Objective: To examine the contributions of community reinforcement therapy to outcome in the community reinforcement approach (CRA) + vouchers outpatient treatment for cocaine dependence.

Methods: One hundred cocaine-dependent outpatients were randomly assigned to one of 2 treatment conditions: CRA + vouchers or vouchers only. All patients earned incentives in the form of vouchers exchangeable for retail items contingent on cocaine-free urinalysis results during treatment weeks 1 to 12. Incentives were combined with a 24-week course of CRA therapy designed to promote healthy lifestyle changes in the CRA + vouchers condition, while incentives represented the primary treatment in the vouchers-only condition. Patient drug use and psychosocial functioning were assessed at intake and at least every 3 months for 2 years after treatment entry.

Results: Patients treated with CRA + vouchers were retained better in treatment, used cocaine at a lower frequency during treatment but not follow-up, and reported a lower frequency of drinking to intoxication during treatment and follow-up compared with patients treated with vouchers only. Patients treated with CRA + vouchers also reported a higher frequency of days of paid employment during treatment and the initial 6 months of follow-up, decreased depressive symptoms during treatment only, and fewer hospitalizations and legal problems during follow-up.

Conclusions: Combining CRA with vouchers had therapeutic effects on substance abuse and psychosocial functioning during treatment and posttreatment follow-up in cocaine-dependent outpatients, although effects on cocaine use appear to be limited to the treatment period.

Arch Gen Psychiatry. 2003;60:1043-1052

Development and dissemination of effective treatments for cocaine dependence remains an important US public health priority. There are approximately 1.7 million current cocaine users in the United States, including 437,000 users of crack cocaine.1 Cocaine dependence has become an entrenched problem, especially among those with less than a high school education and the unemployed.1 Efforts to develop pharmacotherapies for cocaine dependence are continuing but have not yet identified an efficacious medication.2,3 Several efficacious psychosocial treatments have been identified,3 but a great deal more remains to be learned about the scope, magnitude, and durability of their effects.

Our group has been researching an efficacious intervention for outpatient treatment of cocaine dependence that combines a contingency-management component, involving vouchers exchangeable for retail items contingent on cocaine abstinence and an intensive behavior therapy intervention known as the community reinforcement approach (CRA).4-8 The voucher component is designed to promote an initial period of continuous cocaine abstinence. The impetus for the voucher-based incentive program came from controlled studies demonstrating that contingency-management interventions were efficacious in reducing benzodiazepine and illicit opiate abuse in patients receiving methadone maintenance treatment9,10 and promising preliminary results suggesting the same for cocaine abuse among outpatients enrolled in drug-free treatment.11 The impetus for CRA was an impressive program of research demonstrating its efficacy in the treatment of alcohol-dependent inpatients and outpatients.12-14 Initial reviews on treatment of cocaine dependence indicated that early attrition and ongoing cocaine use were serious challenges to effective treatment of this population in outpatient settings, presumably because of the robust reinforcing effects of cocaine.15 In designing the CRA + vouchers intervention, the goal was to use a contrived alternative reinforcer (vouchers) in the early stages of outpatient treatment to retain individuals for a sufficient period to establish initial cocaine abstinence and to initiate CRA therapy. The plan was that the healthy life-
style changes achieved with CRA would be in place and sufficiently reinforcing to effectively compete with cocaine use and sustain abstinence when the voucher program was terminated.

Results from a series of randomized clinical trials support the efficacy of this combined CRA+voucher intervention.4,6,8 In addition to examining efficacy, some of these trials were also directed at experimentally analyzing the contribution of the treatment elements to the positive outcomes observed.8,9 The goal behind dismantling the intervention was to streamline the treatment and to facilitate potential dissemination of efficacious elements. The first randomized clinical trial in this dismantling effort compared CRA with vouchers vs CRA alone.9 Retention and cocaine abstinence were significantly greater when CRA was combined with vouchers compared with CRA alone, thereby demonstrating the active contribution of the voucher component to the positive outcomes observed with the combined treatment. Posttreatment follow-up of subjects in that trial demonstrated positive treatment effects through 6 months after treatment termination.10 The second randomized trial in this effort further supported the contribution of the voucher program to cocaine abstinence, isolated the importance of the contingent relationship between voucher delivery and cocaine abstinence to achieving those effects, and demonstrated positive effects of contingent vouchers through 1 year of posttreatment follow-up.9 Results from a number of randomized clinical trials conducted by other investigators16-20 also supported the efficacy of contingent vouchers for increasing initial cocaine abstinence, although there were some negative results as well.21 Negative results are always difficult to account for, but they may be more likely when the contingency is placed on multiple substances as opposed to targeting cocaine specifically.

The purpose of the present study was to experimentally analyze whether CRA improves treatment outcome above the effects contributed by the contingent vouchers component alone. To isolate the contributions of CRA to outcome, cocaine-dependent individuals were randomly assigned to receive treatment with the combined CRA+vouchers intervention or the vouchers component only.

**METHODS**

**SUBJECTS**

Subjects were 100 men and women seeking outpatient treatment at a university research clinic for the treatment of cocaine dependence. For trial inclusion, individuals had to be 18 years or older, meet DSM-III-R criteria for cocaine dependence,22 have used cocaine in the past 30 days, and reside within the county in which the clinic was located. Exclusion criteria were current opioid or sedative dependence, psychosis, dementia, pregnancy, plans to leave the geographic area within 6 months or pending incarceration, and having a significant other enrolled in the trial.

Inclusion and exclusion criteria were determined on the basis of information obtained in an intake interview involving the Addiction Severity Index (ASI),23 the Beck Depression Inventory (BDI),24 the Michigan Alcoholism Screening Test,25 drug history and sociodemographics questionnaires developed in our clinic, and the Psychoactive Substance Abuse Disorders section of the DSM-III-R Checklist.26

Minimum likelihood allocation27 was used to randomly assign subjects to CRA+vouchers or vouchers only, while achieving balance between conditions for the following baseline characteristics: sex, primary route of cocaine administration, having a significant other who was not a drug abuser, being under criminal justice supervision, race, and willingness to initiate disulfiram therapy.

**STUDY DURATION**

The study entailed a recommended course of 24 weeks of treatment, 6 months of aftercare, and 3 years of further follow-up. Outcome assessments (see the “Assessments” subsection) were scheduled with all subjects, including treatment dropouts, at 6, 12, and 24 weeks after treatment entry and then at 3-month intervals through 24 months, and then 12-month intervals out to 48 months after treatment entry. This report describes results from the first 24 months of the study.

**BIOCHEMICAL MONITORING OF DRUG USE**

Routine urinalysis monitoring conducted during the 24-week treatment period involved thrice-weekly (Monday, Wednesday, and Friday) testing during weeks 1 through 12 and twice weekly (Monday and Thursday) during weeks 13 through 24. Specimens were screened immediately by an on-site enzyme-multiplied immunoassay technique (Syva, San Jose, Calif.). Specimens were obtained under direct observation of a same-sex study member and were screened for benzoylecgonine, a cocaine metabolite. One randomly selected specimen each week was also screened for the presence of other abused drugs (ie, amphetamines, benzodiazepines, cannabis, methadone, opiates). Breath alcohol levels were assessed at the time that urine specimens were collected. Failure to submit a scheduled urine specimen was treated as a cocaine-positive result with regard to the voucher program described below, and a subject was considered a treatment dropout if he or she failed to submit scheduled specimens on 5 consecutive occasions. The latter rule was applied exclusively to determine a termination date for persons who discontinued treatment without giving notice.

**TREATMENT CONDITIONS**

**Vouchers Only**

Urine specimens collected during treatment weeks 1 through 12 that tested negative for benzoylecgonine earned points that were recorded on vouchers and given to subjects. Points were worth the equivalent of $0.25 each. The first cocaine-negative specimen earned 10 points at $0.25 per point, or $2.50. The value of each subsequent consecutive cocaine-negative specimen increased by 5 points. The equivalent of a $10 bonus was provided for each 3 consecutive cocaine-negative specimens. Cocaine-positive specimens or failure to submit a scheduled specimen reset the value of vouchers back to the initial $2.50 value; submission of 3 consecutive cocaine-negative specimens after a cocaine-negative specimen returned the value of points to where they were before the reset. Points could not be lost once earned. The only restrictions on voucher use in this condition were that purchases be legal and not involve alcohol, cigarettes, or firearms. Testing positive for drug use other than cocaine did not affect the voucher program or have any other programmed consequence.

Urine specimens collected during weeks 13 through 24 that tested negative for benzoylecgonine earned a $1.00 Vermont State Lottery ticket. To further support submission of urine speci-
mens during weeks 13 through 24, subjects received a $10 voucher per specimen independent of urinalysis results. This $10 non-contingent payment was added to provide individuals in the vouchers-only condition an added reason for participating in regular urinalysis monitoring during weeks 13 through 24.

Four additional treatment elements were included for patient protection. First, patients were assessed at each clinic visit for suicide risk and other crises. Those who reported crises were referred to appropriate community agencies. Second, patients were encouraged to participate in self-help meetings (eg, Alcoholics Anonymous), provided a list of meeting times and location, and offered transportation to their first meeting. Third, patients received a single AIDS-education session. Fourth, anyone who did not submit at least 5 consecutive cocaine-negative specimens within the first 6 weeks of treatment was encouraged, but not required, to consider referral to another treatment facility.

Those who were retained in treatment for the recommended 24 weeks of treatment were encouraged to participate in 6 months of aftercare involving at least a once-monthly clinic visit and urine toxicology screen.

**CRA + Vouchers**

Those assigned to the CRA+vouchers condition received the same incentive program as described above. The only difference was that therapists approved all voucher purchases and attempted to integrate them into individualized treatment plans. Positive urine toxicology tests were shared with CRA therapists to be addressed in therapy sessions, but otherwise had no programmed consequences. Patients assigned to CRA+vouchers also received the same crisis monitoring as those assigned to vouchers only, but crises were referred to the CRA therapist. Patients were informed about and encouraged to participate in self-help meetings. The AIDS-education session was identical in the 2 conditions.

The provision of CRA therapy was the main experimental manipulation in this study. Those assigned to CRA+vouchers were offered twice-weekly 1- to 1.5-hour CRA therapy sessions during weeks 1 through 12 and once-weekly sessions of the same duration during weeks 13 through 24. This schedule could be increased or decreased through joint decisions of therapist and patient. The CRA is a manual-guided therapy that has been described previously. Briefly, sessions focused on 5 general topics. First, patients were counseled in how to identify and avoid antecedents, find alternatives for the positive consequences, and make explicit the negative consequences of cocaine use. They were trained in drug-refusal skills. Those with other specific skill deficits that might increase cocaine use were provided additional skills training (eg, mood regulation, relaxation training, or sleep hygiene). Second, subjects were counseled to develop new recreational activities and to develop a healthy social network. Planning recreational and social activities was a regular part of therapy sessions. Third, participants were offered employment counseling and assistance with miscellaneous practical needs (eg, obtaining alternative housing). Fourth, patients with romantic partners who were not drug abusers were offered relationship counseling. Fifth, all who reported alcohol problems were offered monitored disulfiram therapy. This was typically in the form of a 230-mg daily dose ingested under staff observation on days that subjects visited the clinic and as take-home doses for the intervening days.

On completion of the 24 weeks of treatment, subjects were encouraged to participate in 24 weeks of aftercare as described in the “Vouchers Only” subsection, last paragraph.

Therapists were 3 (2 women and 1 man) master’s-level counselors experienced in delivering this treatment.

**ASSESSMENTS**

Formal assessments were conducted by trained bachelor’s-level research assistants who were aware of patient treatment condition. Assessments included completion of the ASI and BDI and submission of a urine specimen collected under staff observation. The ASI is a structured interview to assess drug and alcohol use and areas of functioning commonly affected by substance abuse (ie, medical, employment, family/social, psychiatric, and legal). Composite scores were calculated for each problem area. These composite scores are weighted combinations of individual items that provide reliable and valid measures of problem severity during the 30 days before the interview. Because composite scores have sometimes been relatively insensitive in our previous research,2,33 we also examined specific individual ASI items. The BDI is a 21-item self-report instrument for assessing the presence and severity of depressive symptoms. The Treatment Services Review35 was used during treatment to assess the amount of clinical services patients received from inside and outside of the study clinic. The Treatment Services Review is a 5-minute technician-administered interview that provides a quantitative profile of substance abuse and related treatment services received. Subjects from both treatment groups were paid $40 for completing formal assessment interviews and $10 for providing a urine specimen independent of urinalysis results.

**STATISTICAL METHODS**

Comparisons between treatment groups on baseline characteristics were performed by means of either 2-sample t tests or Wilcoxon rank sum tests for continuous measures and χ² tests for categorical variables. The t tests were also used to compare treatment groups on mean number of documented cocaine-negative urine toxicology test results, mean percentage of positive breath alcohol tests, and Treatment Services Review composite scores for services received. Treatment Services Review composite scores represent the sum of services in each area per month during the period an individual was in treatment (ie, not influenced by retention). A log-rank test was used to compare treatment groups on retention through the 24-week treatment period. The χ² tests were used to compare treatment groups on percentages of subjects who completed 12 and 24 weeks, percentage abstinent from cocaine and other drugs on the basis of urinalysis assessments, and percentage of subjects who self-reported abstinence from cocaine and alcohol for the 30-day periods before each assessment. Repeated-measures analyses of covariance were used for treatment comparisons corresponding to ASI composite scores, individual ASI items, and BDI scores. The statistical model used for the analyses of covariance consisted of fixed factors representing treatment group; time, which corresponded to the 3 periodic assessments during the scheduled treatment period (6, 12, and 24 weeks), 2 assessments during the initial 6 months of follow-up when aftercare was still available (9 and 12 months), and 4 assessments during the year after the end of the recommended course of clinical care (15, 18, 21, and 24 months); and their interaction. Subjects’ intake values for each outcome measure were used as covariates to adjust for potential treatment group differences at intake and to reduce error variance. To differentiate between treatment differences during the scheduled treatment period and during the 2 follow-up periods, a priori contrasts were constructed to test the significance of the main effect of treatment separately for these 3 assessment periods. Additional analyses of covariance were used to perform treatment comparisons within strata defined by whether subjects were appropriate for and willing to use disulfiram therapy. Analyses were performed with SAS, PROC MIXED (SAS Institute Inc, Cary, North Carolina).
TREATMENT ASSIGNMENT

The stratification procedure succeeded in balancing the 2 treatment conditions on each of the selected subject characteristics. The treatment groups were also comparable on the majority of other subject characteristics examined, although 3 differences were noted (Table 1). A larger proportion of subjects assigned to the vouchers-only condition met diagnostic criteria for cannabis dependence, and those assigned to the vouchers-only condition had higher mean ASI psychiatric composite scores and BDI scores. As described in the subsection “Influence of Subject Characteristics on Treatment Effects,” there was no evidence that these differences in baseline characteristics significantly influenced treatment effects.

TREATMENT SERVICES RECEIVED

Consistent with the study protocol, those treated with CRA+vouchers received significantly more study-clinic services than those treated with vouchers only (Table 2). The only significant difference in the number of outside services received was that those treated with CRA+ vouch-
ers received more employment services, which likely resulted from CRA therapist use of community resources.

Sixty-three percent (31/49) vs 22% (11/51) of those assigned to CRA+vouchers and vouchers only, respectively, participated in aftercare services in the study clinic (χ² = 17.8, P < .001; RR, 2.93; 95% CI, 1.67-5.16). Average duration of participation among those who participated in CRA+vouchers and vouchers only was 126 ± 105 and 100 ± 60 days, respectively. Four subjects in the CRA+vouchers condition continued disulfiram therapy during aftercare, for an average of 50.5 days (range, 10-142 days).

Table 2. Treatment Services Received

<table>
<thead>
<tr>
<th>Service</th>
<th>CRA+ (n = 49)</th>
<th>VO (n = 46)†</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>0.79 ± 1.96</td>
<td>0.00 ± 0.00</td>
<td>.007</td>
</tr>
<tr>
<td>Employment</td>
<td>3.71 ± 4.20</td>
<td>0.00 ± 0.00</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Alcohol</td>
<td>19.03 ± 11.62</td>
<td>9.11 ± 2.44</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Drug</td>
<td>17.94 ± 5.60</td>
<td>9.94 ± 1.83</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Legal</td>
<td>0.48 ± 0.98</td>
<td>0.01 ± 0.07</td>
<td>.002</td>
</tr>
<tr>
<td>Family</td>
<td>1.95 ± 2.10</td>
<td>0.01 ± 0.07</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Psychiatric</td>
<td>1.28 ± 1.75</td>
<td>0.10 ± 0.54</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Values are mean ± SD for the number of services received monthly per participant in each treatment condition during the 24-week treatment. Boldface P values indicate significant difference.

†Data were unavailable for 5 subjects because of early dropout.

COCAIN, ALCOHOL, AND OTHER SUBSTANCE USE

Cocaine Use

Of the 60 urine toxicology tests scheduled as part of routine monitoring during treatment, patients in the CRA+vouchers group submitted an average of 35.6 ± 18.9 cocaine-negative specimens vs 24.6 ± 20.7 from patients in the vouchers-only group (t = 2.9, P = .004). Those differences were likely influenced by differential retention rates, but less cocaine use also was documented among those treated with CRA+vouchers by means of urinalysis results from the 12-week periodic assessment that was scheduled with the intent-to-treat sample (Figure 2A). Seventy-eight percent (38/49) vs 51% (26/51) of those treated with CRA+vouchers vs vouchers only, respectively, had cocaine-negative urinalysis results at the 12-week assessment (χ² = 10.2, P = .001; RR, 1.52; 95% CI, 1.12-2.07). No significant differences between treatment conditions in cocaine urinalysis results were observed at the other periodic assessments.

The ASI results from the periodic assessments were congruent with urinalysis results. There was a trend for ASI drug composite scores to be lower in the CRA+vouchers than the vouchers-only condition during treatment (F(1,145) = 3.7, P = .06), but not follow-up (Figure 2B). Subjects treated with CRA+vouchers reported significantly fewer days of cocaine use in the past 30 days (F(1,173) = 4.5, P = .04) and spending less money on cocaine (F(1,170) = 5.4, P = .02) during treatment, but not follow-up (Figure 2C and D).

Alcohol Use

Breath alcohol levels recorded as part of urinalysis monitoring did not differ significantly between the treatment conditions. The ASI alcohol composite scores (Figure 3A) were significantly lower in the CRA+vouchers than the vouchers-only condition during treatment (F(1,125) = 8.2, P = .005) and showed a similar trend during the 9- and 12-month (F(1,166) = 2.9, P = .09) and 15- through 24-month (F(1,125) = 3.1, P = .08) follow-up periods. Consistent with the composite scores, patients in the CRA+vouchers group reported fewer days of drinking in the past 30 days during treatment (F(1,133) = 6.6, P = .01), but not follow-up (Figure 3B). Patients in the CRA+vouchers group also reported fewer days of drinking to intoxication in the past 30 days during treatment (F(1,126) = 8.9, P = .003), and that effect remained evident during the 9- and 12-month (F(1,172) = 5.0, P = .03) and the 15- through 24-month (F(1,121) = 4.4, P = .04) follow-up periods (Figure 3C).

We were interested in whether treatment effects were exclusively attributable to disulfiram therapy (23 individuals assigned to CRA+vouchers received disulfiram therapy during treatment for an average of 84 days; range, 6-161 days). To address that question, we analyzed effects on drinking to intoxication after dividing individuals in each treatment condition into 3 categories according to the following information collected before randomization: (1) Disulfiram therapy was indicated and the individual expressed willingness to use the medication. (2) Disulfiram therapy was indicated, but the individual was unwilling to use the medication. (3) Disulfiram therapy was not indicated. Among those for whom the medication was indicated who were willing to use it, treatment effects were significant during treatment (F(1,85) = 5.5, P = .02) and 9- through 12-month follow-ups (F(1,116) = 4.0, P = .05), with the trend during 15- through 24-month follow-ups (F(1,79) = 2.9, P = .09). Among those for whom disulfiram therapy was indicated but patients were unwilling to use it, treatment effects were significant during treatment (F(1,20) = 6.2, P = .02)
and during 9- through 12-month follow-ups ($F_{1,30}=4.3, P=.05$), but not during 15- through 24-month follow-ups. There were no significant treatment effects during treatment or follow-up among those for whom disulfiram was not indicated.

Other Substance Use

There were no significant differences between the treatment conditions in urinalysis screenings for other drug use at the intake interview, although there was a trend toward fewer cannabis-positive specimens in the CRA+vouchers than the vouchers-only condition (24% [12/49] vs 41% [21/51], $\chi^2=3.1, P=.08$; RR, 0.59; 95% CI, 0.33-1.07). The magnitude of the difference in the percentages of subjects testing positive for cannabis generally remained stable at approximately 21% throughout subsequent treatment and follow-up assessments. The percentage of benzodiazepine-positive specimens differed significantly at one assessment (9 months), when patients treated with CRA+vouchers submitted fewer positive specimens than those in the vouchers-only group (0% [0/39] vs 14% [5/37], $\chi^2=5.6, P=.02$). The percentage of opiate-positive specimens was less in the CRA+vouchers than the vouchers-only condition at 15-month (0% [0/39] vs 9% [3/32], $\chi^2=3.8, P=.05$) and 24-month (0% [0/40] vs 11% [4/36], $\chi^2=5.6, P=.03$) assessments.

PSYCHOSOCIAL FUNCTIONING/HEALTH PROBLEMS

Employment Problems

The ASI employment composite scores did not differ significantly between the treatment conditions, but those treated with CRA+vouchers reported greater mean days of paid employment in the past 30 days during treatment ($F_{1,167}=4.7, P=.03$) and the 9- through 12-month follow-up period ($F_{1,244}=9.5, P=.002$), but not the 15- through 24-month follow-up period (Figure 4A).

Psychiatric Problems

The ASI psychiatric composite scores did not differ significantly between the treatment conditions during treatment or follow-up. The BDI scores were significantly lower...
in the CRA+vouchers than the vouchers-only condition during treatment ($F_{1,126}=8.1$, $P=.005$), but not follow-up (Figure 4B).

### Medical Problems

The ASI medical composite scores did not differ significantly between the treatment conditions, although subject-reported number of hospitalizations for medical problems in the past 90 days differed at the 12- and 24-month follow-up assessments (Figure 4C). Among those assessed at the 12-month assessment, 2% (1/44) of patients in the CRA+vouchers group vs 24% (10/42) patients in the vouchers-only group reported a recent hospitalization ($\chi^2=8.9$, $P=.003$; RR, 0.10; 95% CI, 0.01–0.71), and among those assessed at 24 months, the rates were 2% (1/42) among patients in the CRA+vouchers group and 16% (6/38) among those in the vouchers-only group ($\chi^2=4.5$, $P=.03$; RR, 0.15; 95% CI, 0.02–1.20).

### Legal Problems

The ASI legal composite scores did not differ between the treatment conditions during the treatment period, but a trend toward more problems among those treated with vouchers only was evident during the 9- through 12-month follow-up period ($F_{1,225}=3.4$, $P=.06$), and that difference was significant during the 15- through 24-month period ($F_{1,142}=4.6$, $P=.03$). Worth noting is that in assessing individual ASI items regarding recent arrests (past 90 days), 2% (1/44) of subjects treated with CRA+vouchers vs 14% (6/42) of subjects treated with vouchers only reported a recent arrest for driving under the influence at the 12-month assessment ($\chi^2=4.1$, $P=.04$; RR, 0.16; 95% CI, 0.02–1.27) (Figure 4D).

### Family/Social Problems

No significant differences between treatment conditions were noted in this area of the ASI.

### INFLUENCE OF SUBJECT CHARACTERISTICS ON TREATMENT EFFECTS

Analyses of covariance conducted post hoc examined whether the 3 significant differences in subject characteristics between treatments observed at intake (Table 1: cannabis dependence, ASI psychiatric composite scores, and BDI scores) contributed to the observed differences in outcome according to the following 4 outcome variables: treatment retention, days of cocaine use in the past 30 days, days of drinking to intoxication in the past 30 days, and days of paid employment in the past 30 days. None of the 3 intake characteristics was a significant predictor of any of these outcome measures, and treatment effects remained significant after inclusion of the covariates.

### COMMENT

This study provides the first experimental demonstration that CRA is an active element of the CRA+vouchers treatment for cocaine dependence. A series of previous studies demonstrated the efficacy of the contingent-vouchers component,\(^6^,^8^,^18^–^20\) but the contributions of the CRA component had not been previously characterized.

Early attrition is a major obstacle to effective treatment of cocaine dependence in outpatient settings, with a sizable proportion of patients often failing to remain in treatment for even several weeks.\(^3^7\) Increased retention rates is one of the most reliable effects of the combined CRA+vouchers intervention.\(^4^,^6\) The contribution of vouchers to that effect has been experimentally demonstrated,\(^6\) and now the present results demonstrate that
the CRA component also improves retention. The present study does not identify which aspects of CRA are responsible for this effect, but the active outreach efforts along with the provision of a broad array of individualized clinical services likely operate in concert to retain individuals in treatment.28,38

The present results also provide evidence that CRA contributes to the significant decreases in cocaine use reported previously with the combined CRA+vouchers intervention, but only during the treatment period. That observation runs counter to part of the original rationale for combining CRA with contingent vouchers, which was to use the healthy lifestyle changes produced by CRA to maintain the effects on cocaine use engendered initially by the voucher program. That said, the results are consistent with several previous observations regarding longer-term cocaine abstinence. First, we previously reported that posttreatment cocaine abstinence rates were significantly greater in patients treated with contingent vouchers combined with CRA vs noncontingent vouchers combined with CRA.39 Those results demonstrated that contingent vouchers continued to influence cocaine abstinence rates during the posttreatment period and that they did so above any effects produced by CRA, which all subjects received. Second, our group has previously reported that an initial period of sustained abstinence may be key to achieving longer-term cocaine abstinence among individuals treated with CRA+vouchers and comparison treatments alike.39 In the present study, CRA’s effects on cocaine use appeared to represent more a decrease in the frequency of use than an increase in sustained abstinence. For example, the 2 treatment conditions did not differ significantly in the percentage of subjects reporting 30-day abstinence from cocaine use at any outcome assessment. Those points notwithstanding, a cautionary note is warranted. The effects of CRA on cocaine use in the present study were evaluated by means of a research design in which all subjects received contingent vouchers. Such a design could obscure detection of the full impact of CRA on cocaine use. That is, CRA may still affect longer-term cocaine use, but just not to an extent greater than contingent vouchers. Evaluating CRA’s

Figure 4. Outcome measures relating to psychosocial functioning and health for subjects in the community reinforcement approach plus vouchers (CRA+) and vouchers-only (VO) treatment conditions. Mean days of paid employment in the 30 days preceding assessments (A) and mean scores on the Beck Depression Inventory (BDI) for the 30 days preceding assessments (B) are presented as a function of baseline (B on x-axis, intake values) and 1.5- through 24-month follow-up assessments. Percentages of subjects hospitalized in the 90 days preceding the 12- and 24-month assessments are shown as a function of treatment condition (C; percentages represent 1 of 44 and 1 of 42 subjects in the CRA+ group and 10 of 42 and 6 of 38 in the VO group, respectively). Percentages of subjects arrested for driving while under the influence (DUI) in the 30 days preceding the 12-month assessment are shown as a function of treatment condition (D; percentages represent 1 of 44 and 6 of 42 in the CRA+ and VO conditions, respectively). Limit lines represent ±1 SEM of the estimated mean (A and B) or proportion (C and D).
The present effects of CRA+vouchers on substance abuse and other outcome measures provide a systematic replication and extension of the findings of Azrin and colleagues on the efficacy of CRA in the treatment of alcohol dependence.12-14 In those studies, CRA produced many-fold decreases in drinking outcomes than comparison treatments and, when used with more severely impaired inpatients,12,13 significant improvements in employment, time away from home, and time “institutionalized” (this latter outcome measure was not defined further). We know of 2 other studies among alcohol-dependent patients focused on replicating the CRA research of Azrin and colleagues.44,45 Both reported positive effects of CRA on selected drinking outcome measures. Only 1 of them, a study comparing CRA vs standard care of alcohol-dependent homeless individuals,44 reported effects on other aspects of psychosocial functioning (employment and housing stability). Those measures improved significantly through the course of the study, but to a comparable extent in both treatment conditions. The present results with CRA+vouchers replicate effects on drinking outcomes reported in these previous studies and extend them to a population with codependence on cocaine and other substances. The present results also extend at least some of the effects on psychosocial functioning noted in the original studies by Azrin and colleagues with inpatients to outpatients with multiple substance dependencies. The combined use of CRA and vouchers in the present study is a notable difference from previous replication efforts that likely enhanced outcomes in the present study.46

The present results suggest that the disulfiram therapy component of CRA was not the only contributor to the positive outcomes. The significant difference in drinking to intoxication noted between the subgroups of patients in the 2 treatment conditions who were eligible for but declined disulfiram therapy supports that conclusion. The CRA includes other interventions (eg, coping and social skills training) that have been independently documented to be efficacious treatments for problem drinking,47 and they may have contributed to the outcomes observed in the present study. The point is not to downplay the positive contributions of monitored disulfiram therapy,48 but to caution against assumptions that it alone accounted for the treatment effects observed in the present study.

The present study has limitations that should be acknowledged. The present results demonstrate the improvements in outcome that are produced by combining CRA with contingent vouchers compared with treatment with contingent vouchers only. The study does not address whether CRA is superior to other potential therapies in that regard. Also, the study was conducted with an almost exclusively white population, in a small metropolitan area located within a rural state, and in a clinic fully supported by research grants and associated resources. Any one of those study features could limit the generalizability of the findings to other settings and populations. Potentially limiting dissemination to community clinics is our use of master’s level therapists experienced in substance abuse counseling who carried lighter caseloads than might be possible in community clinics. Balanced against these potential limitations on generalizability and dissemination is that our pre-
vious findings with vouchers were made in the same clinic and proved to have generalizability to metropolitan settings and ethnically diverse samples. The same is true regarding our practice of using clinic-supervised disulfiram therapy with cocaine-dependent outpatients. Also, the 2 CRA replications we cited were conducted in Albuquerque, NM, demonstrating the feasibility of implementing CRA in larger urban areas. Surely, adjustments and further testing would be necessary, but we see no a priori reason to conclude that CRA + vouchers cannot be implemented in community clinics or large metropolitan areas.

Submitted for publication August 27, 2002; final revision received February 24, 2003; accepted March 20, 2003.

Preparation of this manuscript was supported by research grants DA06113 and DA08076 and training award DA07242 from the National Institute on Drug Abuse, Bethesda, Md.

We thank Stacey Horn for assistance in conducting the study, Laurianne Verret for assistance in preparing figures, and Joan Mongeon for assistance with data analysis.

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