Supplementary Technical Appendix for

A Community-Partnered, Participatory, Cluster-Randomized Study of Depression Care Quality Improvement: Three-Year Outcomes

1. Intervention and Training Features

TABLE S1. Community Partners in Care Interventions and Training Features by Condition

	Resources for Services (RS)	Community Engagement and Planning (CEP)
Initial Model	1) Depression care collaborative care toolkit (manuals, slides, medication pocket cards, patient education brochures and videos) via print, flash drives, and website. 2) Trainings via 12 webinars / conference calls to all programs and site visits to primary care 3) Expert trainers: nurse care manager, licensed psychologist cognitive behavioral therapy trainer, three board-certified psychiatrists for medication management, experienced community service administrator supporting cultural competence and participation 4) Community engagement specialist for up to 5 outreach calls to encourage participation and fit toolkits to programs 5) Study paid for trainings and materials at $16,333 per community.	1) Depression care collaborative care toolkit (manuals, slides, medication pocket cards, patient education brochures and videos) via print, flash drives, and website. 2) Expert trainers: nurse care manager, licensed psychologist cognitive behavioral therapy trainer, three board-certified psychiatrists for medication management, experienced community service administrator supporting cultural competence and participation 3) 5 months of 2-hour, bi-weekly planning meetings for a CEP councils to tailor materials and develop and implement a written training and depression service delivery plan for each community, guided by a manual and community engagement model. The goal of the plan was to support increased capacity for depression care through collaboration across a myriad of community programs. 4) Co-leadership by study Council following community engagement and social justice principles to encourage collaboration and network building 5) $15,000 per community for consultations and training modifications
Implemented		
Overall	21 Webinars and 1 primary care site visit	Multiple one-day conferences with follow-up trainings at sites; webinar and telephone-based supervision
Cognitive Behavioral Therapy (CBT) and clinical assessment	Manuals (Individual and group) and 4 webinars offered for licensed physicians, psychologists, social workers, nurses marriage and family therapists	1) Manuals (Individual and group) 2) Tiers of training: For licensed providers plus substance abuse counselors: a) intensive CBT support included feedback on audiotaped therapy session with one to two depression cases for 12-16 weeks, b) 10 week webinar group consultation, and for any staff trainee, c) Orientation workshops for concepts and approaches.
Case management	Manuals, 4 webinars and resources for depression screening, assessment of comorbid conditions, client education and referral, tracking visits to providers, medication adherence, and outcomes, and introduction to problem solving therapy and/ behavioral activation; for nurses, case workers, health educators, spiritual advisors, *promotoras*, lay counselors	1) Manuals 2) In-person conferences, individual agency site visits, and telephone supervision for the same range of providers. 3) Modifications included a focus on self-care for providers, simplification of materials such as fact sheets and tracking with shorter outcome measures. Similar range of providers and staff as RS. 3) Training in active listening in one community; training of volunteers to expand capacity in one community 4) Development of an alternative "resiliency class" approach to support wellness for Village Clinic
Medication and clinical assessment	1) Manuals, medication pocket cards. 2) For MD, Nurses, Nurse practitioners, physician's assistants; training in medication management and diagnostic assessment; webinar and in-person site visit to primary care	1) Manuals, medication pocket cards. 2) Two-tiered approach with training for medication management and clinical assessment coupled with information on complementary / alternative therapies and prayer for depression, through training slides; and second tier of orientation to concepts for lay providers.
Administrators/Other	Webinar on overview of intervention plan approaches to team building/management and team-building resources	1) Conference break-outs for administrators on team management and building and team –building resources; support for grant-writing for programs 2) Administrative problem-solving to support "Village Clinic" including option of delegation of outreach to clients from RAND survey group, identification of programs to support case management, resiliency classes, and CBT for depression
Training events	21 webinars and 1 site visit (22 hours) (combined communities) CBT (8 hours) Care management (8 hours) Medication (1 hours) Implementation support for Administrators (5 hours)	144 training events (220.5 total hours) (combined communities) CBT (135 hours) Care Management (60 hours) Medication (6 hours) Other Skills (19.5 hours)

2. Analytic Sample

Enrollment

The study settings were South Los Angeles and Hollywood-Metro. Participant sampling (program and client recruitment) and randomization are described in greater detail in prior publications. Within enrolled programs, clients were screened for eligibility in waiting rooms (consecutive selection) or events (random selection) between March 2010 to November 2010 by community members blinded to intervention condition and supervised by RAND. Staff approached 4645 adults (age≥18) over 2-3 days per program; 4440 (96%) agreed to screening. Study eligibility was limited to clients providing contact information and depressed based on a score of 10 or greater on a modified 8-item Patient Health Questionnaire (PHQ-8) (3). Of 4440 screened, 1322 (30%) were eligible and 1246 (94%) consented. In our previous publications,(1-3) we created enrollment weights based on propensity weighting adjustment, by fitting logistic regression models to predict the enrollment among those eligible(4, 5). The reciprocal of the predicted response probability was used as the enrollment weight for each participant. See Supplementary Materials in previous publications (1, 2).

Telephone survey

Baseline survey. Between April 27, 2010-January 2, 2011, we approached 1,246 consented clients for baseline telephone survey conducted by survey staff blinded to intervention condition and 981 clients (79% of 1246 consented, RS: 492, CEP: 489) completed the baseline, 36 refused (RS: 17, CEP: 19), 227 were unable to contact (RS: 96, CEP: 131), and 2 deceased (RS: 1, CEP: 1).

6 month follow-up survey. Between November 2, 2010 and August 11, 2011, we approached 1093 participants (RS: 540, CEP: 553) for 6-month follow-up telephone survey; 153 enrolled participants were excluded from the contact list because their baseline survey response status was in one of following categories: final refusal, ill or incarceration, unable to contact, or deceased. Of 1093 attempted for 6-month follow-up, N=759 (69% of attempted, RS: 380, CEP: 359) completed the survey, 12 refused (RS: 3, CEP: 9), 321 were unable to contact (RS: 157, CEP: 164), and 3 deceased (RS: 1, CEP: 2).

12 month follow-up survey. Between May 10, 2011 and March 12, 2012, we approached 974 participants for 12-month follow-up telephone survey; 272 enrolled participants were not attempted for 12-month follow-up based on their baseline or 6 month survey status. Of 974 attempted for 12-month follow-up, N=733 (75% of attempted, RS: 364, CEP: 369) completed the survey, 7 refused (RS: 4, CEP: 3), 229 were unable to contact (RS: 109, CEP: 120), and 5 deceased (RS: 3, CEP: 2).

3 year follow-up survey (current study). Between 1/14/2014 and 10/14/2014, we attempted to contact 1004 participants for 36-month follow-up except those who were deceased (RS: 4, CEP: 4), who made final refusal in previous wave (RS: 22; CEP: 27), or who had no data on baseline, 6, and 12 months (RS: 84; CEP: 101). Of 1014 attempted for 36-month follow-up, 600 (600/1014=59%) participated (RS 293, CEP:307), 24 were deceased (RS:14, CEP:11), 10 refused (RS:7, CEP:3), 3 were too ill/incapable (RS:2, CEP:1), and 367 (RE:180, CEP:186) were not able to be reached.

3. Weighting

In the 6 months outcome study, we created nonresponse weights. The analytic sample for 6 months is comprised of 1018 participants who completed baseline, or 6-month telephone follow-up surveys. We used nonresponse weighting to address missing data for subjects who did not complete any both baseline and 6 months follow-up telephone surveys. We started with a large set of independent categorical variables to be considered for a logistic regression on the outcome of response among enrolled participants. The final model included predictors that were significant (p<0.05) for either intervention arm (age, gender, ethnicity, living situation, income, US born), as well as for two design variables (community and sector of the screening program). The final weights defined on the analytic sample were the product of the two adjustment factors for

enrollment and nonresponse. See Supplementary Materials in previous publications (1, 2). We applied the weights to the 36 months outcome analysis excluding 24 deceased cases (1004 attempted - 24 deceased = 980).

4. Multiple Imputation for Item-level Missing Data

We used an extended hot deck multiple imputation technique to impute missing values for item-level nonresponse (6). The procedure was based on cycling through each missing-data pattern on each variable with incomplete items. This method involved two steps: 1) forming imputation classes based on the predicted mean of the variable being imputed from a multiple regression model, and 2) drawing imputations at random from observed data within each class based on an approximate Bayesian bootstrap. To reflect the uncertainty of donor cells we created bootstrap weights and then used the product of the bootstrap weights in the multiple imputation model. Five imputed datasets were created. Each of the imputed data sets differs by the bootstrap weight and the seed used to obtain the random number employed in the hot deck imputation. Data on several hundred, multi-item scales were collected at screener, baseline and follow-up time points. Most variables had item-level missingness rates of less than 5% except for baseline income and MINI variables. With imputations stratified by intervention arms, 5 alternative imputed datasets were produced for screener, baseline, 6 month, 12 month, and 3 year follow-ups, and multiple imputation inferences were used in all analysis (7, 8).

The approach for selecting variables for multiple regression models was intended to preserve the associations and relationships among variables. In general, we identified common predictors for all imputation models including design variables (community, type of programs), social demographic variables (age, gender, ethnicity, marital status, education, living situation, income, and working status), and PHQ-8 score. For baseline, 6 months, 12 months, and three year data, baseline health variables (count of chronic medical conditions, PCS12 and MCS12) were included. In addition to these common predictors, each imputation model also included other predictors to be used in later analyses of interest. The order in which variables were imputed was determined based on a judgment of the analytic importance of the variables and the degree of missing data. Earlier imputed values were used during subsequent imputation steps, implying some dependence on the order in which variables were imputed.

5. Unit-Level Multiple Imputation

We used a hot deck multiple imputation procedure based on an approximate Bayesian bootstrap method for unit-level missing data (9, 10). This model assumes that both missingness and dropout arise from mechanisms that are missing at random (MAR) in the sense defined by Rubin (7). Our imputation techniques attempted to include information related to the missing values whenever possible. We first modeled the propensity of response at a given time point (coded 1 if response and 0 if nonresponse). In Step 2, we stratified cases based on the quintiles of the propensity scores and used the approximate Bayesian bootstrap to select donors. In practice these procedures were applied in sequence for the baseline, 6-month, 12-month, and 3-year data, with imputations stratified by two intervention arms. We started with imputing baseline. For each of the 5 item-level imputed screener datasets, we imputed a unit-level imputation baseline dataset. Limited to the analytic sample of 1018, we then used baseline variables as predictors for modeling 6 and 12-month follow-up data and produced unit-level imputation datasets. In modeling the logistic regression of predicting response propensities, we started with a large set of independent variables. The final baseline model included the predictors: age, gender, ethnicity, income, living situation, US born, community, and type of screening program. The 6-month models included participants characteristics assessed at screener (age, gender, ethnicity, health insurance, and type of screening program.), and baseline clinic and service variables (multiple chronic conditions, alcohol abuse or use of illicit drugs, any depression care). The 12-month models included additional variables: community, PHQ-8 assesses at screener, mental wellness, and homeless status at baseline. The three years models included age, gender, ethnicity, employment status, ≥3 chronic conditions, homeless, 12-month alcohol abuse or use of illicit drugs, no place to stay for at least two nights in the past 6 months, type of screening program, and community with additional stratum variable sector (social-community screening sector vs healthcare Screening Sector) in Step 2. Values for participants who were deceased were not imputed.

6. Sensitivity Analyses

For a sensitivity analysis, we conducted a longitudinal analysis using all waves of data (baseline, 6 months, 12 months, 3 years) adjusted the same set of baseline covariates as in the main analysis. We specified a spline model, with a linear segment between baseline and the first follow-up for initial improvement, and another linear segment for the subsequent follow-ups; the 2 linear segments are specified to join at the first follow-up. In analyzing continuously scaled PCS-12 as the dependent variable, we used a 3-level, mixed-effect regression model by using SAS proc mixed(11, 12). To account for the intraclass correlation due to the multilevel structure, we specified random effects at the clinic level, including random intercepts at program level and a spatial power covariance structure at the client level to account for the unequal spacing of waves. We utilized a generalized estimating equation (GEE)(13) framework with logistic regression models for binary outcomes and Poisson models for count data using SAS proc genmod due to unstable estimates for program-specific random effects with SAS proc glimmix, specifying exchangeable correlation at the program level. From the estimated spline model, we developed a contrast involving a linear combination of coefficients to test intervention effects at each end point (baseline, 6 months, 12 months, and 3 years) and tested differences between intervention groups in change from baseline to 6 months, 12 months, and 3 years. The results of sensitivity analyses are presented in Tables S2 and S3.

TABLE S2. Longitudinal analyses for alternative modeling of intervention effects (RS or CEP) on primary and community-prioritized outcomes

	CEP vs RS at specific time				CEP vs RS in change from baseline			
	OR	95% CI	p	pFDR[a]	OR	95% CI	p	pFDR[a]
Primary outcomes								
MCS12≤40								
Baseline	.98	.77-1.25	.88	.88				
6-month follow-up	.69	.55-.87	.002	.005	.7	.51-.97	.035	.069
12-month follow-up	.89	.73-1.09	.249	.387	.91	.68-1.22	.53	.63
36-month follow-up	1.15	.78-1.71	.442	.884	1.18	.76-1.83	.454	.834
PHQ8≥10								
Baseline	1.11	.47-2.62	.816	.88				
6-month follow-up	.78	.52-1.17	.209	.209	.7	.27-1.85	.477	.477
12-month follow-up	.89	.66-1.18	.387	.387	.8	.32-1.99	.63	.63
36-month follow-up	1.0	.72-1.41	.977	.977	.91	.37-2.25	.834	.834
Community-prioritized (secondary)								
	Group difference	95% CI	p	pFDR[a]	Group difference in change from baseline	95% CI	p	pFDR[a]
PCS-12								
Baseline	.36	-.59-1.3	.456	.66				
6-month follow-up	.55	-.41-1.52	.259	.519	.19	-.98-1.37	.743	.743
12-month follow-up	.85	.15-1.54	.017	.034	.49	-.54-1.52	.351	.351
36-month follow-up	1.14	.23-2.05	.015	.022	.78	-.47-2.03	.218	.218
	IRR[b]	95% CI	p	pFDR[a]	IRR[b]	95% CI	p	pFDR[a]
N of behavioral health hospital nights								
Baseline	.86	.43-1.72	.66	.66				
6-month follow-up	1.39	.49-3.95	.538	.538	1.62	.48-5.53	.438	.743
12-month follow-up	.53	.23-1.2	.124	.124	.61	.23-1.68	.341	.351
36-month follow-up	.2	.05-.79	.022	.022	.23	.05-1.02	.052	.105

[a]pFDR, adjusted p value from the False Discovery Rate procedure calculated separately for primary and secondary outcomes
[b]Incidence-rate ratio

TABLE S3. Longitudinal analyses for alternative modeling of intervention effects (RS or CEP) on service utilization

	CEP vs RS at specific time				CEP vs RS in change from baseline			
	IRR[b]	95% CI	p	pFDR[a]	IRR[b]	95% CI	p	pFDR[a]
Healthcare Sector								
N of ER or urgent care visits								
Baseline	1.0	.77-1.28	.976	.976				
6-month follow-up	.67	.35-1.29	.196	.327	.67	.34-1.32	.227	.566
12-month follow-up	.87	.58-1.31	.488	.742	.87	.57-1.34	.528	.972
36-month follow-up	1.13	.39-3.31	.807	.978	1.13	.39-3.31	.8	.896
N of visits to a PCP								
Baseline	1.01	.82-1.25	.9	.976				
6-month follow-up	.95	.71-1.26	.701	.701	.94	.7-1.26	.649	.809
12-month follow-up	1.01	.82-1.25	.932	.932	1.0	.77-1.28	.972	.972
36-month follow-up	1.07	.73-1.58	.701	.978	1.06	.69-1.62	.778	.896
N of outpatient primary care services for depression								
Baseline	1.05	.76-1.44	.769	.976				
6-month follow-up	1.28	.88-1.86	.19	.327	1.22	.76-1.97	.406	.677
12-month follow-up	1.12	.71-1.78	.594	.742	1.07	.61-1.88	.796	.972
36-month follow-up	.99	.41-2.39	.978	.978	.94	.37-2.43	.893	.896
N of mental health outpatient visits								
Baseline	.94	.65-1.36	.755	.976				
6-month follow-up	.69	.4-1.19	.166	.327	.73	.44-1.2	.195	.566
12-month follow-up	.82	.56-1.21	.308	.742	.87	.59-1.29	.485	.972
36-month follow-up	.98	.62-1.54	.937	.978	1.04	.62-1.76	.88	.896
N of visits to outpatient SA agency or self-help group								
Baseline	.83	.53-1.31	.429	.976				
6-month follow-up	.88	.5-1.55	.648	.701	1.05	.67-1.66	.809	.809
12-month follow-up	.88	.55-1.41	.592	.742	1.06	.72-1.55	.771	.972
36-month follow-up	.88	.33-2.37	.784	.978	1.06	.4-2.78	.896	.896
Social-community Sector								
N of social services for depression								
Baseline	1.4	.67-2.96	.371	.741				
6-month follow-up	.82	.29-2.31	.702	.702	.58	.18-1.84	.355	.818
12-month follow-up	1.02	.48-2.15	.962	.962	.72	.31-1.71	.46	.842
36-month follow-up	1.27	.45-3.58	.623	.741	.9	.31-2.6	.844	.934
N of called a hotline for ADM problem								
Baseline	2.81	1.28-6.15	.01	.04				
6-month follow-up	3.79	.77-18.66	.098	.39	1.35	.28-6.52	.702	.818
12-month follow-up	2.37	.64-8.69	.178	.636	.84	.24-2.92	.779	.842
36-month follow-up	1.48	.29-7.61	.631	.741	.53	.11-2.59	.421	.842
N of days self-help visit for mental health								
Baseline	.93	.48-1.8	.82	.82				
6-month follow-up	.84	.44-1.62	.602	.702	.91	.41-2.02	.818	.818
12-month follow-up	.87	.54-1.4	.563	.751	.94	.52-1.7	.842	.842
36-month follow-up	.9	.47-1.73	.741	.741	.97	.5-1.9	.934	.934
	OR	95% CI	p	pFDR[a]	OR	95% CI	p	pFDR[a]
Any faith-based services for depression								
Baseline	1.08	.75-1.55	.669	.82				
6-month follow-up	.9	.56-1.44	.653	.702	.83	.49-1.42	.495	.818
12-month follow-up	1.18	.84-1.66	.318	.636	1.09	.72-1.66	.669	.842
36-month follow-up	1.56	1.04-2.32	.031	.123	1.44	.9-2.29	.124	.494
Medication								
Use of any antidepressant								
Baseline	1.19	.8-1.79	.388	.508				
6-month follow-up	.82	.46-1.47	.485	.894	.69	.4-1.18	.152	.455
12-month follow-up	.9	.63-1.28	.544	.802	.75	.56-1.01	.057	.172
36-month follow-up	.97	.63-1.51	.898	.898	.81	.54-1.23	.326	.49
Use of any mood stabilizer								
Baseline	1.39	.82-2.36	.224	.508				
6-month follow-up	1.18	.63-2.19	.596	.894	.85	.43-1.68	.612	.612
12-month follow-up	1.63	1.0-2.65	.051	.154	1.17	.66-2.06	.568	.568
36-month follow-up	2.25	1.21-4.19	.012	.036	1.62	.81-3.23	.163	.49

TABLE S3. Longitudinal analyses for alternative modeling of intervention effects (RS or CEP) on service utilization

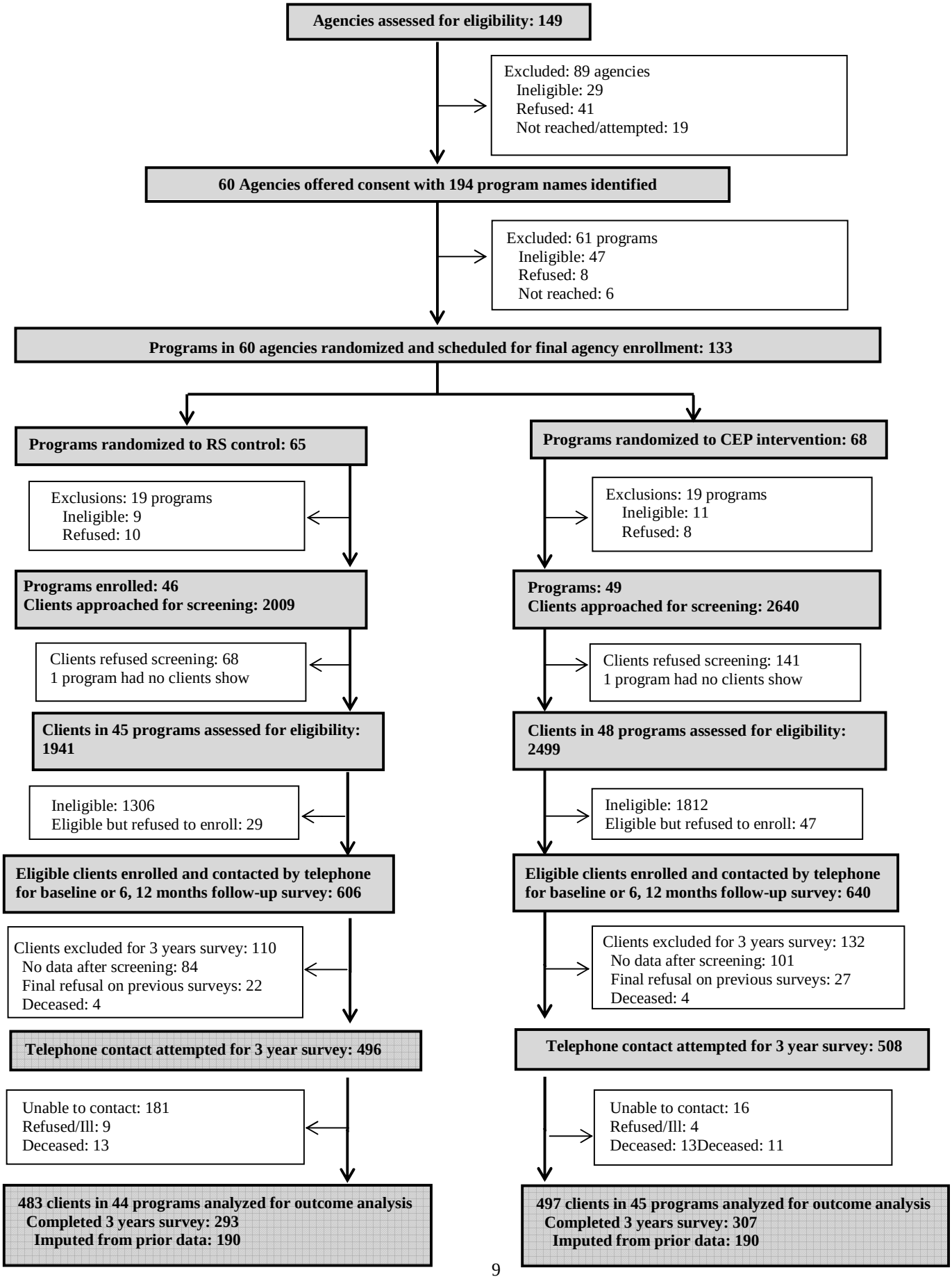
	CEP vs RS at specific time				CEP vs RS in change from baseline			
Use of any antipsychotic								
Baseline	1.19	.71-1.99	.508	.508				
6-month follow-up	1.01	.59-1.73	.961	.961	.85	.55-1.32	.455	.612
12-month follow-up	1.05	.7-1.6	.802	.802	.89	.61-1.28	.52	.568
36-month follow-up	1.1	.7-1.73	.689	.898	.92	.57-1.48	.74	.74
Summary utilization								
Any visit in healthcare sector								
Baseline	1.13	.63-2.02	.675	.711				
6-month follow-up	1.11	.68-1.81	.666	.839	.98	.59-1.65	.945	.945
12-month follow-up	1.15	.8-1.64	.457	.684	1.01	.65-1.59	.956	.956
36-month follow-up	1.18	.69-2.02	.525	.787	1.04	.56-1.95	.892	.892
Any community sector visit for depression								
Baseline	1.06	.77-1.46	.711	.711				
6-month follow-up	1.04	.72-1.48	.839	.839	.98	.65-1.46	.906	.945
12-month follow-up	1.16	.91-1.47	.216	.647	1.09	.8-1.5	.578	.867
36-month follow-up	1.3	.93-1.81	.117	.352	1.22	.82-1.82	.317	.836
Depression treatment[c]								
Baseline	1.21	.8-1.83	.373	.711				
6-month follow-up	1.08	.65-1.78	.759	.839	.89	.56-1.43	.604	.945
12-month follow-up	1.07	.78-1.46	.684	.684	.88	.65-1.2	.427	.867
36-month follow-up	1.06	.71-1.58	.789	.789	.87	.56-1.38	.557	.836

[a]pFDR, adjusted p value from the False Discovery Rate procedure, calculated separately for services use from health care sector, services use from social-community sector, medication, and summary utilization

[b]Incidence-rate ratio

[c]Antidepressant ≥2 mo. or ≥4 mental health or PCP depression visits

Figure 1. CONSORT diagram for CPIC 3 years outcome analysis



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