

# Cost-effectiveness of Evidence-Based Pharmacotherapy or Cognitive Behavior Therapy Compared With Community Referral for Major Depression in Predominantly Low-Income Minority Women

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**Background:** Few clinical trials have evaluated interventions for major depressive disorder in samples of low-income minority women, and little is known about the cost-effectiveness of depression interventions for this population.

**Objective:** To evaluate the cost-effectiveness of pharmacotherapy or cognitive behavior therapy (CBT) compared with community referral for major depression in low-income minority women.

**Design, Setting, and Participants:** A randomized clinical trial was conducted in 267 women with current major depression.

**Interventions:** Participants were randomly assigned to pharmacotherapy (paroxetine hydrochloride or bupropion hydrochloride) (n=88), CBT (n=90), or community referral (n=89).

**Main Outcome Measures:** The main outcomes were intervention and health care costs, depression-free days, and quality-adjusted life years based on Hamilton Depression Rating Scale scores and Medical Outcomes Study 36-Item Short-Form Health Survey summary scores for 12 months. Cost-effectiveness ratios were estimated to compare incremental patient outcomes with incremen-

tal costs for pharmacotherapy relative to community referral and for CBT relative to community referral.

**Results:** Compared with the community referral group, the pharmacotherapy group had significantly lower adjusted mean Hamilton Depression Rating Scale scores from the 3rd month through the 10th month ( $P=.04$  to  $P<.001$ ) of the study, and the CBT group had significantly lower adjusted mean scores from the 5th month through the 10th month ( $P=.03$  to  $P=.049$ ). There were significantly more depression-free days in the pharmacotherapy group (mean, 39.7; 95% confidence interval, 12.9-66.5) and the CBT group (mean, 25.80; 95% confidence interval, 0.04-51.50) than in the community referral group. The cost per additional depression-free day was \$24.65 for pharmacotherapy and \$27.04 for CBT compared with community referral.

**Conclusions:** Effective treatment for depression in low-income minority women reduces depressive symptoms but increases costs compared with community referral. The pharmacotherapy and CBT interventions were cost-effective relative to community referral for the health care system.

*Arch Gen Psychiatry.* 2005;62:868-875

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**A**CCCESS TO HEALTH SERVICES and specifically mental health services for low-income minority men and women is limited by the availability of publicly allocated funding and other barriers to care. Ethnic minorities are less likely to obtain care for depression than their white counterparts<sup>1</sup> and are less likely to receive guideline-consistent treatment when they receive care.<sup>2,3</sup> These disparities are partially due to minorities' being less likely to be insured,<sup>1</sup> which results in poor access to care

and greater dependence on public health services. Given the limitations in resources available for health care services, public health policy decisions need to take into account efficiency in health care delivery and cost-effectiveness of various options for health care interventions.<sup>4</sup> Because depressed low-income minority women are unlikely to obtain traditional mental health services, evaluation of services tailored to engage these women in appropriate care is necessary. For programs funded by state and federal public health agencies to provide coverage for ef-

fective depression treatment programs, tailored interventions must demonstrate that they reach and are beneficial to potential participants, in terms of depression and health status outcomes, and they must demonstrate cost-effectiveness. We evaluated the cost-effectiveness of tailored interventions that were demonstrated to be effective in improving depression outcomes for minority women, many of whom are uninsured.<sup>5</sup>

There have been several economic analyses based on randomized clinical trials comparing depression treatments.<sup>6-11</sup> Lave and colleagues<sup>7</sup> compared the depression outcomes and medical costs associated with pharmacotherapy (nortriptyline hydrochloride) or interpersonal psychotherapy vs usual-care practice in primary care patients with major depressive disorder. In their study, the cost per quality-adjusted life year (QALY) gained for pharmacotherapy ranged from \$11 270 to \$19 510. More recently, Wells et al<sup>12</sup> compared the effectiveness of quality improvement programs on depression treatment in primary care settings. They found that these interventions improved mental health and employment outcomes for 12 months,<sup>12</sup> although differences attenuated during the second year of the study.<sup>13</sup> Depression outcomes improved more for minority participants than white participants.<sup>14</sup> The mean medical costs during 2 years were \$3997 for usual care and increased an average of \$419 and \$485 in the medication and psychotherapy groups, respectively.<sup>11</sup> Depression burden was significantly decreased in both quality improvement intervention groups.

In this study, we evaluated the cost-effectiveness of pharmacotherapy (paroxetine hydrochloride or bupropion hydrochloride) or cognitive behavior therapy (CBT) tailored for minority women receiving care at public health or social services facilities compared with community referral for major depression. Twelve-month outcomes were measured by depression-free days (DFDs) and by QALYs, with intervention and all health care costs included in the economic analyses. Given that most of these women were uninsured, medical costs were valued from the perspective of state Medicaid programs, to ensure the policy relevance of the results.

## METHODS

### STUDY DESIGN AND TREATMENT INTERVENTIONS

This economic study was based on the treatment interventions and data collected in the Women Entering Care clinical trial conducted by Miranda et al.<sup>5</sup> Details on the design and methods of the Women Entering Care study can be found elsewhere.<sup>5</sup> Briefly, we used the Primary Care Evaluation of Mental Disorders<sup>15</sup> as a depression screen in women attending Title X family planning clinics and pediatric-related services provided in Prince George's and Montgomery counties, Maryland, and in Arlington and Alexandria, Va. Women who screened positive for major depression (11% of those assessed) were invited to participate in confirmatory psychiatric diagnostic telephone interviews.<sup>16</sup> Subjects were excluded if they failed to meet a Composite International Diagnostic Interview diagnosis of major depression, were bereaved, tested positive for current alcohol or other substance abuse, were pregnant or planned to become pregnant, were currently breastfeeding, or were cur-

rently receiving mental health care. Those women with confirmed major depressive disorder diagnoses who were willing to participate in the study were randomized to receive pharmacotherapy, CBT, or community referral. The study recruited a diverse ethnic sample of women (ie, Latinas born in Latin America, African American, and white). The study was approved by the relevant institutional review boards, and all patients provided written informed consent.

Two hundred sixty-seven women consented to treatment and were randomized to 1 of the 3 treatment groups. The pharmacotherapy group (n=88) received paroxetine, 10 to 50 mg/d (adjusted based on response and reported adverse effects), consistent with the Agency for Health Care Policy and Research<sup>17</sup> guidelines for depression treatment. Paroxetine treatment was managed by primary care nurse practitioners under the supervision of a board-certified psychiatrist (J.Y.C.). Eighteen (20%) patients unable to continue paroxetine were switched to bupropion therapy. Pharmacotherapy was continued for up to 6 months. Women in the CBT group (n=90) received therapy from experienced psychotherapists supervised by a licensed clinical psychologist, consisting of 8 weekly sessions administered in group or individual sessions.<sup>18,19</sup> All patients were provided protocol-based CBT therapy based on a course manual, and treatment involved homework and monitoring activities. Cognitive behavior therapy continued for 8 weeks and could be extended an additional 8 weeks if the patient still met criteria for major depressive disorder and wanted additional therapy (15 [17%] received an additional course of CBT). Women in the community referral group (n=89) were educated about depression and its treatment, and they were referred to appropriate community providers. All women in the Women Entering Care study were followed up for 12 months regardless of whether they continued to receive study treatments.

### DEPRESSION AND HEALTH STATUS MEASURES

Study patients were assessed at baseline and at 1, 2, 3, 4, 5, 6, 8, 10, and 12 months with the Hamilton Depression Rating Scale (HDRS).<sup>20</sup> The HDRS measures depressive symptoms and is widely used in clinical trials comparing antidepressant interventions. Based on the methods developed by Lave et al,<sup>7</sup> we estimated the number of DFDs for each subject using their HDRS scores. If subjects reported HDRS scores of 22 or higher, they were considered to have no DFDs. If they had HDRS scores of 7 or lower, they were assumed to have a complete DFD. For subjects with scores on the HDRS between 8 and 21, each day was weighted proportionately. For pairs of consecutive assessments, we added each HDRS score, divided by 2, and multiplied the result by the number of days between the assessments (DFD weight, 0 to 1). Total DFDs were summed for each subject. To compare the cost-effectiveness findings in this study with those of economic studies in other diseases, we estimated QALYs based on these DFDs and the utilities for severe depression (mean utility, 0.30) and for depression remission (mean utility, 0.86) from a previous study.<sup>21</sup> In that study, standard gamble utilities for these depression-related states were estimated in a sample of 70 primary care patients with major depressive disorder. Quality-adjusted life years represent the duration of time adjusted (or weighted) by a health status index, in this case, utilities.

The Medical Outcomes Study 36-Item Short-Form Health Survey,<sup>22</sup> a generic health status measure, was administered at baseline and at 3, 6, and 12 months. This survey contains 8 domain-specific subscales and 2 summary scores, the mental component summary (MCS) and the physical component summary (PCS).<sup>23</sup>

## HEALTH SERVICE UTILIZATION AND COSTS

Data on the use of pharmacotherapy and CBT-related services were obtained from study records collected during the clinical trial. For the pharmacotherapy group, these data included the number of nurse practitioner visits for medication titration and monitoring, the dosage of paroxetine (or bupropion if prescribed), and psychiatrist supervisory time. For the CBT group, we recorded information on the number and type (ie, individual vs group) of treatment sessions. Data were collected on the use of all nonstudy mental health and non-mental health-related services from patients using standardized survey questions and monthly telephone interviews during the initial 6 months and then bimonthly for the remainder of the 12-month study. Information was collected on hospitalizations, emergency department visits, outpatient visits to physicians and other health care providers, and psychotropic and nonpsychotropic prescriptions. The nonstudy prescription data included the drug name, dosage, and duration of treatment. When dates were incomplete, we assumed that prescriptions started at the beginning of the month before the interview date. If medication dosages were not recorded, we assumed the standard dosage from the *Physicians' Desk Reference*.<sup>24</sup>

The economic perspective taken was that of state or county Medicaid or other publicly funded health services; therefore, only direct medical costs or other potential costs to the system were included in this study. All inpatient and outpatient medical services were valued using 2002 Maryland Medicaid payment rates.<sup>25</sup> Inpatient physician visits were estimated by assuming 1 visit per day in the hospital. Costs for all physician and other health care provider visits were based on the Maryland Medicaid fee schedule. Drugs were priced according to the lowest mean wholesale price, using generic costs for the study drugs and concomitant medications from the *Drug Topics Red Book*.<sup>26</sup> These costs were estimated from data collected on relevant drugs, dosages, and duration of medication use and included a pharmacy administration fee.

In the intervention groups, educational sessions were required before many subjects entered treatment, and some subjects needed transportation or babysitting services to participate in the study interventions. We included the cost of resources associated with the educational sessions as part of the intervention costs because they were integral to engaging and maintaining the women in treatment. We used receipts for taxi and other transportation expenditures and estimated costs for babysitting services associated with participating in medication monitoring or CBT sessions. These expenditures were also included as part of the study intervention costs.

The primary end point for the economic analyses was the total outpatient costs, which consist of emergency department visits; outpatient psychiatrist, physician, and other health care provider visits; and medication costs. Study-related pharmacotherapy and CBT intervention costs were included as part of the total outpatient costs. Few subjects were hospitalized at any time during the study (32 [12%]), and these inpatient costs were not included in the primary economic analysis. We report total medical costs, which include study intervention costs, total outpatient costs, and hospital and inpatient-related physician costs.

### STATISTICAL ANALYSIS

All statistical analyses were conducted based on an intent-to-treat approach. Descriptive statistics are reported for baseline demographic, clinical, and health status variables. At any particular month after baseline, interviews for 64 (24%) to 101 (38%) of the participants were lacking. Because questions on health care utilization were phrased as "Since your last inter-

view, have you . . . ?," it was only necessary to impute missing use for dropouts. For each type of use (provider visits, emergency department visits, etc), we assumed that the daily probability of use followed a Poisson distribution and imputed samples from this distribution by treatment group. For subjects whose last interview occurred after 12 months, we assumed that the time of use was uniformly distributed between the next to the last interview and the last interview and included the use in our estimates if the case from this uniform distribution was before the end of the year.

Hamilton Depression Rating Scale scores were imputed for each missed interview using a predicted mean-matching hot-deck method with an approximate Bayesian bootstrap. We used multiple imputation to account for imputation uncertainty. Our estimates of inpatient costs, outpatient costs, DFDs, QALYs, and cost-effectiveness ratios were calculated by combining estimates across the 5 multiple imputation data sets.<sup>27,28</sup>

A random intercept and slope repeated-measures analysis of variance was used to compare the mean HDRS, MCS, and PCS scores among the 3 treatment groups for 12 months. This model accounts for within-subject correlation and allows for individual trends over time. The focus was on the effect of treatment over time, with planned contrasts between the pharmacotherapy and community referral groups and between the CBT and community referral groups. Ordinary least squares regression models were used to compare DFDs, QALYs, total outpatient costs, and total medical costs between the 3 groups. The regression models included demographic variables (ie, ethnicity, educational attainment, and health insurance) and baseline HDRS and PCS scores.  $P < .05$  was considered statistically significant.

We calculated cost-effectiveness ratios comparing the pharmacotherapy and community referral groups and the CBT and community referral groups. A cost-effectiveness ratio is a measure in which the numerator is the incremental medical cost and the denominator is the incremental effectiveness of the intervention group vs some alternative group.<sup>4,7</sup> To construct these cost-effectiveness ratios, we estimated multivariate regression models to determine how log-transformed total outpatient costs, log-transformed total costs, and effectiveness outcomes (ie, DFDs and QALYs) differed between treatment groups, controlling for selected covariates (ie, demographic variables and baseline clinical and health status).

The cost-effectiveness ratios were then calculated based on the regression coefficients for the treatment groups in the cost and outcome models. We assumed the distribution of the incremental cost-effectiveness outcomes in each ratio as having a bivariate normal distribution with parameters from the regression models. After retransforming costs back to their original scale, we then constructed 95% confidence intervals around these ratio estimates using Fieller theorem.<sup>29,30</sup>

## RESULTS

There were no significant differences in baseline demographic or clinical characteristics among the 3 treatment groups (**Table 1**). The observed HDRS scores before treatment indicated mild to moderate depressive symptoms but were consistent with previous studies<sup>8,10</sup> in primary care patients. The baseline PCS and MCS scores indicated that study patients had little impairment in physical functioning and well-being but significant impairment in psychological well-being (Table 1).

In the community referral group, only 15 (17%) women attended at least 1 referral session or received any community care, and 5 (6%) received antidepressants.

In the pharmacotherapy group, 66 (75%) received 9 or more weeks of antidepressant treatment, and 40 (45%) received guideline-consistent care for at least 24 weeks. In the CBT group, 48 (53%) women participated in 4 or more sessions, and 32 (36%) attended 6 or more sessions. Two women (2%) in the CBT group received antidepressant treatment, and 5 women (6%) in the pharmacotherapy group received CBT during the study. No differences in treatment participation were observed based on ethnicity.

## DEPRESSION AND HEALTH STATUS OUTCOMES

**Figure 1** summarizes adjusted mean HDRS scores for the 3 treatment groups during the 12-month study. Statistically significant treatment group  $\times$  assessment visit interactions were found during the first 4 months of the study, with the pharmacotherapy ( $t = -5.27, P < .001$ ) and CBT ( $t = -2.23, P = .03$ ) groups performing better than the community referral group. After 4 months, the mean HDRS scores for the pharmacotherapy group increased slightly compared with those of the community referral group ( $t = 2.38, P = .02$ ), and the mean scores of the CBT group were not significantly different from those of the community referral group. Because of gains made during the first 4 months of the study, the pharmacotherapy group had significantly lower adjusted mean HDRS scores than the community referral group from the 3rd month through the 10th month of the study ( $P = .04$  to  $P < .001$ ). Similarly, the CBT group had significantly lower adjusted mean HDRS scores compared with the community referral group from the 5th month through the 10th month of the study ( $P = .03$  to  $P = .049$ ), with a trend toward significance at the end of the study ( $P = .05$ ).

During the 12-month follow-up, the pharmacotherapy and CBT groups experienced means of 258 (95% confidence interval [CI], 236-280) and 251 (95% CI, 230-273) DFDs, respectively, compared with 225 (95% CI, 206-244) DFDs in the community referral group. A statistically significantly higher mean number of DFDs was observed in the pharmacotherapy group compared with the community referral group based on the regression analysis (mean, 39.7; 95% CI, 12.9-66.5;  $t = 2.98, P = .005$ ). The CBT group also had significantly more DFDs compared with the community referral group (mean, 25.80; 95% CI, 0.04-51.50;  $t = 2.01, P = .05$ ).

There were statistically significant assessment visit  $\times$  treatment group interactions during the first 3 months of the study for MCS scores between the pharmacotherapy and community referral groups ( $t = 3.21, P = .001$ ) but not between the CBT and community referral groups ( $P > .05$ ). After 3 months, the slopes for the 3 treatment groups were not significantly different (**Figure 2**). The pharmacotherapy group had higher adjusted mean MCS scores at 3 months ( $P = .01$ ) and at 6 months ( $P = .02$ ) compared with the community referral group. There were no significant differences observed between the CBT and community referral groups in adjusted mean MCS scores. No significant differences in mean PCS scores were observed between the treatment groups during the 12-month follow-up (data not shown).

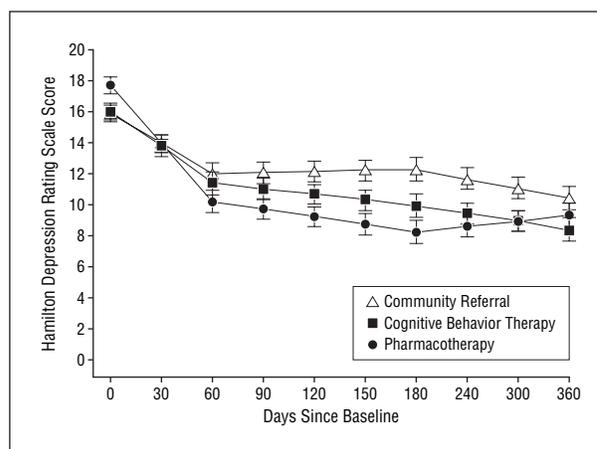
**Table 1. Baseline Demographic and Clinical Characteristics\***

Characteristic	Pharmacotherapy Group (n = 88)	Cognitive Behavior Group (n = 90)	Community Referral Group (n = 89)
<b>Demographic</b>			
Age, y	28.7 $\pm$ 6.6	29.8 $\pm$ 7.9	29.5 $\pm$ 9.1
Ethnicity			
Latina	48 (55)	43 (48)	43 (48)
African American	34 (39)	41 (46)	42 (47)
Married	43 (49)	40 (44)	41 (46)
$\geq$ High school education	51 (58)	63 (70)	54 (61)
Poverty status†			
Below federal poverty	48 (57)	48 (57)	53 (60)
Near poor, 100%-200% of poverty guidelines	33 (39)	27 (32)	28 (32)
Uninsured	55 (63)	58 (64)	60 (67)
<b>Clinical</b>			
HDRS score	18.0 $\pm$ 5.1	16.3 $\pm$ 5.2	16.5 $\pm$ 5.2
SF-36 PCS score	49.1 $\pm$ 9.9	46.9 $\pm$ 12.2	47.7 $\pm$ 10.4
SF-36 MCS score	30.5 $\pm$ 10.4	32.3 $\pm$ 10.7	32.2 $\pm$ 10.5

Abbreviations: HDRS, Hamilton Depression Rating Scale; MCS, mental component summary; PCS, physical component summary; SF-36, Medical Outcomes Study 36-Item Short-Form Health Survey.

\*Data are given as mean  $\pm$  SD or as number (percentage).

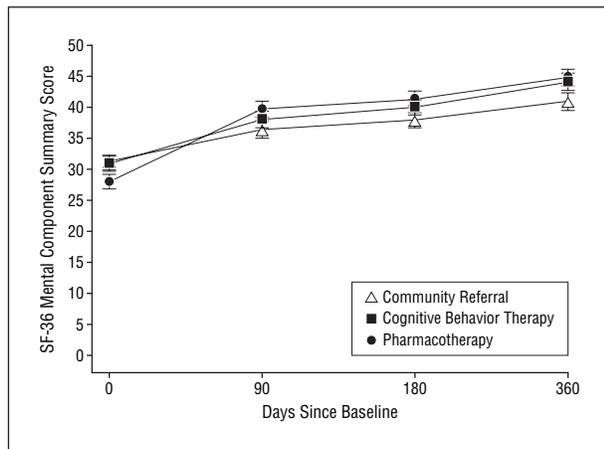
†Ten participants did not provide income data.



**Figure 1.** Adjusted mean Hamilton Depression Rating Scale scores by treatment group for the 12-month study.

## HEALTH SERVICE COSTS

**Table 2** summarizes the major cost categories for the pharmacotherapy, CBT, and community referral groups. As expected, the total outpatient costs and total costs were higher in the intervention groups. There were statistically significantly higher total outpatient costs in the pharmacotherapy group compared with the community referral group (mean, \$677; 95% CI, \$484 to \$870;  $t = 6.91, P < .001$ ) and in the CBT group compared with the community referral group (mean, \$636; 95% CI, \$446 to \$826;  $t = 6.58, P < .001$ ). Although the total costs (including inpatient services) were higher in the intervention groups, the differences were not statistically significant between



**Figure 2.** Adjusted mean Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) mental component summary scores by treatment group for the 12-month study.

the pharmacotherapy and community referral groups (mean, \$772; 95% CI, -\$7 to \$1551;  $t=1.95$ ,  $P=.05$ ) or between the CBT and community referral groups (mean, \$530; 95% CI, -\$241 to \$1300;  $t=1.35$ ,  $P=.18$ ).

#### COST-EFFECTIVENESS OF THE INTERVENTIONS

Based on the observed and imputed 12-month data, the total outpatient costs were higher for the pharmacotherapy and CBT groups compared with the community referral group. There were significantly more DFDs seen in the intervention groups compared with the community referral group. Compared with community referral, pharmacotherapy was associated with \$24.65 (95% CI, \$13.89-\$65.66) total outpatient costs per additional DFD (**Table 3**). The cost-effectiveness ratio is \$8997 per depression-free year, and this translates into \$16 068 per QALY gained. Compared with community referral, CBT was associated with \$27.04 (95% CI, \$12.85-\$449.22) total outpatient costs per additional DFD. The cost-effectiveness ratio is \$9869 per depression-free year, and this translates into \$17 624 per QALY gained.

#### COMMENT

To our knowledge, this study is the first to document the cost-effectiveness of mental health interventions tailored to engaging and treating an impoverished population. The findings in the randomized clinical trial by Miranda et al<sup>5</sup> demonstrated the effectiveness of tailored pharmacotherapy and CBT for treating major depression in low-income minority women during 6 months. Pharmacotherapy and CBT were significantly better than community referral at alleviating depressive symptoms and in improving social and role functioning for 6 months. The results reported herein demonstrate that these depression benefits extended for 12 months. Hamilton Depression Rating Scale scores for women in the pharmacotherapy and CBT groups were comparable to those of the community referral group for the initial months of

the study and then demonstrated significant improvements compared with community referral. However, these clinical and functional outcome benefits required additional treatment resources and costs. Given the limited resources of this population, the treatment intervention included intensive outreach, child care, and transportation services when needed. The results of the present economic study demonstrated that achieving these improvements in depressive symptoms in the intervention groups cost \$24.65 to \$27.04 per additional DFD compared with community referral. This translates into cost-effectiveness ratios of \$16 068 per QALY gained for pharmacotherapy and \$17 624 per QALY gained for CBT.

The key question for the public health system is whether there is sufficient value, in terms of clinical and health outcomes, associated with the additional expenditures for depression intervention in low-income minority women. According to data from the US Public Health Service Panel on Cost-effectiveness in Health and Medicine,<sup>4</sup> a cost-effectiveness ratio that is less than \$40 000 per QALY gained is a reasonable investment for the health care system. Based on this criterion, the pharmacotherapy and CBT interventions are cost-effective alternatives to community referral in this population. In addition, the cost-effectiveness ratios for both interventions are well within the ranges reported for other health care interventions.<sup>4,31</sup>

The results of the present study are comparable to those of previously published economic evaluations of treatments for depression.<sup>7,8,10,11</sup> These previous studies found cost-effectiveness ratios ranging from \$3000 to \$39 000 per QALY gained and costs ranging from \$2 to \$35 per DFD, with most estimates between \$10 and \$15 per DFD. Based on HDRS and medical resource use data collected in a 1-year clinical trial, Lave and colleagues<sup>7</sup> evaluated the cost-effectiveness of treatment for depression in primary care that was consistent with Agency for Health Care Policy and Research guidelines. They found that pharmacotherapy (nortriptyline) resulted in cost-effectiveness ratios ranging from \$11 695 to \$15 202 per QALY and that interpersonal therapy had cost-effectiveness ratios ranging from \$15 398 to \$26 403 per QALY. Simon et al<sup>10</sup> estimated that providing collaborative care interventions to managed care patients with major depressive disorder cost \$14.49 per DFD. Based on the findings of several randomized clinical trials on collaborative care and other related management interventions, the cost per DFD ranged from \$10 to \$35.<sup>10,32-36</sup> Schoenbaum and colleagues<sup>11</sup> found that depression-related quality improvement programs resulted in cost-effectiveness ratios of \$15 331 to \$36 467 per QALY for pharmacotherapy and \$9478 to \$21 478 per QALY for CBT during 12 months. Although we used different utility estimates for calculating QALYs based on DFDs, we found that the cost-utility ratios were comparable to those in previous studies,<sup>7,10,11</sup> that is, the costs herein per QALY gained were \$16 068 for pharmacotherapy and \$17 624 for CBT. The results suggest that there is little or no offset in total medical costs associated with standardized depression interventions but that investment in depression interventions, including additional outreach, educational attainment, and supportive services (ie, transportation

**Table 2. Costs by Treatment Group During 12 Months\***

Cost Category	Pharmacotherapy Group (n = 88)	Cognitive Behavior Group (n = 90)	Community Referral Group (n = 89)
Intervention			
Screening	85.39 ± 25.19	99.84 ± 102.01	85.94 ± 63.24
Protocol treatment†	709.39 ± 431.85	613.13 ± 681.61	Not applicable
Nonprotocol medical			
Outpatient‡	127.10 ± 18.87	182.84 ± 24.29	148.78 ± 25.58
Medication	99.07 ± 426.41	80.37 ± 379.69	78.93 ± 254.57
Inpatient‡	975.88 ± 330.11	868.11 ± 201.71	931.33 ± 258.54
Total‡§	1996.83 ± 349.97	1844.29 ± 238.73	1244.98 ± 286.30
Total outpatient‡	1020.95 ± 69.62	976.18 ± 89.65	313.65 ± 48.32

\*Data are given as mean ± SD dollars.

†Includes costs of treatment intervention, child care services, and transportation.

‡Estimate based on multiple imputations.

§Includes all intervention and nonprotocol medical costs.

||Total costs minus inpatient costs.

and babysitting), consistently improves these women's depression and functional outcomes.

Few clinical trials have evaluated the effectiveness of depression interventions in low-income minority women.<sup>1,5</sup> Based on the findings of the clinical trial by Miranda et al,<sup>5</sup> evidence-based interventions for depression are effective for Latina and African American women with impoverished backgrounds if they are provided support to overcome barriers to care, such as child care costs and transportation difficulties. The present study shows that, even with the addition of these outreach and supportive services, the pharmacotherapy and CBT interventions were cost-effective compared with community referral and compared with depression interventions in more advantaged populations.

The women included in this study were more likely to be without health insurance (173 [65%]) and to have incomes below the federal poverty level (160 [60%]). Their access to appropriate mental health services was poor, even if their depressive symptoms were recognized. Only 15 (17%) of the women in the community referral group received any mental health-related services, and this group, therefore, received little benefit from the existing health care system. When depression outcomes in women who received treatment in the community referral group were compared with those in the intervention groups, clinical benefits in the pharmacotherapy and CBT groups were demonstrated.<sup>5</sup> Interventions for low-income minority women require systematic approaches to identify major depressive disorder and treatment interventions that are acceptable to the participants and feasible for the health care system. We observed some attenuation of pharmacotherapy benefit during the last 6 months of follow-up. Given more recent guidelines on treating depression in primary care that extend treatment for 6 to 12 months after acute therapy to minimize relapse,<sup>37</sup> it is likely that continuation of antidepressant therapy would have improved depression and functional outcomes. This added treatment, while increasing intervention costs, would likely increase the cost-effectiveness of the intervention. Based on our experi-

**Table 3. Cost-effectiveness Ratios for the Intervention Groups vs Community Referral\***

Treatment Group	Cost per DFD†	Cost per QALY‡
Pharmacotherapy		
Total outpatient costs	24.65 (13.89-65.66)	16 068 (9052-42 794)
Total costs	46.06 (20.89-139.48)	30 023 (13 617-90 911)
Cognitive behavior therapy		
Total outpatient costs	27.04 (12.85-449.22)	17 624 (8375-292 794)
Total costs	57.64 (22.38-4351.36)	37 568 (14 590-2 836 158)

Abbreviations: DFD, depression-free day; QALY, quality-adjusted life year.

\*Data are given as mean (95% confidence interval) dollars.

†Based on Hamilton Depression Rating Scale scores (see text for details).

‡Estimated from utilities based on Hamilton Depression Rating Scale scores from Revicki and Wood.<sup>21</sup>

ence, outreach and supportive services are necessary for most of these women to enable them to receive the clinical benefits of the treatment interventions.

Several limitations of this study should be considered when interpreting the results. First, the depression, health status, and health care utilization measures were based on self-report. However, we verified health care use data based on clinical records for a subsample of subjects and found no bias in reporting. Furthermore, the depression and health outcome measures have been used extensively in previous research. Second, nearly 34% (345 of 1017 screened eligible for the study) of the women who screened positive for depression did not follow up with diagnostic interviews and were not included in the study. Pregnant and breastfeeding women were also excluded. Therefore, the generalizability of the study sample to the population of low-income minority women is uncertain. Finally, all women in the study were contacted monthly to assess clinical and other health outcomes. Women in the intervention and community referral groups reported that these contacts were helpful;

therefore, the effect of multiple contacts for study outcome measurement may have attenuated the results of the interventions vs community referral.

The results of this study indicate that providing pharmacotherapy or CBT to low-income minority women is cost-effective for the public health care system. The study interventions resulted in improvements in DFDs and in enhanced health status outcomes during 1 year. Additional total outpatient costs of \$636 to \$677 were associated with these treatments, but these costs included outreach expenses for which greater cost efficiencies could be achieved. Significant benefits, in terms of patient depression and functional outcomes, were associated with these expenditures. The present study did not examine indirect costs and benefits associated with the pharmacotherapy and CBT interventions or the rates and costs associated with foster care placement for children. Consideration of these potential benefits may demonstrate other economic advantages of improved depression treatment, such as increased work productivity and reduced work loss days. Potential health outcome and school performance benefits for children of women with depression were not examined and may also be substantial.

For the public health care system, there are many competing demands for limited health-related resources. Our findings suggest that expenditures for improved interventions for depression in low-income minority women represent a good investment compared with a range of other generally acceptable medical treatments. There are significant, achievable benefits in depression and functional outcomes for these women who receive interventions. Publicly financed health care systems should consider allocation of resources for depression treatment in low-income minority women. Our results suggest that effective treatment for depression in this population has benefits in reducing depressive symptoms and in improving functioning and well-being. Based on the economic analysis, compared with community referral, the pharmacotherapy and CBT interventions are cost-effective for the health care system.

**Submitted for Publication:** September 15, 2004; final revision received January 22, 2005; accepted February 2, 2005.

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**Funding/Support:** This research was funded by grant R01 MH56864 from the National Institute of Mental Health, Bethesda, Md, and by GlaxoSmithKline, Research Triangle Park, NC. Paroxetine was supplied by GlaxoSmithKline.

**Acknowledgment:** We appreciate the support and collaboration we received to conduct the study from the Prince George's County Health Department, Largo, Md, and the Montgomery County Department of Health and Human Services, Rockville, Md; and from the Arlington County Department of Human Services, Arlington, and the Alexandria Health Department, Alexandria. We acknowledge the numerous clinic and program staff, nurses, physicians, and research staff who contributed to the con-

duct of this study. This study would not have been possible without the involvement of the study participants.

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