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# Differential Effectiveness of Enhanced Depression Treatment for Rural and Urban Primary Care Patients

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## **Abstract**

**Context:** There has been limited research on the impact of enhanced depression care on outcomes in rural versus urban primary care settings. **Purpose:** This study explored whether enhanced depression care has comparable impact on clinical outcomes over two years for patients treated in rural and urban primary care practices and whether differences are mediated by receiving evidence-based care (pharmacotherapy and specialty care counseling). **Methods:** A secondary analysis of the Quality Enhancement for Strategic Teaming (QuEST) study data was conducted. The QuEST study is composed of a consecutively sampled cohort of 479 depressed primary care patients recruited from 12 practices in 10 states. **Findings:** Enhanced care for depression improved mental health status over 18 months for urban primary care populations, but not rural patients. Intervention impact depression severity was more observable in the urban than the rural group, although this difference did not reach statistical significance. Intervention effects on both outcomes were not mediated by pharmacotherapy or specialty care counseling in the urban or rural group. **Conclusions:** Enhanced depression care models appear to improve outcomes in urban but not rural populations. Further research is needed to identify potential intervention mediators for rural primary care patients. Findings from this research can then be used to tailor enhanced depression care interventions for rural populations. These tailored interventions should be carefully evaluated before enhanced depression care models are disseminated to rural populations.

## Introduction

Efficacy and effectiveness researchers often disagree about the extent to which delivering comparable rates of evidence-based care will achieve equivalent outcomes in dissimilar populations.<sup>1-4</sup> One critical area where differential effectiveness needs to be evaluated is in providing enhanced depression treatment for major depression to rural versus urban patients. Rural primary care practices consistently encounter greater challenges when they try to improve the quality of care their depressed patients receive.<sup>5-9</sup> In addition, rural patients have greater attitudinal and/or distance barriers to evidence-based care for depression.<sup>10-11</sup>

Only one study tested the impact of enhanced depression treatment in rural and urban practices: the Quality Enhancement for Strategic Teaming (QuEST).<sup>12</sup> The QuEST intervention had the goal of increasing the proportion of primary care patients with current major depression who completed a course of pharmacotherapy and/or psychotherapy in accordance with the Agency for Health Care Policy and Research (AHCPR) Guidelines.<sup>13</sup> The intervention sought to achieve this goal by redefining roles across the primary care team to improve the detection and management of major depression in the absence of an onsite mental health professional.<sup>12</sup>

The QuEST intervention significantly improved both depressive symptoms and functioning in a combined sample of rural and urban patients over two years,<sup>14</sup> increasing remission by 33 percent, emotional functioning by 24 percent, and physical functioning by 17 percent. When the research team proceeded to investigate rural-urban differences in intervention impact on depression treatment over six months<sup>15</sup>, investigators found that the QuEST intervention ensured that comparable rates of evidence-based treatment were delivered to rural patients compared to their urban counterparts by: (1) increasing the odds of a three-month course of antidepressant medication in both rural and urban patients, and (2) increasing the odds of eight or more visits to a mental health specialist for counseling in rural patients only.<sup>15</sup>

The objective of the research presented here was to explore whether enhanced depression care has comparable impact on outcomes for patients treated in rural and urban primary care practices, and to determine whether observed differences are best explained by traditional treatment mediators (e.g., receipt of evidence-based medication and/or specialty care counseling). Our hypotheses were that: a) urban primary care patients would report improvement in depression severity and overall mental health status over two years in response to enhanced depression treatment compared to urban patients receiving usual depression treatment, b) there

would be no significant differences between rural primary care patients receiving enhanced treatment compared to rural patients receiving usual care, and c) improvement in outcomes would not be mediated by differences in receipt of guideline-concordant antidepressant medication and/or specialty care counseling.

## **Research Design and Methods**

We tested our hypotheses by conducting a secondary analysis of the QuEST study data<sup>11</sup> to examine the impact of enhanced depression care on clinical outcomes (depression severity and mental health status) over two years. We also examined whether any observed differences in outcome were mediated by receipt of evidence-based care.

*Sample and Data Collection:* The QuEST study is composed of a consecutively sampled cohort of 479 depressed primary care patients recruited from 12 practices in 10 states; 160 of these depressed primary care patients are recruited from practices in adjacent and non-adjacent non-metropolitan statistical areas (non-MSA) counties in four states.

*Database:* In addition to the variables described below, the QuEST database contains baseline practice characteristics (including size, years in operation, staffing composition); baseline clinician characteristics (including training, caseload, depression knowledge and attitudes); baseline patient characteristics (sociodemographic characteristics, distance to care, physical and psychiatric comorbidities, and psychotropic medication); longitudinal psychosocial characteristics (stressful life events and social support); longitudinal depression treatment characteristics (assessment, antidepressant medication, specialty care counseling, referral); and longitudinal outcome characteristics (depressive symptoms, mental health status, employment, and utilization/expenditures).

*Sites:* The study was conducted in practices located in eight metropolitan statistical areas (MSAs) and four non-metropolitan statistical areas (non-MSAs) in 10 states across the country (Colorado, Michigan, Minnesota, New Jersey, North Dakota, North Carolina, Oklahoma, Oregon, Virginia, and Wisconsin). The eight MSA practices were matched into four blocks by pre-baseline depression treatment patterns before randomizing one practice from each block to

enhanced care. A similar procedure was used to match the four non-MSA practices into two blocks before randomization. The four non-MSA practices were located in four states: (Minnesota, North Dakota, Oregon, and Wisconsin). Specifically, they were in Fergus Falls, MN in Otter Tail County (1996 county population = 53,857); Minot, ND in Ward County (1996 county population = 59,755); Reedsport, OR in Douglas County (1996 county population = 10,728); and Mauston, WI in Juneau County (1996 county population = 23,762).

**Patient Population:** Between April, 1996 and September, 1997, 653 of 11,006 screen-eligible patients screened positive for depression in the past two weeks on a two-stage screener; 73.2% (479 of 653) of screen-positive patients agreed to participate in the study and completed a blinded baseline interview.

#### **Operational Definition of Major Constructs in Data Analysis:**

*Rurality* – Patients recruited from MSA practices were classified as urban, while patients recruited from non-MSA practices were classified as rural. Intra-rural differences in county adjacency/population could not be meaningfully examined in the sample.

*Outcomes* – Depression severity was measured by a 100-point scale of depressive symptoms the patient reported in the last week on the Modified Center for Epidemiological Studies (CES-D) scale<sup>12</sup> adapted to measure all DSM-IV depression criteria, with higher scores indicating worse depressive symptoms. Mental health status was measured using the Mental Component Summary (MCS), a combination of four subscales from the SF-36<sup>16</sup> (which measures overall health state) totaling 14 items. The four subscales include Vitality (i.e., energy and fatigue), Social Functioning (i.e., limitations in social activities because of physical or emotional problems), Role Emotional (i.e., limitations in usual role activities due to emotional problems), and Mental Health (i.e., psychological distress and well-being). Patients' self-report on these aspects of their lives for the previous month, with higher scores indicating better outcomes.

*Treatment Mediators* – Mediators are possible mechanisms or causal links through which an intervention affects outcomes. Treatment mediators investigated in this study were

antidepressant medication-taking and specialty care counseling visits. Antidepressant medication-taking was defined as the total number of months taking antidepressants in the previous 6 months, measured by a question administered every wave. Specialty care counseling was defined as the total number of months of visits made to a mental health professional for individual, group, or family counseling in the previous 6 months, measured by questions administered every wave.

*Covariates* – Sociodemographic variables collected at baseline included age, sex, race/ethnicity, education, paid employment, marital status, and insurance status. Clinical covariates included psychiatric and physical comorbidity.

**Analysis:** We used two-sample t-tests for continuous variables and Chi-square tests for dichotomous and categorical variables to evaluate sociodemographic and clinical differences between intervention and control patients. Intent to treat analyses controlling for clinical and sociodemographic variables were carried out to analyze depression severity and role functioning. Linear mixed models<sup>17</sup> were fitted to handle the correlation of repeated measures on a patient, patients nested within doctors, and doctors within practices. The models were simplified when no clustering effects of doctors and practices were observed.

In the linear mixed models, outcomes were modeled as a function of rurality\*group, rurality\*group\*time, and rurality\*group\*time\*time (growth curve) adjusting for covariates which had a p-value<0.2 in univariate analyses. To allow different impacts of these covariates on the outcomes of rural and urban patients, these covariates entered into the linear mixed models as interacting forms with rurality. We used preplanned linear contrasts to obtain 1) the change from baseline at each time point after baseline for each group and 2) the intervention effect of rural and urban areas at each time point after baseline. All statistical analyses were performed using SAS version 9.1.

Cross-sectional power analyses indicate that we need 126 rural patients (63 in enhanced care and 63 in usual care) to have 80% power to find moderate (0.50) differences in mCES-D or MCS at a 0.05 significance level, with a comparable requirement for urban subjects. Because we used longitudinal analyses with covariate adjustment, we anticipate that the 160 rural and 319 urban patients we studied provided substantially more than 80% power to find moderate

differences in both the rural and urban cohort. However, it is important to note that cross-sectional power analyses indicate that we need 504 rural patients (252 in enhanced care and 252 in usual care) to have 80% power to find small (0.25) differences in mCES-D or MCS at a 0.05 significant level, with a comparable requirement for rural subjects, indicating that even with the increased power the longitudinal covariate-adjusted analysis provides, we had substantially less than 80% power to find small (0.25) clinical differences that these interventions have demonstrated in the past.<sup>18</sup>

## Results

Table 1 presents baseline sociodemographic and clinical data for the sample. The baseline sample had an average age of 42.1 years, was 16.1% male, 14.8% minority, 43.8% currently married, and 79.1% high school educated. Over half (55.7%) were employed either full or part-time, 84.3% had health insurance, and the annual household income averaged \$16,151. Clinically at baseline, patients' mean depression severity on the 100-point CES-D scales was 56.2, the average number of months taking antidepressant medication was 1.8, and 35.5% had received care from a mental health specialist in the previous six months. Over two-thirds (69.5%) reported that using antidepressants was acceptable and 75.6% indicated that specialty care counseling was acceptable. Overall, subjects reported an average of 2.0 physical comorbidities and 37.9% indicated having comorbid panic attacks. Concordant with an intent-to-treat design, patients who left the practice were re-interviewed even though they could not participate in ongoing intervention. The 6-, 12-, 18- and 24-month blinded follow-up interviews between October 1996 and September 1999 achieved response rates of 89.6%, 81.5%, 72.5%, and 67.3%, respectively, with no evidence of non-ignorable missingness.

Baseline comparisons between the rural (rural enhanced care + rural usual care) and urban (urban enhanced care + urban usual care) groups indicated that the urban group had significantly higher depression severity, lower overall health state (i.e., overall SF-36 score), lower physical role functioning, higher physical comorbidity, and higher number of panic attacks. Baseline comparisons between the rural enhanced (REC) versus rural usual (RUC) groups indicated that there were significantly more men in the REC group, and that those in the RUC group were significantly more employed and had more use of anti-depressant medication. Baseline comparisons between the urban enhanced (UEC) versus urban usual (UUC) group

indicated that those in the UEC group had significantly more panic attacks, while those in the UUC group were significantly older and had more physical comorbidity.

**Table 1: Baseline Demographics and Clinical Characteristics**

	Total Sample (n=479)	Rural		Urban	
		REC (n=80)	RUC (n=80)	UEC (n=160)	UUC (n=159)
<b>Basic Demographics</b>					
	%	%	%	%	%
Age <sup>i</sup>	42.1	42.1	43.2	40.4	43.3*
Male	16.1	22.5*	8.8	13.1	19.5
Minority	14.8	2.5	3.8	20.6	20.8
Currently Married	43.8	51.2	48.8	38.1	43.4
High School Educated	79.1	80.0	87.5	78.8	74.8
Employed Full- or Part-Time	55.7	53.8	72.5*	53.8	50.3
Health Insured	84.3	89.9	93.8	81.9	79.2
Annual Household Income <sup>i</sup>	16151	16389	18704	13609	17304
<b>Clinical Characteristics</b>					
	%	%	%	%	%
CESD <sup>i</sup>	56.2	54.8	51.3	59.4	56.2
SF36 <sup>i</sup>	43.8	45.8	48.3	41.7	42.5
MCS <sup>i</sup>	33.8	34.4	37.2	31.1	34.5
Number of Months Taking an Antidepressant <sup>i</sup>	1.8	1.3	2.6**	1.5	1.8
Received Care from Mental Health Specialist in Past 6 Months	35.5	35.0	30.0	35.0	39.0
Reported Antidepressants Acceptable	69.5	75.6	71.4	65.6	69.4
Reported Specialty Care Counseling Acceptable	75.6	74.4	77.5	84.4	78.5
Number of Physical Comorbidities <sup>i</sup>	2.0	1.8	1.9	2.0	2.3*
Comorbid Panic Attack	37.9	32.5	23.8	49.1*	36.5

REC = Rural Enhanced Care; RUC = Rural Usual Care; UEC = Urban Enhanced Care; UUC = Urban Usual Care

<sup>i</sup> Reported numbers are means, not percentages.

\* REC vs. RUC or UEC vs. UUC difference significant at  $p < .05$

\*\* REC vs. RUC or UEC vs. UUC difference significant at  $p < .01$

The enhanced care intervention had a positive but non-significant impact on depressive symptoms (CES-D) for the combined (urban + rural, N = 479) sample at 6, 12, and 24 months, and had a significant effect ( $p = .037$ ) at 18 months. For the urban sample, the intervention had a large positive effect on depressive symptoms, although the impact was statistically non-significant. For the rural sample, the intervention had a much smaller effect on depressive symptoms, also non-significant. Intervention effect was not mediated by the proposed treatment mediators in the combined sample, the urban sample, or the rural sample.



**Table 2: Impact of Intervention on C-ESD Across Time**

Mediator	Month	Urban		Rural		Combined*	
		Enhanced (n = 160) vs. Usual (n = 159) <sup>i</sup>	P	Enhanced (n = 80) vs. Usual (n = 80) <sup>ii</sup>	P	Enhanced (n = 240) vs. Usual (n = 239) <sup>iii</sup>	P
None	6	-2.70	0.106	-0.64	0.797	-1.99	0.151
	12	-4.16	0.074	-1.53	0.665	-3.31	0.087
	18	-4.36	0.057	-2.65	0.444	-3.96	<b>0.037</b>
	24	-3.32	0.237	-4.01	0.292	-3.94	0.081
Anti-Depressant Medication and Specialty Care	6	-2.79	0.095	-0.93	0.714	-2.14	0.123
	12	-4.33	0.062	-1.82	0.611	-3.52	0.070
	18	-4.62	<b>0.044</b>	-2.69	0.445	-4.14	<b>0.030</b>
	24	-3.65	0.191	-3.51	0.359	-3.99	0.076

\* UEC + REC or UUC + RUC

<sup>i</sup> UEC n = 133 (6 months), 112 (12 months), 96 (18 months), 88 (24 months); UUC n = 146 (6 months), 134 (12 months), 123 (18 months), 119 (24 months).

<sup>ii</sup> REC n = 77 (6 months), 71 (12 months), 66 (18 months), 66 (24 months); RUC n = 76 (6 months), 74 (12 months), 64 (18 months), 63 (24 months).

<sup>iii</sup> Combined enhanced n = 210 (6 months), 183 (12 months), 162 (18 months), 154 (24 months); Combined usual n = 222 (6 months), 208 (12 months), 187 (18 months), 182 (24 months).

The enhanced care intervention had a positive significant impact on mental health functioning (MCS) in the combined sample at 12 (p = .032) and 18 (p = .013) months. For the urban sample, the intervention had a large positive effect on mental health functioning at six (p = .014), 12 (p = .006), and 18 (p = .003) months, resulting in a clinically significant 10-point or greater improvement.<sup>19-20</sup> For the rural sample, the intervention had a much smaller and insignificant impact on mental health functioning, in part because MCS scores of rural patients improved in usual care. Intervention effect was not mediated by the proposed treatment mediators in the combined sample, the urban sample, or the rural sample.

**Table 3: Impact of Intervention on MCS Across Time**

Mediator	Month	Urban		Rural		Combined*	
		Enhanced (n = 159) vs. Usual (n = 159) <sup>i</sup>	P	Enhanced (n = 80) vs. Usual (n = 80) <sup>ii</sup>	P	Enhanced (n = 239) vs. Usual (n = 239) <sup>iii</sup>	P
None	6	3.35	<b>0.01</b>	-0.26	0.90	2.06	0.07
	12	5.19	<b>0.006</b>	-0.18	0.95	3.32	<b>0.03</b>
	18	5.53	<b>0.003</b>	0.24	0.93	3.77	<b>0.01</b>
	24	4.38	0.06	0.99	0.75	3.42	0.07
Anti-Depressant Medication and Specialty Care	6	3.35	<b>0.01</b>	-0.22	0.91	2.06	0.07
	12	5.25	<b>0.006</b>	-0.29	0.92	3.31	<b>0.03</b>
	18	5.67	<b>0.002</b>	-0.21	0.94	3.75	<b>0.01</b>
	24	4.64	<b>0.05</b>	0.02	0.99	3.38	0.07

\* = UEC + REC or UUC + RUC

<sup>i</sup> UEC n = 133 (6 months), 112 (12 months), 96 (18 months), 88 (24 months); UUC n = 146 (6 months), 134 (12 months), 123 (18 months), 118 (24 months).

<sup>ii</sup> REC n = 77 (6 months), 71 (12 months), 66 (18 months), 66 (24 months); RUC n = 76 (6 months), 74 (12 months), 64 (18 months), 63 (24 months).

<sup>iii</sup> Combined enhanced n = 210 (6 months), 183 (12 months), 162 (18 months), 154 (24 months); Combined usual n = 222 (6 months), 208 (12 months), 187 (18 months), 181 (24 months).

## **Discussion**

For patients treated in urban practices, enhanced care for depression had a positive and significant impact on mental health functioning and a positive but insignificant impact on depression severity. For patients treated in rural practices, enhanced care for depression had a positive but non-significant impact on either mental health functioning or depression severity. The intervention effect was not mediated by medication or specialty care counseling in the urban or rural group

Two primary aspects of this study's results require discussion. First, the finding that enhanced treatment for depression did not have an observable impact on symptom severity for patients in rural practices is disconcerting, given previous analyses demonstrating that the intervention increased guideline-concordant medication in this sample.<sup>14</sup> Second, in that controlling for treatment mediators did not reduce our estimate of intervention impact on clinical outcomes in urban patients, indicating that improvements in depressive symptoms and mental health cannot not be fully attributed to receipt of evidence-based care. In other words, the data suggests that the intervention is significantly impacting outcomes (at least with respect to mental health functioning) independently from its provision of guideline concordant treatment. This raises the question of how intervention components can impact clinical outcomes aside from these generally accepted mediators.

Several possibilities may account for the failure of the intervention to significantly improve outcomes for rural patients. First, evidence-based treatment does not have the same impact on clinical outcomes in a rural population as in an urban population. For instance, rural populations often face unique challenges, such as limited resources and services, lower incomes, all of which can create or exacerbate life stresses that urban or suburban populations may not face. Next, evidence-based treatment has a comparable impact on clinical outcomes in rural and urban populations, but we could not observe it because our populations differed in unobserved severity. This explanation questions whether our case-mix adjustment methods effectively

controlled for differences in unobserved severity. This explanation is concordant with unusually higher rates of education, employment, income and clinical improvement we observed in the rural usual care group (see Table 1). Third, evidence-based treatment has a comparable impact on clinical outcomes in rural and urban populations, but we lacked power to observe this impact in rural populations. Fourth, evidence-based treatment has a comparable impact on clinical outcomes in rural and urban populations but we could not observe it because our measures of evidence-based care were flawed.

We recognize that despite the fact that rural and urban primary care teams received equivalent training in the enhanced care model, rural clinicians may have been less able to deliver the model because they have fewer resources, including staff and time.<sup>5-9</sup> Urban primary care teams may have had previous professional training or experience beyond training for the study that rural providers did not, which made urban providers more effective organizationally or clinically. It is also possible that the lack of resources in rural practice settings may have impacted care delivery in ways we did not observe but which limited the impact of the intervention on clinical outcomes. We propose that this is the most plausible explanation for the difference if the intervention impacts clinical outcomes through mediators like the provision of social support. This explanation clearly deserves further investigation.


The internal validity of these results is strengthened by the use of a randomized block design to evaluate the intervention's ability to improve process and outcomes of care with a longitudinal intent-to-treat analysis. Although not every participant was followed over two years, the sample loss was smaller than in most similar studies, and we tried to reduce the impact of sample loss by using attrition weighting and modeling techniques that allowed projection of trends when patients did not complete all follow up interviews. However, we acknowledge that even with the extra power afforded us by longitudinal analyses, we were not able to detect small differences in outcomes due to small sample sizes (especially for the rural group). Furthermore, we cannot yet identify which component(s) of the intervention account for the improved outcomes for urban enhanced care patients or why similar improvements were not seen in for rural enhanced care patients. We also acknowledge the possibility that not all the variability in differences between rural-urban outcomes can be explained by the dataset's measured constructs. Testing the intervention on a clinically, sociodemographically and geographically diverse group of patients and practices strengthens the external generalizability of our findings. External

generalizability was also strengthened by the fact that the intervention was implemented by primary care practices under normal practice conditions, rather than the research team or its employees.

Future research will need to address several issues related to findings from this study. First, further investigations are needed to determine why quality improvement interventions like QuEST are less effective in rural practices than in urban practices. For example, researchers should examine external factors such as the role of social support and stressful life events that might impact intervention effectiveness. If these factors are shown to mediate intervention impact, interventions to enhanced depression care should be redesigned. Second, these redesigned models need to be tested in rural practices. Because we observed virtually no clustering at the physician or clinic level, future studies should consider randomizing at the patient-level, rather than the clinic level. Future investigations should also employ multi-faceted experimental designs to determine which intervention components are essential to improve outcomes in rural populations. This research agenda should produce not only an intervention that works in rural populations, but an understanding of how it works to inform policy and administrative decisions and benefit patients with depression by offering treatment that works.

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The WICHE Center for Rural Mental Health Research was established in 2004 to develop and disseminate scientific knowledge that can be readily applied to improve the use, quality and outcomes of mental health care provided to rural populations. As a General Rural Health Research Center in the Office of Rural Health Policy, the WICHE center is supported by the Federal Office of Rural Health Policy, Health Resources and Services Administration (HRSA), Public Health Services, grant number U1CRH03713.

The WICHE Center selected mental health as its area of concentration because: (1) although the prevalence and entry into care for mental health problems is generally comparable in rural and urban populations, the care that rural patients receive for mental health problems may be of poorer quality, particularly for residents in outlying rural areas and (2) efforts to ensure that rural patients receive similar quality care to their urban counterparts generally requires restructuring treatment delivery models to address the unique problems rural delivery settings face. Within mental health, the Center proposes to conduct the research development/dissemination efforts needed to ensure rural populations receive high quality depression care.

Within mental health, the Center will concentrate on depression because: (1) depression is one of the most prevalent and impairing mental health conditions in both rural and urban populations, (2) most depressed patients fail to receive high quality care when they enter rural or urban treatment delivery systems, (3) outlying rural patients are more likely to receive poorer quality care than their urban counterparts, (4) urban team settings are adopting new evidence-based care models to assure that depressed patients receive high quality care for the condition that will increase the rural-urban quality chasm even further, and (5) urban care models can and need to be refined for delivery to rural populations.

The WICHE Center is based at the Western Interstate Commission for Higher Education. For more information about the Center and its publications, please contact:

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