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A Comparative Effectiveness Trial of Depression Collaborative Care: Subanalysis of Comorbid Anxiety

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Abstract

The purpose of this exploratory subanalysis was to compare the effects of two depression quality improvement approaches on clinical outcomes and service utilization for individuals with comorbid depression/anxiety. This study used data from Community Partners in Care, a cluster-randomized comparative effectiveness trial (N= 1018; depression= 360; comorbid depression/

anxiety= 658). Each intervention arm received the same quality improvement materials, plus either technical support (Resources for Services, RS) or support for collaborative implementation planning (Community Engagement and Planning, CEP). For the comorbid depression/anxiety subgroup, the collaborative planning arm was superior at improving mental health-related quality of life and mental wellness, as well as decreasing behavioral hospitalizations and homelessness risk at six months. The effects were not significant at twelve months. A collaborative planning process versus technical support for depression quality improvement can have short-term effects on mental wellness and social determinants of health among those with comorbid depression/anxiety.

Keywords

Depression; Anxiety/Stress; Community; Adults; Experimental or quasi-experimental

Depression and anxiety commonly co-occur among adults in the United States (US). Approximately 10% of US adults will have a depressive episode in their lifetime with slightly less than half of individuals with depression experiencing a co-morbid anxiety disorder (Kessler et al., 2015). Comorbid depression and anxiety disorders (e.g. generalized anxiety disorder [GAD], panic disorder, agoraphobia, or social anxiety disorder) have been shown to lead to greater functional impairment, diminished quality of life, and poorer treatment outcomes than depression without anxiety (Brown, Schulberg, Madonia, Shear, & Houck, 1996; Bruce et al., 2005; Gorman, 1996). Similarly, adults with co-morbid depression and obsessive-compulsive disorder (OCD) or posttraumatic stress disorder (PTSD) have also been shown to be associated with poorer outcomes than depression without co-morbid OCD or PTSD. Depression/anxiety comorbidity is associated with sociodemographic vulnerabilities affecting community populations and low-resource communities who may be unengaged or under-engaged in treatment (de Graaf et al., 2002). Given the patterns of risk factors and poor outcomes for comorbid depression/anxiety, clinical and community interventions are needed that are effective for persons with such comorbidity.

While there are existing evidence-based clinical interventions for depression/anxiety (e.g., cognitive behavioral therapy, antidepressant medications), these interventions are not always well-suited to the needs, preferences, cultural values, and access limitations of minority and low-resource communities at high risk for poor treatment access and outcomes (Miranda, Azocar, et al., 2003; Miranda, Duan, et al., 2003). Service delivery is further complicated by the disproportionately high levels of social disparities, such as homelessness, poverty, education, employment, and family difficulties among adults with mental illness (Allen, Balfour, Bell, & Marmot, 2014). In an effort to address persistent depression disparities, in 2008, an interdisciplinary group of clinicians, researchers, and community members in Los Angeles, California, developed the Community Partners in Care (CPIC) trial (Wells, Jones, et al., 2013). This cluster, randomized, comparative effectiveness trial used a novel *community-partnered participatory research* (CPPR) approach to design and implement a study comparing the effects of two program-level implementation approaches for evidence-based quality improvement programs for depression, on outcomes with highly vulnerable

communities. The CPPR approach builds on the framework of Community-Based Participatory Research by promoting community, patient and provider stakeholders as equal collaborators in all stages of research, from development to implementation and dissemination (Jones & Wells, 2007; Pavlish & Pharris, 2011). The model emphasizes true power sharing through principles of trust, respect, transparency and two-way knowledge exchange.

Prior to the CPIC study, the Partners in Care study conducted by the same research group found that collaborative care for depression in primary care could improve health outcomes as much or more for racial/ethnic minorities as for whites (Miranda, Azocar, et al., 2003; Miranda, Duan, et al., 2003; Wells et al., 2000). The CPIC study extended this work by exploring how collaborative care could be implemented across under-resourced communities through healthcare and social-community programs and compared two approaches to do so: either expert technical assistance to individual programs or multi-sector collaboration through a coalition model. Community members were extensively involved in the co-design, co-implementation, and co-dissemination of the CPIC study in an academic-community partnership, a role which extended beyond usual limited community member opportunities for advising or participating in clinical trials (Chung et al., 2010). For example, the community partners expanded the planned focus on social services and community-based programs by including “community trusted locations” where mental health care might be sought including churches, parks and recreation-operated community/senior centers, fitness centers, and barber/beauty shops, as well as services for additional community-prioritized special populations including homeless, prisoner re-entry and substance misuse clients. Further, all publications and presentations of findings from the CPIC study are co-authored and co-presented with community partners, even in settings such as academic conferences where community members are not usually represented. More detailed information about the CPPR process specific to the CPIC study is reported elsewhere (Chung et al., 2010).

The CPIC study used this community partnership framework to compare two program-level implementation interventions for depression quality improvement programs based on an expanded collaborative care model across under-resourced communities. Resources for Services (RS) was a more traditional approach to implementing collaborative care depression toolkits for individual using a “train-the-trainer” approach through an expert team offering webinars, and for primary care sites, a site visit. Community Engagement and Planning (CEP) involved a CPPR planning process to design the implementation of depression collaborative care with programs collaborating together across health and community sectors, through a four-month planning process followed by implementation of tailored trainings. Both interventions were based on the same evidence-based depression toolkits supporting team management, care management, Cognitive Behavioral Therapy (CBT) and clinical assessment and medication management, but the CEP intervention involved a collaborative planning process while the RS intervention did not. Overall, the study found that CEP was more effective than RS at improving mental health-related quality of life, increasing physical activity, reducing risk factors for homelessness, and shifting service utilization away from hospitals and specialty mental health clinics toward primary care and community-sector services, at 6-month follow-up (Wells, Jones, et al., 2013). There was evidence for some continued effects on reducing poor mental health-related quality of

life and behavioral health hospitalizations over 12 months of follow-up, although in some sensitivity analyses findings were not statistically significant (Chung et al., 2017).

Prior secondary analyses of subgroups within the larger CPIC study sample confirmed that some effects observed for the sample as a whole also applied to key subgroups (gender subgroups and individuals with serious mental illness; Castillo et al., 2018; Mehta et al., 2017; Ngo et al., 2016). The CPIC study has not yet explored intervention effects for those with comorbid depression and anxiety. Although the study was not specifically designed to capture intervention effects in this subgroup, comorbid depression/anxiety was an area of interest for the community and clinical stakeholders. Given that almost half of those with a depressive disorder experience a comorbid anxiety disorder, it is important to understand whether a collaborative care approach to depression treatment implementation has efficacy for comorbid anxiety. In studies of depression collaborative care, those with comorbidities are often not eligible to participate, and although the CEP intervention was not primarily tailored to comorbidities, this approach to collaborative care—which included some instructions for modifications to address comorbidities and development of a rich service network—presents a unique opportunity to understand the effects of a collaborative care approach for comorbid depression/anxiety. Literature reviews suggest that collaborative care and for depression and anxiety disorders separately, are effective, but comorbidity of the two disorders has yet been extensively studied, particularly for low-resource communities (Archer et al., 2012; Young & Skorga, 2013). Furthermore, prior studies of collaborative care approaches to depression or anxiety focused on clinical settings without incorporation of community-based services in nonclinical settings.

The purpose of this exploratory, sub-analysis was to determine whether the favorable effects of the coalition (Community Engagement and Planning, CEP) intervention relative to a non-coalition, technical assistance-only approach (Resources for Services, RS) can be confirmed within the subgroup with anxiety disorders and to explore whether there is a significant difference in key outcomes between those with and without comorbid anxiety disorders. Our study hypothesis was that the CEP intervention would be superior to the RS intervention for those with depression-only and for those with comorbid depression/anxiety. Given that comorbid depression/anxiety is often more severe than depression alone, finding intervention efficacy for this subgroup would lend greater support for intervention scale-up and dissemination.

Methods

Design

This study was a secondary analysis of data from the first twelve months of client follow-up data from CPIC, a cluster-randomized comparative effectiveness trial (Murray, 1998). The trial compared two implementation interventions for depression quality improvement toolkits across health and community-based programs in low-resource settings. The CPIC study used a community-partnered participatory research (CPPR) approach to conduct the trial in partnership with community members in Los Angeles. Funded in 2007 and not considered a clinical trial by NIMH, the trial was registered post client enrollment at [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01699789) (NCT01699789).

Interventions

Two program-level, interventions were compared. Both interventions were designed to enhance implementation of evidence-based collaborative care for depression that was adapted for healthcare and community settings (Wells, Jones, et al., 2013). They both included a toolkit with resources for cognitive behavioral therapy (CBT), clinical assessment, medication management, and case management (services by a nurse, social worker, or other trained staff person with clinical supervision; the case manager communicated care goals between the provider and client, served as a client supporter and advocate, and provided patient education) (Landry et al., 2016; Miranda, Duan, et al., 2003; toolkit available at www.communitypartnersincare.org). The toolkit manuals included attention to identifying comorbid conditions and modifying treatment strategies for comorbid conditions, a standard component of depression collaborative care. The Resources for Services (RS) arm offered technical assistance through a “train-the-trainer” approach to support implementation of the toolkit. Training was offered through webinars (12–14 per community) and site visits for primary care sites, with expert trainers including a nurse care manager, a psychologist, three psychiatrists, a community service administrator, and staff support. The training included information on CBT, medication management, patient education, case management, and team-based management with information about when to make referrals for clients needing more intensive mental health or social services (Chung et al., 2010). Community Engagement and Planning (CEP), supported multi-sector coalitions in four months of biweekly meetings to develop collaboration plans for training and fit training to the needs and cultures of communities, with a written implementation plan that was then supported in implementation and monitoring over a year. Additionally, community representatives and leaders co-led toolkit trainings. In comparison to the RS arm, the CEP arm developed more training sessions, involved community leadership, and promoted innovations such as developing a lay-person led group education program in CBT principles, but both arms received the same toolkits. Programs were encouraged, but not required, to use the toolkit resources and client participants were free to seek and use services in any sector they wished. The CEP approach relative to RS led to greater program and provider participation in depression trainings and among nonlicensed providers, to greater use of therapeutic practices and time spent delivering community services (Chung et al., 2017; Landry et al., 2016).

Setting and Sample

The study took place in two low-resource communities in Southern California, South Los Angeles and the Hollywood-Metropolitan area. Eligible programs provided mental healthcare, primary care, substance use services, social services (homeless-serving, prisoner re-entry or family preservation) or community-based services (faith-based, park and recreation community or senior centers, hair salons), were financially stable (i.e., not expecting to close during the study period), offered services for adults or parents of child clients, served a minimum of 15 clients/week, with at least one staff member and did not focus exclusively on persons with psychotic disorders or home services. Relevant programs were identified through county listings and nominations from community partners and were contacted and screened for potential eligibility and preliminary enrollment. Of 60 potentially eligible agencies with 194 programs, 133 identified as potentially eligible were assigned to

the two intervention arms (RS= 65; CEP= 68). Following blinded site visits by research staff to finalize enrollment, 20 programs were found to be ineligible (i.e., did not meet one or more of the eligibility criteria described above), and 18 programs declined to participate in the trial, for a final count of 95 programs from 50 agencies (RS= 46; CEP= 49).

Clients were screened from March 2010 to November 2010 on several designated days per program. All potential clients were enumerated and approached consecutively in randomly assigned order at programs, except for two programs where clients were approached while they were waiting in lines to receive free meals. For these programs, clients were selected from food lines using a random number generator (Castillo et al., 2018). A total of 4649 adults were approached, and 4440 agreed to screening. Clients were eligible to participate if they were willing to provide their contact information and had a score of 10 or greater on the 8-item version of the Patient Health Questionnaire (PHQ-8) (Kroenke et al., 2009; Razykov, Ziegelstein, R. C., Whooley, M. A., & Thombs, 2012), adapted to have 2 versions of one item with and without the word depression (Wells, Jones, et al., 2013). There were 1322 total adults eligible to participate in the study, and 1246 (94.3%) consented (Wells, Jones, et al., 2013).

Baseline telephone interviews were conducted by research staff who were blinded to intervention status from April 2010 to January 2011. A total of 981 clients (79% of enrollees) completed a baseline telephone survey. Six-month telephone follow-up surveys were conducted from November 2010 to August 2011, and 759 clients participated. Twelve-month telephone surveys were conducted from May 2011 to March 2012, and 733 clients participated. Eligibility criteria for the main analytic sample were that clients enrolled in the study, completed at least one survey at baseline or 6 months (i.e., completion of baseline was not required), and had not died by 6 months. For the 12-month sample, 5 participants were found to have died, so the sample was reduced to 1013 for those analyses. (Wells, Jones, et al., 2013). The study main analytic sample was comprised of 1018 clients (77% of those eligible, 82% of those enrolled).

Variables

We used baseline, 6-month, and 12-month data to address our study aims. Inclusion criteria required the presence of at least mild depressive symptoms (PHQ-8 score ≥ 10 , counting a positive response to either version of the one item with and without the word depression), and anxiety that was defined as concurrent lifetime panic disorder, current agoraphobia, generalized anxiety disorder (GAD) in the past 6 months, generalized social phobia (SAD) in the past month, or PTSD in the past month as measured by the Mini-International Neuropsychiatric Interview (MINI) for *DSM-IV* (American Psychiatric Association [APA], 2000; Sheehan & Lecrubier, 2002). The primary outcomes for this study were depression status measured by PHQ-8 scores of 10 or greater, poor mental health-related quality of life measured by scores less than or equal to 40 on the mental component summary score of the 12-item Short Form Health Survey (MCS-12; Ware, Kosinski, & Keller, 1996). In addition, we the Generalized Anxiety Disorder 7-item (GAD-7) scale as a secondary outcome, measured at 12 months only (Spitzer, Kroenke, Williams, & Löwe, 2006; Wells et al., 1989). We examined as exploratory outcomes, service utilization measures for a six-month look-

back period prior to six and 12-month follow-ups by client self-report, including healthcare utilization (any healthcare sector visits for depression), social/community service utilization (any community sector visit for depression), and use of any antidepressant. We also included community-prioritized outcomes identified through the CPPR process, which is described in detail elsewhere (Chung et al., 2010; Wells, Tang, et al., 2013). The community-prioritized outcomes were as follows:

1. Mental wellness, defined as having feelings of calmness, peacefulness, energy, or happiness in the past four weeks;
2. Self-reported behavioral health hospitalizations; and
3. Current homelessness or risk for chronic homelessness, defined as having at least 2 of the following risk factors in the past 6 months:
 - a. Having no place to stay for at least 2 nights;
 - b. Eviction from a primary residence;
 - c. Experiencing a financial crisis; or
 - d. Food insecurity.

Because the focus of community stakeholders was on reducing homelessness and risk for chronic homelessness, the selected homelessness risk factors were based on empirical evidence and established frameworks for what factors are associated with chronic homelessness (Apicello, 2010; Gundersen, Weinreb, Wehler, & Hosmer, 2003).

Analysis

We first used univariate and bivariate statistics to describe the sample on sociodemographic and clinical characteristics at baseline. We used Chi-square tests to assess differences between the CEP and RS arms within the comorbid depression/anxiety subgroup, within the depression-only group, and overall. To address our main study aims, intent-to-treat, comparative-effectiveness analyses models were estimated, using logistic regression models for dichotomous outcomes, and linear regression models for continuous outcomes stratified by the baseline comorbid depression/anxiety status. The independent variable was intervention status (CEP, RS). Covariates for the models were the baseline status of the dependent variable, age, race/ethnicity, education, 12-month depressive disorder, and community. Results from logistic regression models are presented as odds ratios (OR) and linear regression models are presented as between-group differences with 95% confidence intervals. Results are illustrated using standardized predictions generated from fitted regression models (Korn & Graubard, 1999). Significance of comparisons by intervention status was based on regression coefficients, using two-sided tests with $p < 0.05$. To address missing data for non-enrollment among eligible clients and to account for attrition, we used non-response weighting (Groves, Dillman, Eltinge, & Little, 2002; Korn & Graubard, 1999). Additionally, we used hot-deck multiple imputation for item nonresponse and an approximate Bayesian bootstrap for unit non-response among the analytic sample (Lavori, Dawson, & Shera, 1995; Little, 1988). Data were missing at rates of 5% or less for all variables except baseline income and MINI variables, which had higher rates of item-level

non-response. We used Taylor series linearization with a subpopulation statement in SUDAAN version 11.0.1 (<http://www.rti.org/sudaan/>) which accounted for clustering of clients within programs, weighting, and multiple imputations (Binder, 1983; Rubin, 1987). We also fit models using the full sample including indicators of intervention status, comorbid anxiety status and their interaction. None of the interactions between comorbid anxiety status and intervention status were significant (Online Resource 1).

Results

Among CPIC participants, 658 (64.6%) and 360 (35.4%) of participants met our criteria for comorbid depression/anxiety and depression-only, respectively. For the comorbid depression/anxiety group, the mean age was 46 years ($SD= 12$), the mean PHQ-8 score was 15.9 ($SD= 4.1$), and the mean MSC-12 score was 38.0 ($SD= 7.2$). The CEP and RS arms did not differ significantly from one another within the comorbid depression/anxiety group on any of these variables. For the depression-only group, the mean age was 46 years ($SD= 14.2$), the mean PHQ-8 score was 14.1 ($SD= 3.6$), and the mean MSC-12 score was 41.5 ($SD= 7.0$). The two intervention arms also did not differ significantly within the depression-only group, although comparing the comorbid depression/anxiety and depression-only groups overall, the depression-only group had significantly higher MSC-12 scores and comorbid depression/anxiety group had significantly higher PHQ-8 scores. There were no statistically significant differences between the RS and CEP study arms for any sociodemographic variables for those with comorbid anxiety. The RS and CEP arms were similar in the depression-only group for all baseline variables except poverty; the CEP arm had a higher proportion of participants living in poverty (77.% in CEP versus 57% in RS; $P= 0.039$).

There were significant differences between the depression-only and comorbid depression/anxiety subgroups in bivariate tests comparing participants on sociodemographic and clinical characteristics. The comorbid depression/anxiety group had a higher burden of illness compared to the depression-only group (see Table 1).

Sixty-two percent of those with comorbid depression/anxiety had 3 or more chronic illnesses, compared with 42.4% of participants with only depression ($P< .001$). The comorbidity group had more participants with a past 12-month depressive disorder (78.3% versus 32.1%, respectively; $P< .001$), more participants with past-12 month alcohol or illicit drug use (46.2% versus 26.7%, respectively; $P< .001$), and fewer participants endorsing mental wellness (31.0% versus 55.5%, respectively; $P< .001$). The comorbid depression/anxiety group had higher average PHQ-8 scores ($M= 15.6$, $SD= 4.2$, $P< .001$), and the depression-only group had higher MSC-12 scores (i.e., higher mental health-related quality of life) ($M= 41.5$, $SD= 7.0$, $P< .001$). The depression-only group (see Table 2) had more participants who were married or partnered than those with comorbid depression/anxiety (27.7% versus 19.8%, respectively; $P= 0.003$) and more participants who were employed (26.1% versus 16.6%, respectively; $P= 0.001$).

More than half of participants in the comorbid depression/anxiety group (63.4%) had multiple risk factors for chronic homelessness, while 37.2% of participants in the

depression-only group had multiple risk factors for chronic homelessness risk ($P < .001$). The entire sample had relatively high levels of sociodemographic and clinical vulnerabilities, but overall, the comorbid depression/anxiety subgroup had higher proportions of participants with these vulnerabilities than those in the depression-only subgroup.

Six months following baseline, participants with comorbid depression/anxiety in the CEP arm in comparison to the RS arm had lower odds of endorsing poor mental health-related quality of life ($OR = 0.62$), decreased odds of having multiple risk factors for chronic homelessness ($OR = 0.51$), decreased odds of a behavioral health hospitalization ($OR = 0.46$), and higher odds of endorsing mental wellness ($OR = 1.84$) (see Table 3).

There were no significant differences between the intervention arms on odds of having a positive depression score, GAD-7 score, or outpatient service utilization indicators for the comorbid depression/anxiety subgroup. There were no significant differences between the CEP and RS arms for the depression-only group at six months (Online Resource 1). At twelve months, there were no statistically significant differences between the RS versus CEP intervention arms for either the comorbid depression/anxiety group or the depression-only group.

Discussion

This study used data from the CPIC cluster-randomized comparative effectiveness trial to examine the effects of a more standard expert technical assistance implementation approach to depression quality improvement intervention (RS) versus a CPPR-based, multi-sector coalition approach to depression quality improvement intervention (CEP) for adults with depression who visited a range of clinical and non-clinical, community-based services settings. This study focuses on comparison of intervention effects among persons with comorbid depression and anxiety. Our hypothesis was that the CEP intervention would be superior to the RS arm for those with comorbid depression/anxiety, and this hypothesis was supported for 6 months follow-up. The study found CEP was superior to RS at improving mental health-related quality of life and mental wellness, as well as decreasing behavioral hospitalizations and homelessness risk, six months following baseline. These 6-month effects span the range of primary and community-prioritized outcomes for the main study which may be important for treatment engagement. While statistically significant intervention effects were not found for the depression-only group, the direction of the effects favored CEP, and the lack of statistical significance may have been due to the smaller sample size and limited statistical power for this subgroup. Similarly, in exploratory analyses we did not find significant interaction effects between intervention status and presence or absence of comorbid anxiety, which may reflect lack of statistical power for interactions, and is consistent with main results applying across subgroups—even while we can confirm 6-month intervention effects within the comorbid anxiety group specifically.

We did not observe significant intervention effects for either subgroup at 12 months, which had more limited outcome effects in the main study than at 6 months. Both intervention groups improved relative to baseline, but there was no usual care control group and it is possible that the non-significant 12-month findings were due partly to the comparative

effectiveness nature of the study without a non-intervention control group. The positive effects of CEP intervention found in this subanalysis are effects over and above RS effects because technical trainings on the same toolkits were available in both arms of the study. The lack of significant long-term intervention effects may also be related to lower statistical power for subgroup than for main analyses, as the original study was not designed to power this analysis. The population was very under-resourced, and analyses of service utilization among the CPIC sample over the first 12 months showed declining use of services over time (Ong et al., 2017), so there could be lower intervention exposure. Thus, the highest exposure to the intervention and strongest effects observed were short-term. At the same time, the lack of significant intervention effects at 12 months may suggest that overall results for the main sample apply across subgroups, but this cannot be confirmed at this time point for either subgroup while the 6-month effects can be confirmed for the comorbid anxiety subgroup. The CEP intervention appears to be effective for short-term outcome improvement for clients with comorbid anxiety, as was the case for those with severe mental illness. Individuals with comorbid mental illness may require services, support, or reinforcement of collaborative care principles across different sectors or community programs because of their increased illness complexity (Castillo et al., 2018). A collaborative, coalition approach to service delivery like that of the CEP intervention in our study may hold potential for targeted, tailored interventions for complex clients, an issue for future research.

This subgroup analysis of individuals with comorbid depression and anxiety found similar results to the parent CPIC study at 6 months, confirming the positive effects of CEP for individuals with psychiatric comorbidity. This is a promising finding given past studies showing smaller treatment effects for those with comorbid depression/anxiety versus those with depression alone (Brown et al., 1996; Bruce et al., 2005; Gorman, 1996). Our findings suggest that collaborative care planning at the community level may offer community members new opportunities for understanding depression services and how to seek care.

This study highlights the promising nature of sharing depression care tasks and education across clinical and nonclinical settings and through licensed and nonlicensed providers. Involving community-sector programs from faith-based centers, parks and recreation centers, fitness centers, and barber or beauty shops facilitated implementing some depression services in under-resourced settings through trusted community settings. While professional clinical intervention is often necessary in cases of mental illness in under-resourced communities, the CPIC study suggests that trusted community organizations and leaders may be important partners to clinical agencies in disseminating mental health resources. This finding is consistent with prior studies of task shifting in mental health and nursing to lay providers finding positive results (Javadi, Feldhaus, Mancuso, & Ghaffar, 2017; Buttorff et al., 2012; Weaver & Lapidus, 2018). Likewise, there is evidence that community co-location of services can improve service access and utilization (Rich et al., 2001). In the parent CPIC study, training participation increased under CEP relative to RS across provider groups and use of therapeutic skills improved among nonlicensed providers (Chung et al., 2015; Landry et al., 2016). Coordinating mental health outreach, screening, and service delivery activities with community partners has potential to improve access and utilization outcomes for under-resourced or hard-to-reach populations, as our study demonstrated for those with comorbid depression/anxiety.

The CEP approach may facilitate the development of multi-sector care networks where tasks and information are shared among partners (e.g., screening/referral done by a faith organization, medications provided by primary care, and housing by a social service agency). In the CPIC study, partnered networks formed not only between community/healthcare sector organizations, but also among healthcare disciplines (e.g., public health, primary care, nursing), consistent with the Institute of Medicine recommendation to integrate public health and primary care for individual healthcare services, efforts to address social and environmental determinants of health, and public health activities to address health behaviors and exposures (Institute of Medicine, 2012). The CPIC approach and our findings around comorbidity offer community health nurses a framework for facilitating collaboration processes through community engagement and tailoring services to heterogeneous communities for improved patient-centered care. By establishing rich service networks where social services and healthcare can be individualized, community members with mental illness comorbidities may be more likely to receive appropriate screening, assessment, and treatment. Our study suggests that it is feasible to include comorbid anxiety in depression collaborative care efforts, as people benefit. Future studies should explore what further adaptations to collaborative care may be helpful for tailoring services to such comorbidity and what other effects may be observed as a result.

While mental health and illness have become more visible, there is still a need for trust building between healthcare providers and vulnerable communities. In an adaptation of the CPIC coalition approach (CEP) for community disaster resilience, investigators relied on public health nurses for facilitating coalitions that involved task-shifting and task-sharing with licensed and non-licensed staff (Wells, Tang, et al., 2013). Nurses also played important intervention roles in CPIC, in clinical and some community-based settings. The CPIC approach to collaborative care, to some extent in both intervention arms, emphasized the importance of bridge roles between community and healthcare organizations, roles well suited to nurses in many contexts that may facilitate building trust, particularly for care around mental illness. Supporting community voices and integrated decision making with communities are key components of this process.

There are several limitations to this study that should be considered in interpreting the results. The study relied on self-report measures at all time points. The study was conducted in communities where some leaders were experienced with community-partnered research and it is possible that this experience and history of trust led to stronger implementation of the research aspects of the study and successful implementation of the CEP model. As such, it is important to replicate the study in other communities where community-partnered research may be less common and include capacity building for the research aspects of the partnership (Pavlish & Pharris, 2011). Agency response rates were moderate, and the study may have had more committed agencies to research and change with stronger results, but it is also possible that broader agency participation may have further strengthened coalition effects. However, response rates were high for programs within agencies as well as for clients within programs. The CPIC study was not specifically designed for this sub-analysis and power was limited for longer-term outcomes and for testing interaction effects. However, it is promising that there is confirmation of some intervention effects within the comorbid depression/anxiety group. The intervention effects were not significant for GAD

scores, which suggests that a stronger emphasis on management of comorbid anxiety might strengthen intervention effects in subsequent studies. Additionally, future studies should explore the effectiveness of strategies to sustain effects, both for individuals as they switch systems/service sites (e.g., technology reinforcement) or for programs through ongoing education/quality improvement or strengthening some collaborative care components, such as systematic outcomes tracking supported by information technology advances, not included in this study. There were strengths to the study as well. The study was one of the largest randomized comparative effectiveness trials of a coalition versus an alternative approach (CEP versus RS) for health of minority communities, according to a Cochrane Collaborative Review (Anderson et al., 2015). The study used a CPPR approach and involved community members in all aspects of the study while maintaining rigorous experimental research methodology in under-resourced communities.

This subgroup analysis within the context of the parent CPIC findings suggests that a collaborative, multi-sector program-level implementation intervention (CEP) for depression quality improvement relative to a technical assistance implementation approach (RS) has moderate, significant, short-term effects on improving mental wellness, reducing behavioral health hospitalizations, and having multiple risk factors for chronic homelessness for those with comorbid depression/anxiety. The CPPR implementation process in the CEP arm was superior to the RS arm for a range of 6-month outcomes, demonstrating the importance of an equitable, partnered community planning process for achieving positive client outcomes. The CPIC study was designed to sample under-resourced communities with multiple sociodemographic risk factors in addition to psychiatric comorbidity. The findings are promising given the known challenges of improving outcomes for under-resourced communities and reducing disparities including for clinically complex groups such as those with depression and comorbid anxiety. CEP may be a useful approach for nurses and other healthcare providers to facilitate depression care in underserved communities and broaden healthcare/community networks. Equitable partnerships can engage underserved, difficult-to-reach individuals in care and break down barriers across and within communities and healthcare sectors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Baseline Comparison Between RS and CEP Groups for Comorbid Depression/Anxiety Group (N= 658)

	N (%)	N (%)	N (%)	p-value
	Overall	RS	CEP	
Female sex	368 (54.4)	177 (52.3)	191 (56.4)	0.587
Married/partnered	131 (19.8) ^a	68 (20.2)	63 (19.5)	0.847
Less than high school education	281 (42.1)	143 (43.4)	138 (40.9)	0.634
3 chronic medical conditions of 18	398 (61.5) ^a	203 (63.1)	195 (60.0)	0.591
Poverty	490 (74.4)	254 (78.5)	235 (70.5)	0.105
Uninsured	359 (55.2)	193 (59.7)	166 (50.8)	0.209
Employed	109 (16.6) ^a	60 (18.0)	50 (15.3)	0.526
Homelessness risk	410 (63.4) ^a	214 (67.3)	195 (59.6)	0.195
Depressive disorder in past 12 months	514 (78.3) ^a	254 (78.5)	260 (78.1)	0.91
Alcohol abuse or use of illicit drugs in past 12 months	302 (46.2) ^a	136 (42.4)	166 (49.9)	0.262
Mental wellness	205 (31.0) ^a	98 (30.0)	107 (32.0)	0.594

^aOverall group comparison of comorbid depression/anxiety versus depression-only differed significantly.

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Table 2

Baseline Comparison Between RS and CEP Groups for Depression-Only Group (N= 360)

	N (%)	N (%)	N (%)	p-value
	<u>Overall</u>	<u>RS</u>	<u>CEP</u>	
Female sex	227 (61.8)	109 (59.5)	118 (63.9)	0.599
Married/partnered	100 (27.7) ^a	48 (27.1)	52 (28.2)	0.859
Less than high school education	165 (46.2)	78 (44.2)	86 (48.0)	0.608
3 chronic medical conditions of 18	150 (42.4) ^a	67 (38.1)	82 (46.4)	0.194
Poverty	260 (72.5)	119 (67.0)	142 (77.5)	0.039
Uninsured	186 (52.2)	93 (53.0)	93 (51.5)	0.85
Employed	96 (26.1) ^a	45 (25.4)	50 (26.8)	0.801
Homelessness risk	129 (37.2) ^a	69 (40.8)	60 (33.9)	0.28
Depressive disorder in past 12 months	115 (32.1) ^a	57 (32.6)	58 (31.6)	0.857
Alcohol abuse or use of illicit drugs in past 12 months	96 (26.7) ^a	44 (25.0)	52 (28.3)	0.667
Mental wellness	202 (55.5) ^a	101 (56.4)	100 (54.7)	0.763

^aOverall group comparison of comorbid depression/anxiety versus depression-only differed significantly.

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Table 3

Intervention Effects on outcomes and service use at 6 and 12 months follow-up among participants with Comorbid Depression/Anxiety and Depression Only

	Comorbid Depression/Anxiety				Depression Only				
	RS Estimate	CEP Estimate	OR or Difference Estimate	RS Estimate	CEP Estimate	OR or Difference Estimate	RS Estimate	CEP Estimate	OR or Difference Estimate
Primary Outcomes									
MCS12<=40									
6 months	56.6 (49.6, 63.3)	44.9 (38.7, 51.3)	0.62 (0.45, 0.86)**	42.3 (35.3, 49.7)	42.0 (33.1, 51.5)	0.99 (0.61, 1.61)			
12 months	53.4 (46.5, 60.2)	46.7 (40.4, 53.2)	0.76 (0.53, 1.08)	45.8 (36.6, 55.4)	40.6 (30.6, 51.3)	0.80 (0.47, 1.36)			
PHQ8>=10									
6 months	73.8 (66.5, 80.0)	70.1 (61.5, 77.5)	0.82 (0.47, 1.46)	53.8 (43.4, 64.0)	45.6 (35.1, 56.5)	0.70 (0.37, 1.34)			
12 months	68.5 (62.1, 74.2)	65.8 (56.0, 74.5)	0.88 (0.54, 1.44)	49.4 (40.6, 58.1)	52.5 (43.2, 61.6)	1.14 (0.70, 1.87)			
GAD Score									
12 months	10.7 (9.7, 11.7)	10.0 (9.0, 11.0)	-0.73 (-2.19, 0.74)	7.5 (6.2, 8.7)	7.7 (6.5, 8.9)	0.26 (-1.25, 1.77)			
Community-prioritized outcomes									
Homelessness risk									
6 months	45.8 (39.0, 52.9)	31.6 (23.9, 40.4)	0.51 (0.31, 0.86)*	28.7 (20.0, 39.3)	26.1 (18.9, 34.7)	0.86 (0.47, 1.58)			
12 months	37.2 (30.3, 44.7)	36.3 (30.0, 43.1)	0.96 (0.63, 1.46)	22.4 (13.8, 33.9)	30.6 (21.1, 42.0)	1.62 (0.91, 2.89)			
Behavioral health hospitalizations									
6 months	12.4 (8.8, 17.2)	6.3 (3.5, 11.0)	0.46 (0.23, 0.90)*	7.1 (3.1, 15.0)	5.0 (2.2, 10.7)	0.69 (0.18, 2.63)			
12 months	5.7 (3.4, 9.4)	4.5 (2.7, 7.4)	0.76 (0.36, 1.61)	3.8 (1.5, 9.2)	4.0 (1.7, 9.2)	1.05 (0.29, 3.89)			
Mental wellness									
6 months	26.9 (21.7, 32.9)	39.7 (33.0, 46.9)	1.84 (1.14, 2.99)*	46.9 (37.8, 56.2)	56.3 (49.0, 63.3)	1.49 (0.88, 2.54)			
12 months	41.2 (32.2, 50.8)	42.7 (35.5, 50.2)	1.07 (0.63, 1.81)	58.5 (51.2, 65.4)	60.1 (51.3, 68.3)	1.07 (0.66, 1.74)			
Service Utilization									
Healthcare sector visit for depression									
6 months	75.4 (69.5, 80.6)	72.3 (64.8, 78.8)	0.84 (0.47, 1.48)	49.0 (40.1, 57.9)	51.2 (40.9, 61.4)	1.10 (0.60, 2.01)			
12 months	67.7 (59.4, 75.1)	63.4 (55.0, 71.1)	0.81 (0.47, 1.42)	79.8 (73.2, 85.1)	81.5 (71.8, 88.5)	1.13 (0.54, 2.41)			
Social-community sector visit for depression									
6 months	33.0 (26.3, 40.5)	34.8 (29.4, 40.6)	1.09 (0.71, 1.67)	23.0 (17.0, 30.2)	24.0 (17.1, 32.6)	1.06 (0.57, 1.99)			

	Comorbid Depression/Anxiety				Depression Only			
	RS	CEP	OR or Difference	RS	CEP	OR or Difference	Estimate	95% CI
	Estimate	95% CI	Estimate	Estimate	95% CI	Estimate	Estimate	95% CI
12 months	24.5 (18.5, 31.5)	25.2 (19.7, 31.6)	1.04 (0.60, 1.81)	13.0 (7.7, 20.9)	20.4 (13.6, 29.2)	1.75 (0.88, 3.47)		
Antidepressant usage								
6 months	48.0 (39.6, 56.6)	38.9 (31.4, 46.8)	0.63 (0.38, 1.06)	25.9 (16.1, 38.4)	25.2 (16.8, 35.9)	0.96 (0.38, 2.46)		
12 months	42.0 (34.4, 50.0)	33.0 (27.3, 39.3)	0.64 (0.40, 1.01)	24.9 (18.0, 33.4)	23.7 (17.6, 31.0)	0.92 (0.51, 1.66)		

Notes. Results are presented as odds ratios for logistic regression models, and between group differences for linear regression models. Estimates are adjusted for baseline status of the dependent variable, age, education, race/ethnicity, 12-month depressive disorder, and community and accounted for the design effect of the cluster randomization

* p<0.05

** p<0.01.