Economics of Collaborative Care for Management of Depressive Disorders

A Community Guide Systematic Review

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Context: Major depressive disorders are frequently underdiagnosed and undertreated. Collaborative Care models developed from the Chronic Care Model during the past 20 years have improved the quality of depression management in the community, raising intervention cost incrementally above usual care. This paper assesses the economic efficiency of collaborative care for management of depressive disorders by comparing its economic costs and economic benefits to usual care, as informed by a systematic review of the literature.

Evidence acquisition: The economic review of collaborative care for management of depressive disorders was conducted in tandem with a review of effectiveness, under the guidance of the Community Preventive Services Task Force, a nonfederal, independent group of public health leaders and experts. Economic review methods developed by the *Guide to Community Preventive Services* were used by two economists to screen, abstract, adjust, and summarize the economic evidence of collaborative care from societal and other perspectives. An earlier economic review that included eight RCTs was included as part of the evidence. The present economic review expanded the evidence with results from studies published from 1980 to 2009 and included both RCTs and other study designs.

Evidence synthesis: In addition to the eight RCTs included in the earlier review, 22 more studies of collaborative care that provided estimates for economic outcomes were identified, 20 of which were evaluations of actual interventions and two of which were based on models. Of seven studies that measured only economic benefits of collaborative care in terms of averted healthcare or productivity loss, four found positive economic benefits due to intervention and three found minimal or no incremental benefit. Of five studies that measured both benefits and costs, three found lower collaborative care cost because of reduced healthcare utilization or enhanced productivity, and one found the same for a subpopulation of the intervention group. One study found that willingness to pay for collaborative care exceeded program costs. Among six cost–utility studies, five found collaborative care was cost effective. In two modeled studies, one showed cost effectiveness based on comparison of $/disability-adjusted life-year to annual per capita income; the other demonstrated cost effectiveness based on the standard threshold of $50,000/quality-adjusted life year, unadjusted for inflation. Finally, six of eight studies in the earlier review reported that interventions were cost effective on the basis of the standard threshold.

Conclusions: The evidence indicates that collaborative care for management of depressive disorders provides good economic value.

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Context

According to the WHO global burden update of 2004, major depressive disorder is the leading cause of disability among people aged 15–44 years.[1] Of the adult U.S. population, 6.7% or approximately 14.8 million American adults (based on 2004 U.S. Census data) suffer from major depressive disorders in a given year. Dysthymic disorders, where mild depression persists for at least 2 years in adults, affect about 3.3 million (1.5%) in the U.S. population aged ≥18 years in a given year.[2]

The first comprehensive study of the economic burden of major depression in the U.S. estimated an annual economic burden of about $42 billion.[3] (All monetary values here are expressed in 2008 dollars.) That estimate referred to prevalence and treatment practices in 1980, with the burden distributed as $5 billion (13%) in direct medical costs; $10 billion (26%) in mortality costs due to suicide; and $26 billion (61%), the major share, due to loss of workplace productivity. Subsequent studies, based on conditions in 1990, expanded the illness definitions to include bipolar disorder and dysthymia and incorporated estimates of subpar performance at work due to illness; the resulting estimate of the economic burden was $72 billion to $87 billion.[4,5] A recent estimate for 2000 set the burden at $104 billion: $33 billion (31%) in medical care; $6 billion (7%) in mortality due to suicide; and $65 billion (62%) in workplace productivity losses.[6]

A substantial part of the cost associated with depressive disorders is borne by employers as a consequence of workplace absenteeism and presenteeism (i.e., being at work, but too ill to be fully productive). In this context, depression and depressive episodes in bipolar disease ranked second after bipolar disorder in terms of employer expenditures for employee benefits among six large U.S. employers in 1999. The annual cost per eligible employee was $31 for depression and $29 for depressive episodes in bipolar disease, with 50%–58% attributable to absences and disability.[7]

Between the 1990s and 2000s, the number of people suffering from depression remained stable while the percentage receiving treatment increased by more than 50%; however, reduced episode severity and duration associated with treatment resulted in a decline of almost 20% in annual direct cost per treated patient.[8] The slower growth in economic burden is also partly explained by the rapid growth of managed care in the 1990s and the shift toward cheaper outpatient pharmaceutical-based care and away from inpatient care. In spite of the increase in the percentage getting treatment, the quality of usual care received for depression is often not adequate because of lack of adherence with treatment, follow-up of patients, and efficient monitoring and tracking of symptoms—aspects the collaborative care model attempts to improve.

Usual Care for Depressive Disorders

Major depressive disorders are commonly treated by primary care providers (PCPs).[9] According to national medical expenditure surveys, outpatient treatment for depression increased substantially from 0.73 per 100 people in 1987 to 2.33 per 100 people in 1997, with an increasingly large proportion treated by PCPs: 68.9% in 1987 versus 87.3% in 1997.[10] Based on the National Comorbidity Survey Replication (NCS-R) of 2001–2003,[11] of respondents with DSM-IV disorders who received some form of treatment from one or more sources in the past 12 months, treatment was sought most frequently from PCPs (22.8%), followed by nonpsychiatrist mental health specialists (16%); psychiatrists (12.3%); and others (14.9%).

The proportion of respondents with mood disorders who used mental health services increased substantially over 3 decades from the 1980s to the early 2000s.[9] Much of this expansion of treatment occurred in the primary care setting, and Kessler et al.[9] note that "general medical doctors act as gatekeepers responsible for initiating mental health treatments themselves and for deciding who to triage for specialty care." Although case identification and treatment have increased, underdiagnosis within primary care is substantial.[12,13] Based on the NCS-R conducted during 2001–2003, more patients in specialty care (under care of a psychiatrist or psychologist or in the care of a social worker or counselor within a specialist mental health setting) than in general medical practice received more than minimally adequate care for mood disorders—52.3% vs 14.3%.[11] Similarly, only about 21% of all people with major depressive disorder receive adequate treatment.[14]

Recently, a detailed examination of use of treatment for major depression at subpopulation levels based on race and ethnicity was conducted.[15] The study used the National Institute of Mental Health's Collaborative Psychiatric Epidemiology Surveys (CPES) data, which combine the National Survey of American Life, the NCS-R of 2001–2003, and the National Latino and Asian-American Study. Although analysis within the study was for subpopulation-level use and adequacy of care, findings for the whole sample reveal that only about 11% of those using pharmacotherapy were concordant with guidelines (and 19% for psychotherapy, 9% for combined therapy, and 21% for any therapy).

Promise of Collaborative Care: Costs and Benefits

As discussed briefly above, collaborative care for management of depressive disorders is promoted within the context of continued underdiagnosis, predominant treatment within the primary care setting, and treatment

(when it occurs) that falls short of guidelines and adequacy. The collaborative care model and intervention definition are covered in detail in the accompanying article on effectiveness.[16] The expectation is that education and training of PCPs will increase the identification of cases. Collaboration among PCPs, case managers, and mental health specialists (i.e., psychiatrists, psychologists, and psychotherapists) will bring treatment within the primary care setting into concordance with evidence-based guidelines, thus improving health outcomes. A key role is played by the case manager as coordinator among all providers and their patients.

The current paper reviews the economic evidence on collaborative care for management of depressive disorders. The economic evidence is based on implementation cost and incremental cost of collaborative care over usual care, any economic benefits gained through reduced overall healthcare use or improved workplace productivity, and an assessment of how costs compare with possible benefits.

Evidence Acquisition

According to *Community Guide* rules,[17,18] economic evaluations are conducted only when evidence of effectiveness of an intervention has been established, as is the case with collaborative care for management of depressive disorders. Methods used in economic evaluations are described elsewhere.[17] The standard abstraction form used for economic reviews is available at www.thecommunityguide.org/about/EconAbstraction_v5.pdf. The following describes the conceptual bases for consideration of economic costs and benefits reported in evaluation studies of collaborative care.

Both the effectiveness review[16] and this economic review compare collaborative care to usual care. Usual care in the primary care environment is generally understood to be brief encounters with the general practitioner, who may prescribe antidepressants or subsequently refer the patient to specialist care. From a purely economic standpoint, the collaborative care model implies consumption of greater resources than usual care. However, several personnel and some of their activities may coincide across the two types of care. Hence, in comparing collaborative care to usual care within the PCP setting, resources used in collaborative care should be those specific to activities of collaborative care over and above those expended for usual care.

For example, physicians, nurses, psychiatrists, behavioral care providers, and pharmacists may be involved at some point or other in providing usual care for depression for the typical patient. The distinction in collaborative care is the additional element of coordination among these providers. The patient consults directly with the PCP (usually an MD); the PCP prescribes medication under the supervision of a psychiatrist; and the case manager (usually a nurse) monitors patient adherence and progress and also acts as the channel for feedback among all parties. Treatment may include psychotherapy, usually provided by a psychiatrist or psychologist. Thus, besides the costs of any additional behavioral health service delivery following the implementation of collaborative care, the incremental cost of collaborative care versus usual care should focus on the value of labor and material resources assignable to coordination and case management functions.

Given the expectation of positive incremental intervention cost of collaborative care compared to usual care, economic research has sought to determine what economic benefits might result—in particular whether there is a "cost offset" from reduced overall healthcare utilization due to collaborative care. With regard to this expectation of a cost offset, Katon[19] notes that mental health services are being held to a higher standard for establishing cost effectiveness than general medical interventions. On the other hand, this review considers all economic benefits of collaborative care for management of depression.

The expected benefits include improvement of depressive disorders, which improves quality and daily functioning of patients, captured in the health economics literature through the metric of quality-adjusted life-years (QALYs). At the healthcare-systems level, proper evidence-based management of depression is expected to improve remission rates, reduce relapse, and lower the probability of new episodes in the future. These improvements will translate to reduced healthcare use by depressed patients.

Further, the "offset" hypothesis says that utilization of health care will be reduced overall because depressed patients use healthcare resources at a higher level than patients with similar health status who are not depressed. Hence, researchers might estimate categories of use separately for behavioral and general medical care, further categorized as inpatient, outpatient, and pharmaceuticals. Finally and importantly, the literature also identifies depression as a serious detriment to full productivity in worksites among depressed workers, whether or not they are aware of their depressed status.

The studies included in the current review focus on some or all of the benefits identified in the preceding paragraph. For example, it is not uncommon for a researcher writing from the perspective of a healthcare organization to focus on benefits that might accrue to the organization through reduced overall use of health services. A researcher taking the perspective of a large, self-insured employer might focus both on the utilization of health care and the impact on productivity in the workplace. Although these different perspectives are valid in and of themselves, the *Community Guide* methods[17] follow the Panel on Cost Effectiveness on Health and Medicine recommendation[20] that economic evaluations of health interventions take a societal perspective that considers costs and benefits across all parties regardless of who actually pays and who gets the benefit.

To improve comparability across studies, economic outcomes reported in foreign currencies were first converted to U.S. dollars and then inflated to 2008 U.S. dollars. Conversion of foreign currency values is performed using indices for purchasing power parity from the World Bank.[21] Inflation adjustment is performed using either the consumer price index (CPI) or the medical care component of CPI (MCPI) from the Bureau of Labor Statistics.[22]

Search Strategy and Search Yield

A previous economic review published in 2006[23] that searched publications in MEDLINE, Embase, CINAHL, PsycLIT, EconLit, Cochrane, and the Health Economics Evaluation Database (HEED) covered the period to November 2005. The Gilbody et al. review[23] included only those RCTs that reported an economic outcome, such as cost effectiveness, cost–benefit, or cost–utility. To avoid duplicative research, that review's search yield and results

were used as a starting point for the current review. Studies already included in Gilbody et al. were not abstracted for the current review; in effect, their findings were accepted at face value.

The search for the current review covered the period 1980 through 2009 and included the following sources: databases at the Center for Reviews and Dissemination (CRD) at the University of York, MEDLINE, EconLit, PsycINFO, Google Scholar, SSCI, Dissertation Abstracts International, and conference proceedings. The inclusion criteria for this economic review are identical to those for the review of effectiveness,[16] with the additional requirement that papers report economic values such as cost, cost effectiveness, or cost–benefit.

Evidence Synthesis

A total of 175 eligible studies were identified after title and abstract screening. Successively detailed review at the level of abstract and full text produced 23 studies that met all inclusion criteria, including two modeled studies and the Gilbody et al. review.[23] Table 1 provides a summary of included evaluation studies with respect to type of economic outcome, study design, and study location. Of 20 evaluation studies in the current review, 17 were RCTs,[24–30,33–35,37–43] and three were pre–post design.[31,32,36] Most studies were based in the U.S., with one each from Israel[36] and the UK.[41] The type of economic outcomes reported in these evaluation studies varied, as is generally the case in the health economics literature (Table 1).

Table 1. Economic outcomes, design, and location of included evaluation studies

	No. of studies
Type of economic outcome	
Cost-only	2[24,25]
Benefit-only	7[26–32]
Cost–benefit	4[33–36]
Cost–utility	6[37–42]
Willingness-to-pay	1[43]
Study design	
RCT	17[24–30,33–35,37–43]
Pre–post	3[31,32,36]
Study location	
U.S.	18[24–35,37–40,42,43]
Israel	1[36]
UK	1[41]

Note: Studies were categorized as cost-only analysis if only program cost was reported; as benefit-only analysis if only the monetary benefit of the intervention was reported; as cost–benefit analysis if both program cost and benefit were reported; and as cost–utility analysis if the incremental cost per quality-adjusted life-year (QALY) gained was reported. One study conducted a willingness-to-pay analysis, which is classified as a type of cost–benefit study.

The presentation of results is arranged in sections below, based on the type of economic analysis conducted in the studies. Results from the previous review are presented first, followed by studies that reported (1) intervention costs; (2) only economic benefits; (3) both benefits and costs; and (4) cost–utility.

Findings from the Previous Systematic Review

The Gilbody et al. review paper[23] was used as a starting point for this review. Papers included in that review were not abstracted for the current review. Eight studies from Gilbody et al. met inclusion criteria for the present review, six dealing with newly diagnosed cases, and one each for treatment-resistant depression and relapse prevention. The summary economic outcomes were reported by the authors in terms of net cost per depression-free days, and converted to $/QALY for the present review, based on the conversion factor of 1 depression-free day = 0.00082 QALY.[44] In summary, the Gilbody et al. review found that collaborative care generally increased the cost of behavioral care, but there was some evidence for offsets through reduced nonbehavioral healthcare utilization. Six of eight included studies reported cost effectiveness of intervention ranging from $17,000 to $39,000 per QALY, comfortably within the $50K threshold for accepted economic value.

Intervention Costs

Intervention costs and program costs are used interchangeably in this review. The reported intervention costs are converted to cost per person per year to make comparisons across studies more meaningful. Table 2 provides the number of participants in the intervention arms and the average or incremental cost per participant for studies that reported program costs.

Across all 20 studies, the number of participants was a minimum of 40 and maximum of 999 with a median of 261. For the 13 studies that reported program costs,[24,25,33–43] the intervention group had a minimum of 40 participants and a maximum of 489 with a median size of 211. The small intervention groups are not surprising given that many of the studies were RCTs.

Ideally, in the presence of a comparison group, the cost of intervention should be calculated both as cost of intervention implementation and as the incremental cost of the intervention over the cost for the comparison group. In evaluation studies of collaborative care, it is generally the case that the comparison group receives "usual care" in a PCP clinic. "No treatment" for the comparison group is uncommon on the basis of what constitutes ethical

Table 2. Number of participants and estimates of intervention cost per person per year

No. of studies	No. of participants, median (min/max)	Intervention cost type (2008 $), median (min/max)
13[24,25,33–43]	211 (40/489)	Overall 436 (104/2160)
9[33–35,37–42]	211 (101/489)	Incremental 204 (104/850)
4[24,25,36,43]	150 (40/242)	Average 685 (477/2160)

practice. Program cost is reported in terms of both an average cost of intervention and an incremental cost when there is a comparison group, and when such information is available in the study. Four studies[24,25,36,43] reported a median intervention cost per participant of $685 with a maximum of $2160 and a minimum of $477. Nine studies[33–35,37–42] reported a median incremental intervention cost of $204 per participant with a maximum of $850 and a minimum of $104 (Table 2).

The range of intervention costs can be partly explained by the variation in what these studies included in estimates of intervention cost. Program costs generally included the time of three professionals (i.e., a case manager, a PCP, and a psychiatrist or a psychologist). To estimate intervention cost, most studies took care to measure collaborative care activities separately from usual clinical activities. For example, the psychiatrist's time is recorded for consultation and oversight; PCP time for discussions with the case manager; and case manager time for patient monitoring, feedback, coordination activities, and record keeping. Most studies included the cost of screening too, and some included the cost of training for primary clinic staff. A few studies included the cost of education and training, patient time with the case manager, the cost of self-help materials, and enhancements in information systems to facilitate depression management.

An inverse relationship is expected between average cost and the number of intervention participants because of economies of scale; however, the data show only a small negative correlation of 0.19 ($p=0.53$). Aside from the number of intervention participants, the variation in program costs also might be explained by case manager–patient contacts, whether by phone or in person, and whether cost of screening, staff training costs, or costs of electronic care management systems were included.

Costs and Benefits of Collaborative Care

A total of 12 included studies either reported both the costs of intervention and benefits (five studies)[33–36,43] or assessed benefits alone, such as averted costs (seven studies).[26–32] Six studies[37–42] reported incremental costs per QALY. These studies provide evidence on the economic viability of collaborative care for management of depressive disorders, especially its economic value relative to "usual care." The findings from the review are discussed below, beginning with benefits-only studies, then moving to cost–benefit, cost-effectiveness, and cost–utility studies.

Benefits-only studies. Seven studies[26–32] reported the impact on healthcare utilization or productivity at the workplace but did not report the cost of implementing collaborative care (Table 3). Note that in the case of healthcare utilization, the estimate is likely to include the incremental costs of collaborative care because average utilization is often derived from reimbursement or claims data.

One study[30] estimated the effect of collaborative care treatment on healthcare utilization among medical and surgical patients who screened positive for depression in nine Veterans' Affairs (VA) Medical Centers. The study found that outpatient costs increased during the study period for both the intervention and usual care groups,

Table 3. Studies reporting economic benefits only

Study and design	Economic benefit per person due to intervention (2008 $)
Domino (2008)[26] RCT	No difference in healthcare costs
Grypma (2006)[27] RCT plus post-intervention group	Lower healthcare costs: Post-intervention group: 8771 Pre-intervention group: 9332 Control group: 10,082
Kominski (2001)[30] RCT	Higher healthcare costs (outpatient): 1698 Lower healthcare costs (inpatient): 4389
Simon (2007)[28] RCT	About same healthcare costs: 26,858 vs 28,268 in usual care
Reiss-Brennan (2009)[32] Pre–post with comparison	Lower increase in healthcare costs (claims): 458 per year
Reiss-Brennan (2006)[31] Pre–post with comparison	Slightly lower healthcare costs (claims): ~64–127 Slightly higher depression care costs (claims)
Wang (2007)[29] RCT	Higher productivity: 1922

but the increase for the collaborative care group was $1698 higher than that for the usual care group. On the other hand, although inpatient costs decreased for both groups, the decrease for the collaborative care group was $4389 higher than the decrease for the usual care group. It is plausible that the increased outpatient costs included some elements of collaborative care that increased visits with providers and/or utilization of medications. On balance, the savings from inpatient costs outweighed the increased outpatient costs for this sample of patients with comorbidities.

Pre and post outcomes for healthcare costs were compared in a primary care clinic where collaborative care was implemented as a pilot, with six primary care clinics in the same area serving as comparators.[31] In the post-intervention period, depression-related claims were higher, at about $165–$203 in the pilot clinic compared to $165 in the comparators. On the other hand, total claims were lower in the pilot clinic, a difference of about $64–$127 per patient.

Building on their previous 2006 work,[31] the collaborative care program was extended to 69 of the HMO's 130 PCP clinics.[32] Pre and post estimates were taken for five clinics practicing collaborative care, and eight demographically similar clinics practicing usual care for depression. The authors found that although claims increased for both groups in the post period, the increase of $722 (73%) for the intervention group was smaller than the increase of $1180 (100%) for the comparison group. Although the intervention groups had higher claims increases for psychiatry/counseling and antidepressants, they were also 54% less likely to use the emergency department and 49% less likely to use inpatient psychiatric care, both of which are expensive services.

In one study, a collaborative care model shown to be cost beneficial in a previous RCT was implemented in an actual HMO setting.[27] The authors then compared the cost of utilization by a post-intervention group drawn from the HMO to utilization observed among the intervention and control groups in the original RCT. The study found that the cost of healthcare utilization ($8771) per person in the post-intervention group was lower than that in the original RCT's intervention ($9332) and control ($10,082) groups.

The impact of collaborative care versus usual care was compared for diabetes patients who screened positive for depression in nine primary care clinics.[28] In Year 1 following implementation, the intervention group incurred $889 per person more in outpatient depression care but $254 less in outpatient nondepression care compared to the usual care group. In Year 2, the intervention group incurred about $127 per person more in outpatient depression care but $1778 less in outpatient nondepression care. There was little difference in outpatient plus inpatient costs between the intervention and usual care groups, at $26,858 and $28,268, respectively. However, the inpatient cost estimate was unreliable because of a small sample of very large utilizers.

Work performance was measured based on an RCT conducted in a large sample of employed individuals belonging to a behavioral HMO.[29] Based on measures of weekly hours of work, the authors estimated that the intervention group worked 2 hours per week more than their usual care counterparts, a difference that translates to about $1922 per person per year based on U.S. median annual wages.

Healthcare utilization was estimated inside and outside the VA system for two groups receiving collaborative care treatment, one with referrals to external mental health/substance abuse (MH/SA) clinics and the other with onsite co-located MH/SA clinics.[26] No substantial difference was found in total healthcare cost between groups treated in settings with co-located MH/SA clinics compared to those with external MH/SAs, with the exception of a higher behavioral care cost in the VA system for the group treated in settings with co-located MH/SAs. Although this study did not provide direct evidence on the cost effectiveness of collaborative care, it did indicate that the greater integration of care through co-located MH/SA clinics might increase the cost of MH/SA care utilization but has no substantial impact on total care utilization. The authors noted that this may be due to the cost-offset benefit of collaborative care, by which effective treatment of depressed patients can reduce their utilization of other services.

The evidence from the seven benefits-only studies indicates a likely increase in behavioral outpatient cost with the implementation of collaborative care. There is some evidence that use of outpatient nonbehavioral care is smaller for those receiving collaborative care compared to usual care, and some evidence of no substantial change in total utilization. Although the studies generally reported lower costs for inpatient care, these findings should be interpreted cautiously given the generally small number of observations in this category within RCT samples. Thus, the evidence is not definitive that collaborative care results in substantial cost offsets in healthcare utilization. Conversely, the findings indicate that any potential concern of creating over-users of healthcare services via collaborative care treatment may be unfounded.

Cost–benefit studies. The five studies discussed in this section[33–36,43] assessed both program costs and benefits of the intervention, generally in terms of averted healthcare costs, workplace productivity improvements, or

Table 4. Cost–benefit studies

Study and design	Average cost per person per year (2008 $)	Incremental cost per person per year (2008 $)	Economic benefit per year due to intervention (2008 $)
Dickinson (2005)[33] RCT	—	204	With psychological/physical complaints at index visit—savings in healthcare costs: 1368 per person With physical complaints at index visit—increased healthcare costs: 1924 per person
Lo Sasso (2006)[34] RCT	—	181	2-year total cost: 118,759 2-year total productivity savings: 477,000 ROI=3.02 per year
Matalon (2002)[36] Pre–Post	477	—	Decreased healthcare cost: 4012 per person
Unutzer (2008)[35] RCT	—	639	Lower healthcare cost: 4120 per person
Unutzer (2003)[43] RCT	2160	—	Willingness to pay (WTP) for treatment for persistent depression: 4932±3324

ROI, return on investment

both. Willingness to pay is also included here as a type of analysis based on cost–benefit principles (Table 4).

One study indicates that the benefits of collaborative care differ depending on whether PCP patients presented at the initial visit with physical complaints alone or with psychological complaints (with or without physical complaints).[33] The incremental cost of the intervention over 2 years was reported at $408 per person ($204 per year). During 2 years, the intervention group with psychological complaints had outpatient plus intervention costs of $1368 less than usual care, and improved clinically. At the same time, the intervention group that presented with physical complaints alone had outpatient plus intervention costs of $1924 more than usual care, while showing no clinical improvement.

One study modeled the effect of collaborative care on worksite productivity compared to usual care, from the employer perspective.[34] The effect on work output is modeled from self-reported performance at work, absenteeism, and records of absences from work. The authors reported that the incremental cost of enhanced care was an average of $181 per person per year and the cost of enhanced plus usual care plus training costs was $680 per person per year. For an employer with 1000 employees and 5% participation by depressed workers, the authors calculated the 2-year intervention cost to be $118,759 and the productivity benefits to be $477,000, for a return on investment of 302%.

Patients from 45 family practices in Israel were identified as difficult frequent users of clinical services with multiple somatic complaints or psychological symptoms, and were referred to a multidisciplinary clinic.[36] The authors reported that the average yearly cost of operating the clinic was $19,097. The intervention reduced average yearly use of healthcare services by the 40 participants from $5633 to $1621 per person, producing a yearly benefit of $160,480 and substantially exceeding the cost of the clinic.

A willingness-to-pay survey was conducted, in which respondents stated how much money they would be willing to pay per month for a 6-month treatment that would eliminate symptoms of depression.[43] The average willingness to pay per month was $370 at the 25th percentile of depression severity and $439 at the 75th percentile of depression severity. Categorized by income level of respondents, willingness to pay per month was $346 at the 25th percentile of income and $439 at the 75th percentile of income. The authors concluded that the treatments yield positive net benefit to the patients on the basis of an estimated $180-per-month cost of treatment.

An RCT for collaborative care was conducted among patients in two HMOs who either screened positive for depression or were referred by their PCPs.[35] Program cost was estimated at $639 per person per year with benefits based on the difference between healthcare utilization in the intervention and control groups, measured to be $4120 lower in total utilization for the intervention group. The lower utilization by the intervention patients was observed for all categories of health care including outpatient, inpatient, and medications, regardless if care was for physical or mental health.

In summary, of five cost–benefit studies, four showed that averted healthcare costs, productivity losses, or estimates of what patients were "willing to pay" for treatment exceeded program costs, indicating that the interventions were cost beneficial. One study found clinical improvement and healthcare offsets for those who presented with psychological complaints at the initial visit but

Table 5. Cost–utility studies

Study and design	Incremental cost per person per year (2008 $)	Incremental cost per QALY (2008 $)
Pyne (2003)[37] RCT	472	6555 for women Not effective for men
Pyne (2005)[38] RCT	436	Receptive to antidepressant: 11,629 Receptive to antidepressant and counseling: 12,451 Receptive to antidepressant or counseling: 20,506
Rost (2005)[39] RCT	201	11,990–17,883 based on 3 years
Strong (2008)[41] RCT	850	8577 over 6 months
Wells (2007)[42] RCT	Medication quality: 114 Therapy quality: 104	Subthreshold group: 2679 Depressive disorder group: 70,959
Schoenbaum (2004)[40] RCT	**Latino:** Therapy group: 107 Medication group: 184 **White:** Therapy group: 497 Medication group: 433	**Latino:** Therapy group: 6810–7995 Medication group: 122,413–335,105 **White:** Therapy group: 29,240–58,482 Medication group: 30,367–59,413

QALY, quality-adjusted life-year

not for those who presented with exclusively physical complaints.

Cost–utility studies. Six cost–utility studies[37–42] estimated and reported net incremental cost per QALY gained as a result of the intervention (Table 5). A cost–utility analysis was performed for a subset of patients who were receptive to use of antidepressants as a treatment for their depression.[37] The incremental cost of the intervention was $472 per person per year. The authors found the intervention to be ineffective for men but effective for women in improving depression outcomes. In their base case that excludes staff training, inpatient costs, and worksite productivity effects, the cost effectiveness for women was estimated at $6555/QALY. The authors also computed $/QALY when inpatient costs, training costs, and productivity effects due to work absences were added, reporting associated costs per QALY of $10,244, $12,175, and $6464, respectively.

In a later study,[38] the analysis was extended to examine the results for subsets of patients by their receptivity to either antidepressants or counseling or both. For this sample, the study reported an incremental program cost of $436 per person per year and cost per QALY of $11,629, $12,451, and $20,506, for those receptive to antidepressants, to antidepressants and counseling, and to either antidepressants or counseling, respectively. The authors found that the intervention resulted in decreased QALY and negative cost effectiveness for those who were unreceptive to antidepressants.

A 2-year follow-up of a collaborative care RCT found that the intervention group experienced an incremental QALY increase of 0.049 for an incremental intervention cost of $201 per person per year.[39] Cost effectiveness based on intervention cost and healthcare use ranged from $11,990 to $17,883 per QALY, with the lower estimate reflecting use of generic pharmaceuticals. The cost effectiveness of collaborative care was estimated based on an RCT among cancer patients in Scotland.[41] Incremental cost of the intervention was reported at $425 for 6 months, and based on healthcare utilization plus program cost, the cost effectiveness was computed to be $8577 per QALY.

Two included studies[40,42] were based on the same RCT, which considered the effect of collaborative care in which patients were allowed to choose treatment based on medication or on psychotherapy. One study[40] performed cost-effectiveness analysis for Latino and for non-Latino white subgroups. Collaborative care with either medications or psychotherapy was cost effective for white patients ($29,240 to $59,413/QALY), but only psychotherapy ($6810 to $7995/QALY) was cost effective for Latinos, whereas medication was not ($122,413 to $335,105/QALY). The other study[42] conducted a similar analysis for patients categorized by severity into subthreshold and depressive disorder subgroups, and reported that, based on healthcare utilization and productivity impacts, the cost effectiveness of the intervention ranged from $2,679 to $70,959 per QALY, for the subthreshold and depressive disorders groups, respectively.

In summary, six studies[37–42] reported incremental net costs per QALY. In five of these studies,[37–39,41,42] the

estimates ranged from $3,000 to $71,000, with four[37–39,41] reporting less than $21,000, indicating that the interventions were cost effective according to the conventional threshold for cost effectiveness ($50,000/QALY, unadjusted for inflation). One study[40] provided some evidence that the intervention was more cost effective among Latinos when treatment emphasized psychotherapy over medication.

Modeled Studies

A frequent problem encountered in cost-effectiveness analysis, especially of public health interventions, is lack of estimates for and certainty about parameter values postulated to link measured intermediate outcomes and final outcomes (e.g., lifetime morbidity and mortality). The long time interval between intervention and final outcomes makes it impractical or impossible to have sufficiently lengthy follow-up to take actual measurements of final outcomes. Second, even carefully managed RCTs that follow standard protocols will differ in inputs and outputs because of factors not in the control of the researchers.

For these and other reasons, modeled studies attempt to re-create the entire process from intervention effect to final outcomes using key parameter values drawn from across the body of literature and/or from expert opinion. By allowing for parameter values to take a range of plausible values and/or allowing for parameter uncertainty with distributional assumptions, modeled studies are able to estimate the plausible values for final outcomes in terms of probabilistic statements such as CIs.

Cost effectiveness was modeled for the 14 WHO regions for interventions that included treatment with tricyclic antidepressants or selective serotonin reuptake inhibitors combined with proactive collaborative care.[45] Results for the AmrA and EurA regions are reported: AmrA includes the U.S., Canada, and Cuba; EurA includes Western European countries. The intervention cost per episode per patient ranged from $913 to $965 for the AmrA region and from $820 to $870 for the EurA region. Cost effectiveness was based on intervention costs, healthcare costs averted, and productivity effects per disability-adjusted life-year (DALY) averted.

The study[45] reported the incremental cost effectiveness of pharmaceutical treatment combined with proactive collaborative care versus pharmaceutical treatment alone in terms of $/DALY; cost ranged from $18,305 to $19,771 for AmrA and from $17,547 to $19,085 for EurA. The lower estimates in these ranges are for the tricyclic antidepressants and the upper estimates for selective serotonin reuptake inhibitors. Following the recommendation of the WHO Commission on Macroeconomics and Health,[46] these interventions were deemed cost effective because they were below the annual per capita income for the regions: $39,346 and $29,908, respectively, for AmrA and EurA.

One study compared collaborative care to usual care based on a Markov cohort model of people aged 40 years.[47] The analysis, based on a societal perspective, produced an incremental cost-effectiveness ratio of $23,452/QALY when the cohort was followed over patient lifetimes, but productivity effects were not considered directly. The perspective of an employer was adopted by considering a 5-year horizon instead of lifetime and also including the costs of absenteeism and presenteeism in the workplace. The study reported a benefit–cost ratio from the employer perspective of 1.1. These two studies[45,47] based on decision models of primary care practice demonstrated that collaborative care can be cost effective, one comparing collaborative care with pharmaceutical treatment to pharmaceutical treatment alone and the other comparing collaborative care to usual care.

Conclusion

Thirteen actual intervention studies[24,25,33–43] provide a range of values for average or incremental intervention cost per person per year that may help decision makers in planning for collaborative care. The present review indicates that of seven benefit-only studies,[26–32] three found minimal or no increased economic benefit from collaborative care,[26,28,31] three found substantial economic benefits from the intervention either in terms of healthcare costs or productivity,[27,29,30] and one[32] found that healthcare cost increases were much smaller in the intervention group compared to the comparison group in the post-intervention period. Of five cost–benefit studies,[33–36,43] three found that collaborative care costs were lower because of averted healthcare costs or productivity losses,[34–36] and one found the same for a segment of the intervention sample.[33] One study found a willingness to pay that exceeds program cost.[43]

Five[37–39,41,42] of six cost–utility studies found collaborative care to be cost effective ($3,000–$71,000 per QALY) based on the inflation-adjusted threshold for cost per QALY, and one study found that therapy-based collaborative care is cost effective.[40] An earlier review[23] reported six of eight studies that found the intervention to be cost effective ($17,000–$39,000 per QALY) based on the standard threshold. Finally, of two modeled studies, one showed cost effectiveness based on comparison of $/DALY to annual per capita income,[45] and the other demonstrated cost effectiveness based on the standard threshold for $/QALY.[47] Overall, the weight of the evidence indicates that collaborative care provides good economic value.

There is a need for research in this area on the adolescent population. The effectiveness review included only one study on adolescents, and no studies were identified in the economic review. Also, there is a need to separate the collaborative components of the activities of behavioral professionals such as psychiatrists and psychologists from their usual care activities. Hence, program costs should include the cost of staff associated with managing care and coordinating visits/sessions but should exclude psychiatrist/psychologist time associated with treatment. Only time that is associated with items beyond treatment, such as consultation with primary care providers for management of medication, should be included in program cost. This careful separation of costs associated with the collaborative care intervention and treatment was not always followed in studies included in the current review.

Many of the studies also took a healthcare system perspective (e.g., an HMO) rather than a societal perspective. This might be because researchers are currently examining whether total healthcare use by depressed patients is reduced when collaborative care is implemented. That said, a true public health perspective must look beyond the costs to the healthcare system and also account for societal losses, such as losses to employers from diminished productivity associated with depression. Finally, it should be noted that the current systematic economic review is limited to the comparison of collaborative with usual care for patients with already-identified depressive disorders. It does not consider the economic implications of increased screening, diagnosis, and treatment that may be possible through the collaborative care.

Points of view are those of the authors and do not necessarily reflect those of the CDC.

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