Income received during treatment does not affect response to contingency management treatments in cocaine-dependent outpatients

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ABSTRACT

Background: Prior studies find no effect of baseline income on response to contingency management (CM) interventions. However, income among substance disordered patients is variable, particularly at treatment entry. This study investigated the impact of *during-treatment* income, a more proximal estimate of economic resources at the time that CM is in effect, on response to standard treatment or the standard treatment plus CM.

Method: These secondary analyses included 418 cocaine dependent participants initiating community intensive outpatient treatment. We examined whether differences were present in pretreatment and during-treatment overall income, as well as specific income sources. We then conducted a series of regression models to investigate the impact of during-treatment income on treatment outcome.

Results: Participants' during-treatment income was significantly lower compared to pretreatment income, and this difference was largely attributable to decreases in earned income, illegal income, and support from friends and family. Neither the main effect of income, nor the interaction of income and treatment condition, was significantly associated with treatment outcome. CM, however, was a significant predictor of improved treatment outcome relative to standard treatment. Income sources and some demographic characteristics were also significant predictors of outcomes; public assistance income was associated with improved outcomes and illegal income was associated with poorer outcomes.

Conclusions: These results suggest that substance abusers benefit from CM regardless of their income level, and these data add to the growing literature supporting the generalizability of CM across a variety of patient characteristics.

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1. Introduction

In contingency management (CM) interventions, patients earn reinforcers for attaining verified target behaviors such as abstinence or treatment attendance. Meta-analyses suggest CM is effective for the treatment of a variety of substance use disorders (Lussier et al., 2006; Prendergast et al., 2006), and CM produces the largest effect sizes compared to cognitive-behavioral, relapse prevention, and other psychosocial treatments (Dutra et al., 2008).

Although the evidence base supporting CM's effectiveness builds, community substance abuse treatment providers endorse many perceived barriers to the adoption and implementation of CM (Kirby et al., 2006; Rash et al., 2012). Many providers are concerned

about CM's generalizability and whether it will be effective for their particular patient population, with specific comorbidities or demographic characteristics. Related to the latter, providers frequently question whether CM will be effective across patients with heterogeneous income levels (Rash et al., 2009), as the overall amount of reinforcement provided is often low. Strong-Kinnamen et al. (2007) found that income was not related to the amount of reinforcement received for patients in CM conditions. We (Rash et al., 2009) found that CM's effectiveness was not impacted by self-reported income level in a sample of primarily low-income cocaine abusing patients, and Secades-Villa et al. (2013) replicated this effect in a higher income European sample.

However, all three studies (Rash et al., 2009; Secades-Villa et al., 2013; Strong-Kinnamen et al., 2007) used estimates based on income earned prior to treatment entry. Substance abusers' incomes can be highly variable, especially during periods of transition, and incomes are often low at treatment entry (Metsch et al.,

2003; Oggins et al., 2001; Wickizer et al., 2000). During treatment, patients may decrease income-generating illegal activity, have more disposable income due to not buying drugs or alcohol, gain access to benefits and services, or gain or lose employment. Thus, pre-treatment income may reflect past economic resources and may not accurately represent resources available during substance abuse treatment. Income received during the treatment period may provide a more precise estimate of the impact of personal resources on CM's effectiveness and whether or not higher income patients benefit from CM interventions, especially those providing relatively low magnitudes of reinforcers. In the present study, we first examined if income differed significantly before and after treatment entry. We then examined the impact of *during-treatment* income on the effectiveness of CM compared to standard treatment. This income estimate reflects the economic resources available at the time patients earned reinforcement if they were randomized to a CM condition, and it provides a more thorough assessment of the impact of patients' income on response to CM.

2. Method

2.1. Participants

Data were collected as part of a randomized trial (Petry et al., 2012) to reduce substance use among cocaine dependent patients in community substance abuse programs. Participants were adult, English-speaking, cocaine dependent patients initiating outpatient substance abuse treatment between 2003 and 2007. Exclusion criteria included: (1) inability to understand the study, (2) uncontrolled psychotic symptoms, (3) active suicidality, or (4) in recovery for pathological gambling. The University's Institutional Review Board approved study procedures, and all participants provided written informed consent. Of 442 participants randomized in Petry et al. (2012), we excluded 24 participants who did not have any financial data available during the treatment period. Analyses reported herein focused on the 418 remaining participants.

2.2. Measures/procedures

At baseline, research assistants administered a variety of questionnaires to assess demographic characteristics and substance use diagnoses. Included among these questionnaires was the Service Utilization Form (SUF; Rosenheck and Lam, 1997), which is a comprehensive assessment of medical and mental health service utilization, employment, and financial resources. We assessed the following income sources: earned income, social security benefits (e.g., disability, supplemental), need-based assistance (e.g., rent supplements, food stamps), unemployment and worker's compensation, vocational training, retirement funds, alimony and child support, other support from family and friends, illegal sources, and gambling wins. The SUF was re-administered one month following the start of treatment and again at the end of the 12-week treatment.

The baseline SUF income estimate represented past year income. At each subsequent time point (i.e., week 4, week 12), research assistants inquired about income received since the prior administration of the SUF. For patients who missed the week 4 evaluation, the week 12 evaluation assessed income received since treatment initiation. We excluded those with no income data during active treatment (analyses restricted to $n = 418$ of 442). Eighty nine percent of the analyzed sample ($n = 372$ of 418) had financial data for both during-treatment assessment time points. For individuals with missing income data at one of the two assessments ($n = 46$), we used data from the available time point to estimate income for the full 12-week treatment period (e.g., if the patient

did not attend the later assessment, we estimated income based on income reported at the week 4 assessment).

2.3. Treatments

The primary trial (Petry et al., 2012) included two study arms, one for patients with cocaine negative urine samples at treatment initiation, and the second for patients with cocaine positive samples at baseline. For patients in the initially cocaine-negative arm, research assistants randomized participants to one of three conditions: (a) standard care, (b) abstinence-based CM ($250 average maximum available), or (c) attendance-based CM ($250 average maximum available). Participants in the initially cocaine-positive arm were randomized to one of the following conditions: (a) standard care, (b) abstinence-based CM ($250 average maximum available), or (c) abstinence-based CM ($560 average maximum available). Treatment conditions are described briefly below; for details, see Petry et al. (2012).

2.3.1. Standard treatment.
All participants received intensive-outpatient group therapy. For up to 6 weeks, services were available for up to 4 h per day, 5 days per week. Treatment frequency then decreased per the needs of the patient. Aftercare groups (1 per week) were available for up to 1 year. The content and structure of the standard services were similar for all study participants.

Participants in the study also submitted up to 21 urine and breath samples on a tapering frequency schedule that corresponded to reductions in clinical care (i.e., 3 sample submissions per week in weeks 1–3, 2 sample submissions per week in weeks 4–6, 1 sample submission per week in weeks 7–12). Breathalyzers (Intoximeters, St. Louis, MO) tested breath samples for recent alcohol use, and OnTrak TesTstiks (Varian Inc., Walnut Creek, CA) tested urine samples for cocaine and opioids.

2.3.2. Standard treatment plus CM.
Participants randomly assigned to the CM conditions received the same standard treatment and sample monitoring as described above. In addition, CM participants earned prizes for meeting target behaviors (abstinence or attendance). Of the four CM conditions, one condition (abstinence-based CM, $250 average maximum available) from each arm was identical. Participants in this condition earned chances to win prizes for each sample submitted that tested negative for alcohol, cocaine, and opioids. The abstinence-based $560 condition was similar, but increased the average maximum available reinforcement from $250 to $560 for participants who submitted all negative samples during the treatment period. In the attendance-based CM condition ($250 average maximum available), participants earned chances to win prizes for attending treatment groups. Urine and breath samples were monitored according to the same frequency outlined above, but the results were not reinforced, in this attendance-based condition.

For the present analyses, we collapsed the four CM conditions and the two standard treatment conditions to increase the power to detect an impact of income on treatment outcomes. Table 1 presents comparisons between the participants assigned to a CM condition and those assigned to standard treatment. No differences were noted between the CM and standard treatment groups on demographic or baseline characteristics.

2.4. Data analysis

We converted all monetary amounts to 2008 dollars using the Consumer Price Index. We first examined whether income estimates differed for the pretreatment to during-treatment periods. Because the baseline measure of income reflected past year income,