Consistent with group-randomized trial recommendations,²⁹ we adjusted for baseline status of dependent variables and covariates (age, sex, ≥ 3 chronic physical health conditions, education, race/ethnicity, family poverty, 12-month alcohol abuse or use of illicit drugs, 12-month depressive disorder, and community), which were selected to cover sociodemographic and clinical factors expected to affect outcomes. We weighted data for 1,013 participants to characteristics of the eligible sample,³⁰ using item-level imputation for missing data³¹ and wave-level imputation for missing surveys.^{31,32} Weights account for non-enrollment among eligible participants and attrition.

We conducted intent-to-treat

analyses, with intervention status as the independent variable and examined the compared interventions' effects on service use and medication costs using two-part models because of skewed distributions.³³ The first part estimates the probability of positive costs using logistic regression. The second part estimates level of costs, if positive, using ordinary least-squares linear regression. We used smearing estimate for retransformation, applying separate factors for each intervention group to ensure consistent estimates.^{34,35} We adjusted for clustering of participants within programs using the sandwich variance estimator.^{36,37}

RESULTS

Baseline characteristics of 1,013 depressed participants in outcome analysis by intervention status are shown in Table 1. There were no significant differences by intervention status in participant characteristics at baseline.

Table 2 illustrates mean service use and medication costs per client by intervention status and by health care and social community sectors over 12 months. There were no statistically significant differences by intervention status in cost measures: a) total service use costs; b) behavioral health / depression specific service use costs. The mean client service-use cost (all services across sectors) was \$16,802 for RS and \$16,019 for CEP. For behavioral health/ depression-specific services, it was \$14,860 for RS and \$14,239 for CEP. Behavioral health/ depression specific service-use costs delivered in alternative community-based sectors comprised about 4% of

Table 1. Baseline characteristics of depressed participants (N=1,013) in outcomes analysis, by intervention group status^a

Characteristics	Overall (N=1013)	RS (n=501)	CEP (n=512)
Service sector, n(%)			
Primary care or public health	288 (29.9)	133(27.9)	155 (31.8)
Mental health services	194 (17.8)	109 (20.9)	85 (14.9)
Substance abuse	229 (21.8)	110 (21.0)	119 (22.5)
Homeless services	162 (16.4)	92 (18.8)	70 (14.2)
Community-based	140 (14.1)	57 (11.4)	83 (16.6)
Age, years	45.8 ± 12.9	44.9 ± 12.4	46.6 ± 13.2
Female, n (%)	593 (57.0)	285 (54.9)	308 (59.1)
Ethnicity, n (%)			
Latino	407 (41.0)	192 (38.7)	215 (43.2)
African American	485 (45.9)	238 (47.0)	247 (44.9)
Non-Hispanic White	86 (9.3)	45 (9.7)	41 (8.9)
Other	35 (3.8)	26 (4.6)	9 (3.1)
Married or living with partner, n (%)	229 (22.5)	114 (22.4)	115 (22.7)
Less than high school education, n (%)	443 (43.5)	219 (43.6)	224 (43.4)
≥3 chronic medical conditions of 18, n (%)	546 (54.8)	269 (54.5)	277 (55.1)
Family income from work, past 12 months ≤\$10,000, n (%)	750 (73.5)	371 (75.1)	379 (72.0)
Family income under federal poverty level, n (%)	748 (73.9)	371 (74.5)	377 (73.3)
No health insurance, n (%)	543 (54.2)	284 (57.3)	259 (51.2)
Working for pay, n (%)	205 (20.1)	105 (20.7)	100 (19.4)
12-month depressive disorder, n (%)	627 (62.0)	310 (62.6)	317 (61.5)
Probable depression (PHQ-8≥10)	987 (97.9)	487 (97.6)	500 (98.1)
PHQ-8 score, mean (SD)	15.0 ± 4.1	15.1 ± 4.2	14.9 ± 4.1
Alcohol abuse or use of illicit drugs 12 months, n (%)	395 (39.2)	178 (36.2)	217 (42.1)
Poor mental health-related quality of life, n (%) ^b	545 (53.4)	271 (54.1)	274 (52.7)

a. Data are presented as n (weighted %) or weighted mean (SD).

RS, Resources for Services or individual program technical assistance; CEP, Community Engagement and Planning; Plus-minus values are means ±SD; data were multiply imputed and weighted to eligible sample for enrollment; Chi-square test was used for comparing two groups accounting for the design effect of the cluster randomization; P>.30 for all comparisons.

b. MCS-12≤40; one standard deviation below population mean.

behavioral health and total services costs in RS and CEP, respectively. No statistically significant differences were found in the probability of any behavioral health costs in all part-1 analyses using logistic regression.

Intervention planning and training costs were \$114,380 for RS and \$316,415 for CEP, for mean implementation costs per client of \$228.30 for RS and \$618.00 for CEP. Program staff time for participation in planning and training, depression screening, and suicide prevention calls accounted for 88.5% (\$101,234) and 74.3% (\$235,126) of planning and training costs for RS and CEP, respec-

tively, while the mean cost of training per staff member for RS programs averaged \$5,199.05 vs \$1,434.99 for CEP programs (not shown in tables).

DISCUSSION

Study findings suggest that there were no significant differences by intervention status in costs of service use, whether limited to behavioral health-related services or, more broadly, services across all sectors. Our findings are conservative since hospitalization costs are generally more expensive than the DRG costs

used for the current analyses. As a result, CEP costs may have been reduced compared with RS due to the significant reductions in behavioral health hospitalizations at 6 months. Although our study did include data on depression and non-depression service use and contacts in non-health care settings such as faith-based, social services, homelessness services, our study did not include data on hospitalizations or medication use for general health conditions.

As expected, we found that intervention planning and training costs were three times higher for CEP compared with RS. About 74% of CEP's

Table 2. Estimated results of the two-part model on 1-year cost after baseline and Intervention planning / training costs^a

Test	Estimated mean cost (95% CI)			Part-1 ^b		Part-2 ^c	
	RS (N=501)	CEP (N=512)	Group difference	t	P	t	P
Service use and psychotropic medication costs in past 12 months (\$)							
Total cost	16802 (13628, 19977)	16019 (13410, 18629)	-783 (-5205, 3639)	.74	.46	-.40	.69
Psychotropic medications	4052 (3446, 4659)	3910 (3237, 4583)	-142 (-1132, 848)	-1.01	.33	.23	.82
Health care sectors ^d	11406 (8469, 14342)	10708 (7925, 13490)	-698 (-4970, 3574)	.22	.83	-.35	.73
Social community sectors ^e	1395 (1087, 1703)	1349 (1099, 1599)	-46 (-446, 354)	-.02	.98	-.23	.82
Service use and psychotropic medication costs for behavioral health /depression in past 12 months (\$)							
Total cost	14860 (11754, 17966)	14239 (11654, 16824)	-621 (-4994, 3752)	.53	.60	-.38	.71
Psychotropic medications	4052 (3446, 4659)	3910 (3237, 4583)	-142 (-1132, 848)	-1.01	.33	.23	.82
Health care sectors ^d	9687 (6914, 12460)	9393 (6676, 12110)	-294 (-4378, 3790)	.25	.81	-.19	.85
Social community sectors ^e	1042 (755, 1328)	998 (773, 1223)	-44 (-413, 325)	.27	.79	-.34	.73
Intervention planning and training costs (\$)							
Total	114380	316415	-	-	-	-	-
Per study participant	228	618	-	-	-	-	-

a. 2-part model is comprised of part-1 which is the probability of positive cost using logistic regression and part-2 which is the cost given any use using linear regression OLS. Adjusted analyses use multiply imputed data (n=1,013), weighted for eligible sample for enrollment; adjusted for baseline status of the dependent variable, community, age, sex, 3 chronic conditions, education, race/ethnicity, income < federal poverty level, 12-month alcohol abuse or use of illicit drugs, and 12-month depressive disorder; and accounted for the design effect of the cluster randomization.

b. t-test for the intervention effects of positive cost.

c. t-test of the intervention effects for mean cost.

d. Health care sector services include self-reported hospitalizations, ER, primary / specialty Care, mental health, and alcohol / substance use treatment.

e. Social community sector services include self-reported faith-based, social services, senior centers, parks and recreation, homeless serving, exercise clubs, and hair salons.

and 89% of RS's intervention planning and training costs were from staff time for depression screening, suicide prevention calls, and staff participation in meetings and especially trainings.³⁸ Much of the difference in planning and training costs were due to CEP program staff participating in more than 10 times the mean number of training hours than RS. As a result, the mean cost of training per staff member for RS programs averaged \$5,199.05 vs \$1,434.99 for CEP programs. Since interventions were implemented at the program level, intervention material use was not limited to study participants. Because intervention costs were largely fixed for programs, intervention planning and training costs per client may be lower if prorated across all program participants, whether or not enrolled in the

study. We were unable to calculate the marginal costs over time due to completing one round of compared intervention planning and training.

An important ancillary finding is the low cost of the high utilization of community-based depression services outside of health care. A substantial percentage of total service contacts for behavioral health/depression-specific services were in social community sectors,¹¹⁻¹³ but we found that such programs accounted for only about 4% of estimated health costs over 12 months because of low labor costs. Efforts to involve social community sectors in improving depression services, if effective, may also be efficient. Although we cannot comment on how much of CEP's effectiveness relative to RS resulted from activating social community sectors,

increased use of faith-based and park-based services for depression occurred over the first 6 months of follow-up.¹²

Study Limitations

The study has important limitations. We may have underestimated service use cost reductions for several reasons. First, because we compared the added value and cost of a community-engaged intervention relative to technical assistance to implement depression QI, both likely to be effective compared with usual care, as opposed to a comparison with usual care, our study scope was limited. Second, we did not collect hospitalization and medication data for general health conditions, so we cannot estimate complete health care costs. These may have been reduced, given CEP's positive effects on physical ac-

tivity and homelessness risk factors at 6 months.¹² Third, cost estimates did not include facility charges, inpatient professional fees, ancillary services (eg, lab tests, radiology), staff fringe benefits, and justice involvement (eg, incarceration, probation). Fourth, because our sample includes only 1,013 participants, precision was low for definitive estimates of service costs. As noted previously,^{11,12} the study was conducted in two Los Angeles communities where study leaders have a long history of applying CPPR to depression.¹¹⁻¹³ It is unknown whether applying this approach in communities without this history would yield similar effects. Another limitation is that we relied on self-reported data, although this had the advantage of affording data on community-based programs that typically do not keep records (eg, faith-based programs).

CONCLUSION

Overall, this study suggests that engaging programs across health care and social community settings to collaborate in implementing depression collaborative care relative to individual program technical assistance does not substantially increase service use costs across sectors over a year, at least for the types of services assessed. CEP coalition start-up planning and training costs were greater than RS technical assistance costs to support depression QI due to CEP's impact at successfully engaging staff as reflected by increased attendance at planning meetings and evidence-based trainings, relative to RS. At the same time, resulting service costs

over a year are similar to planning and training through time-limited technical assistance. This suggests that if a community or health system is to implement collaborative care, a CEP model may be feasible particularly if extent of provider uptake is an important outcome for the system. Further, prior studies found evidence of consistent benefits of CEP relative to RS, if not for all primary and secondary outcomes and with intervention effects not significant in all sensitivity analyses for outcomes.

More definitive answers to inform policy will require large studies and more complete data supporting cost-effectiveness analyses. However, given the limited data available on coalition effects relative to an alternative, this information may be useful as Medicaid insurers and providers consider how to implement primary-care, depression collaborative care models in Health Resources and Services-defined shortage areas.³⁹ Health care policy initiatives, such as accountable health communities, accountable care organizations, and Medicaid behavioral health homes, provide incentives that may sustain collaborations across health care and social services.^{15,40,41}

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CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Chung,

Ong, Ettner, Jones, McCreary, Ngo, Sherbourne, Dixon, Koegel, Miranda, Wells; Acquisition of data: Chung, Gilmore, McCreary, Dixon, Koegel, Miranda, Wells; Data analysis and interpretation: Chung, Ong, Ettner, Gilmore, McCreary, Ngo, Sherbourne, Tang, Koegel, Miranda, Wells; Manuscript draft: Chung, Ong, Ettner, Jones, McCreary, Ngo, Tang, Wells; Statistical expertise: Chung, Ettner, Tang, Wells; Acquisition of funding: Chung, Ong, Koegel, Miranda, Wells; Administrative: Chung, Jones, Gilmore, McCreary, Ngo, Sherbourne, Tang, Dixon, Koegel, Wells; Supervision: Chung, Ong, McCreary, Koegel, Wells

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