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## ***DEMOGRAPHIC INFORMATION***

### **Current Appointment**

Assistant Professor  
Johns Hopkins University, School of Medicine  
Department of Psychiatry and Behavioral Sciences

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B.A.	1993	Millsaps College	English
M.S.W.	1997	Louisiana State University	Social Work
Ph.D. student	08/07-current	University of Maryland, Baltimore	

## **PROFESSIONAL EXPERIENCE**

03/2006- 11/2008, **Instructor**, Johns Hopkins University School of Medicine, Department of Psychiatry and Behavioral Sciences

01/2008- present, **Director**, Cornerstone, Johns Hopkins University School of Medicine, Department of Psychiatry and Behavioral Sciences

01/2012- present, **Director**, Hopkins @ Helping Up Mission (HUM), Johns Hopkins University School of Medicine, Department of Psychiatry and Behavioral Sciences

11/2008- present, **Assistant Professor**, Johns Hopkins University School of Medicine, Department of Psychiatry and Behavioral Sciences

## RESEARCH ACTIVITIES

### Publications

Peer-reviewed scientific articles

1. Tuten, M., Jones, H.E. and Svikis, D. (2003). Comparing homeless and domiciled pregnant substance dependent women on psychosocial characteristics and treatment outcomes. *Drug and Alcohol Dependence*, 69, 95-99.
2. Perry, B., Jones, H.E., Tuten, M., and Svikis, D. (2003). Assessing maternal perceptions of harmful effects of drug use during pregnancy. *Journal of Addictive Diseases*, 22, 1-9.
3. Tuten, M., and Jones, H.E. (2003). A partner's drug-using status impacts women's drug-treatment outcome. *Drug and Alcohol Dependence*, 70, 327-330.
4. Tuten, M., Jones, H.E., Tran, G., and Svikis, D. (2004). Partner violence impacts the psychosocial and psychiatric status of pregnant; drug dependent women. *Addictive Behaviors*, 29, 1029-1034.
5. Jones, H.E., Svikis, D., Rosado, J., Tuten, M., and Kulstad, J. (2004). What if they don't want treatment? Lessons learned from intervention studies of non-treatment seeking drug using pregnant women. *The American Journal on Addictions*, 13, 342-357.
6. Jones, H.E., Wong, C.J., Tuten, M., and Stitzer, M.L. (2005). Reinforcement-based therapy: 12-month evaluation of an outpatient drug-free treatment for heroin abusers. *Drug and Alcohol Dependence*, 79, 119-128.
7. Fitzsimons, H., Tuten, M., and Jones, H.E. (2007). Mood disorders affect drug treatment success of pregnant women. *Journal of Substance Abuse Treatment*, 32, 19-25.
8. Tuten, M., Jones, H.E., Lertch, E., and Stitzer, M. (2007). Aftercare plans for inpatients undergoing medication assisted detoxification from heroin. *American Journal of Drug and Alcohol Abuse*, 33, 547-555.
9. Copersino, M., Jones, H.E., and Tuten, M. (2007). Suicidal ideation among drug

dependent treatment seeking inner-city pregnant women. *Journal of Maintenance in the Addictions*, 3, 53-63.

10. Jones, H.E., Johnson, R.E., O'Grady, K.E., Jasinski, D.R., Tuten, M., and Milio, L. (2008). Dosing adjustment in post-partum patients maintained on buprenorphine or methadone. *Journal of Addiction Medicine*, 2: 103-107.
11. Jones, H.E., O'Grady, K.E., Malfi, D., and Tuten, M. (2008). Methadone maintenance vs. methadone taper during pregnancy: Maternal and neonatal outcomes. *The American Journal on Addictions*. 17(5), 372-386.
12. Chisolm, M.S., Tuten, M., Strain, E.C., and Jones, H.E. (2009) Screening for mood disorders in pregnant substance-dependent patients. *Addictive Disorders and Their Treatment*. 8(2):88-98
13. Eggleston, A.M., Calhoun, P.S., Svikis, D.S., Tuten, M., Chisolm, M.S., and Jones, H.E. (2009). Suicidality, aggression, and other treatment considerations among pregnant, substance dependent women with post-traumatic stress disorder, *Comprehensive Psychiatry*. 50 (5), 415-423.
14. Tuten, M., Chisolm, M.S., O'Grady, K., Fitzsimons, H., Heil, S., and Jones, H.E. (2009). Methadone maintained patients and current mood disorder: Delivery and neonatal outcomes. *The American Journal of Drug and Alcohol Abuse*, 35, 358-363.
15. Swenson, C.C., Schaeffer, C.M., Tuerk, E.H., Henggeler, S.W., Tuten, M., Panzarella, P., Laue, C., Remmele, L., Foley, T., Cannata, E., and Guillorn, A. (2009) Adapting multisystemic therapy for co-occurring child maltreatment and parental substance abuse: The building stronger families project. *Emotional and Behavioral Disorders in Youth*, Winter, 2008.
16. Chisolm, M., Tuten, M., Brigham, E., Strain, E.C., and H.E. Jones (2009). Relationship between cigarette use and mood/anxiety disorders among pregnant methadone-maintained patients. *The American Journal on Addictions*, 18: 422-429.
17. Tuten, M., DeFulio, A., Jones, H., & Stitzer, M. (2012). Abstinence-contingent recovery housing and reinforcement-based treatment following opioid detoxification. *Addiction*, 107 (5), 973-982.
18. Tuten, M., Svikis, D., Keyser, L., O'Grady, K., & Jones, H. (2011). A randomized trial of contingency management with pregnant drug-dependent women. Manuscript submitted for publication.
19. Jones, H., Wechsberg, W., O'Grady, K., & Tuten, M. (2011). HIV sexual and drug-use risk in drug-dependent pregnant patients in comprehensive drug

treatment," *International Journal of Family Medicine*, 2011.  
doi:10.1155/2011/872638.

20. Jones, H., Tuten, M. & O'Grady, K. (2011). Treating the partners of drug dependent pregnant patients: Feasibility and efficacy, *American Journal of Drug and Alcohol Abuse*, 37, 130-138. doi:10.3109/00952990.2011.563336
21. Jones, H., O'Grady, K., & Tuten, M. (2011) Reinforcement-Based Treatment improves the maternal treatment and neonatal outcomes of pregnant patients enrolled in comprehensive care treatment, *The American Journal on Addictions*, 20, 196-204. doi: 10.1111/j.1521-0391.2011.00119.x
22. Chisolm, M., Shauna, A., Kaltenbach, K., Bernadette, W., Heil, S., Martin, P., Stine, S., Coyle, M., Leoutsakos, J., Tuten, M., Jansson, L., Backer, P., & Jones, H.E. (2011). Cigarette smoking and neonatal outcomes in depressed and non-depressed opioid-dependent agonist-maintained pregnant patients. *Addictive Disorders & Their Treatment*, 10 (4), 180-187.
23. Lund, I.O., Fitzsimons, H., Tuten, M., Chisolm, M.S., O'Grady, K.E. & Jones, H.E. (2011). Comparing methadone and buprenorphine maintenance to methadone-assisted withdrawal for the treatment of opioid dependence during pregnancy: maternal and neonatal outcomes. *Substance Abuse and Rehabilitation*.
24. Tuten, M., Fitzsimons, H., Nuzzo, P., Chisolm, M., & Jones, H. (2012). Contingent incentives reduce cigarette smoking among pregnant, methadone-maintained women: Results of an initial feasibility and efficacy randomized clinical trial. *Addiction*. 107(10):1868-77.
25. Tuten, M., Svikis, D., Keyser, L., O'Grady, K., & Jones, H. (2012). Lessons learned from a randomized trial of fixed and escalating contingency management schedules in opioid-dependent pregnant women. Accepted for publication February 2012, *American Journal of Drug and Alcohol Abuse*.
26. Tuten, M., DeFulio, A., Jones, H., & Stitzer, M. (2012). Abstinence-contingent recovery housing and reinforcement-based treatment following opioid detoxification. *Addiction*, 107 (5), 973-982.

#### Books, Chapters, Monographs, Other

1. Tuten, M., Jones, H. Schaeffer, C., & Stitzer, M. (2012) Reinforcement-Based Treatment (RBT) for Substance Use Disorders: A Comprehensive Behavioral Approach, American Psychological Association, Washington, D.C.

2. Jones, H.E., Tuten, M., Keyser-Marcus, and Svikis, D. (2006). Chapter 20: Specialty treatment for women. In E.C. Strain and M.L. Stitzer (Eds.). *The Treatment of Opioid Dependence*, pp. 455-484. Baltimore, MD: Johns Hopkins University Press.
3. Tuten, M., Jones, H.E., Ertel, J., Jakubowski, J., and Sperlein, J. (2006). Reinforcement-Based Treatment: A Novel Approach to Treating Substance Abuse During Pregnancy. *Counselor Magazine*, June 2006, 22-29.
4. Wong, C.J., Tuten, M., Jones, H.E., Stitzer, M.L. Chapter 23: Community Reinforcement and Contingency Management Interventions for Substance Abuse. Accepted for publication on April 19, 2008 in: Cox, M., and Klinger, E. (Eds.). *Handbook of Motivational Counseling*. New York, NY: Wiley, Inc.

Published abstracts

1. Svikis, D., Tran, G. and Tuten, M. (1999). Treatment services for pregnant drug-dependent women affected by violence. Abstract published in program of Conference on Violence and Reproductive Health.
2. Tuten, M., Walters, V., Haug, N., Jones, H.E., and Svikis, D. (1999). Comparison of psychosocial variables for homeless vs. domiciled pregnant substance abusers, College on Problems of Drug Dependence, abstract published in *National Institute on Drug Abuse Monograph #180, Proceedings of the 61st Annual Scientific Meeting, CPDD*. U.S. Government Printing Office, p. 138.
3. Tuten, M., Robilotto, C., Jones, H.E., Lantz, M., Garland, D., and Svikis, D. (2000). Alcohol use histories in pregnant smokers. Abstract published in *Alcoholism: Clinical and Experimental Research*.
4. Tuten, M., Robilotto, C., Jones, H.E., Lantz, M., Garland, D. and Svikis, D. (2000). Alcohol, drug use and other health behaviors in pregnant smokers and non-smokers. Abstract published in the *Sixth Annual Meeting, Society for Research on Nicotine and Tobacco Program*.
5. Jones, H.E., Tuten M., Robilotto, C., Lantz, M., Garland, D. and Svikis, D. (2000). Brief Interventions for Alcohol and Tobacco Use in Pregnant Women: A Pilot Study. Abstract published in *Alcoholism: Clinical and Experimental Research*.
6. Laban, M., Moylan, P., Tuten, M. Haug, N., and Svikis, D. (2000). Assessing maternal awareness of risks associated with tobacco use during pregnancy. Abstract published in *National Institute on Drug Abuse Monograph #181, Proceedings of the 62nd Annual Scientific Meeting, CPDD*.

7. Laban, M. Tuten, M., Jones, H.E., and Svikis, D. (2001). Suicidal ideation among drug dependent pregnant women. Abstract published in *National Institute on Drug Abuse Monograph #182, Proceedings of the 63rd Annual Scientific Meeting, CPDD.*
8. Tuten, M., Jones, H.E., Fitzgerald, E., Johnson, R., and Stitzer, M. (2001). Methadone dosing in pregnancy: Treatment implications. Abstract published in *National Institute on Drug Abuse Monograph #183, Proceedings of the 63rd Annual Scientific Meeting, CPDD.*
9. Jones, H.E., Johnson, R.E., Tuten, M. (2001). Methadone detoxification of pregnant opiate addicted women: Safety and efficacy. Abstract published in the *American Methadone Treatment Association Program.*
10. Tuten, M., Jones, H.E. and Stitzer, M.L. (2005). Cigarette smoking among participants in drug treatment: Nicotine dependence and treatment outcomes, abstract published in *Society for Research on Nicotine Dependence Annual Meeting Program.*

#### Extramural Funding

##### **Active**

RO1 DA14979-06 (PI M. Chisolm) 6/30/09-5/31/14  
 NIDA \$489,000/yr. direct  
*Recovery Housing for Drug Dependent Pregnant Women*  
 Role: Co-investigator

R011DA031689-01 (PI L. Jansson) 08/31/12-05/31/16  
 \$401,000/yr. direct  
*Fetal and Infant Effects of Maternal Buprenorphine Treatment*  
 Role: Co-investigator

##### **Inactive**

Baltimore Substance Abuse Systems: Intensive Outpatient and Outpatient Treatment (Tuten)  
 Cornerstone \$262,500 (annual)  
 Role: PI

RO1 DA13003 (Stitzer) 4/05/01 - 3/31/08  
 NIDA  
*Recovery Housing and Drug Abuse Treatment Outcomes*

Role: Co-Investigator

RO1 DA12403-06 (Jones) 06/01/99-06/30/09  
NIDA \$301,111/yr. direct  
Tobacco use in Opioid Agonist Treated Pregnant Women  
Role: Co-investigator

RO1 DA13496 (Jones) 9/30/00-6/30/08  
NIDA \$309,860/yr. direct  
*Stage II: Treating Pregnant Women's Drug Using Partners*  
Role: Co-investigator

RO1 DA015764 (Jones) 9/29/04-6/30/09  
NIDA \$1,035,425/yr direct  
*Maternal Opioid Treatment: Human Experimental Research*  
Role: supervise senior staff at JHU site

RO1 DA020929 (Latimer) 09/30/05 - 8/31/09  
NIDA \$239,254/yr. direct  
*Adapt IFCBT into HIV Prevention Intervention for Pregnant Women in Drug Treatment*  
Role: collaborator: coordinate referrals from CAP program

## EDUCATIONAL ACTIVITIES

### Teaching/Clinical Instruction

Taming the Bureaucracy: Working with clients, Co-workers, Providers, and the Community. Louisiana Conference of the National Association of Social Workers (NASW), March 1998. 3 CME

Promoting Growth in the Foster Family: The Use of Behavior Management Techniques to Promote Successful Foster Care Placements. Louisiana Counsel on Child Abuse (LCCA), March 1998. 3 CME

Identifying Bureaucratic Variables Which Affect Social Workers Overall Job Satisfaction and Professional Performance. Louisiana State University School of Social Work, April 1998.

Introduction to Motivational Interviewing for Smoking Cessation, Family Services, Kent County Maryland, June 2002. 6 CME

The Principles of Motivational Interviewing: Applications to Probation and Parole, District of Columbia Pre-trial Services, April 2003. 6 CME

Motivational Interviewing: An Introduction, Center for Learning and Health, Johns Hopkins Bayview Medical Center, May 2003.

Motivational Interviewing: Client Ambivalence and Counselor Empathy, Center for Addiction and Pregnancy, September 2003.

Motivational Interviewing with Alcohol Abusers, University of Maryland, March 12-13, 2004. 11 CME

Reinforcement-Based Treatment with Pregnant Women, Center for Addiction and Pregnancy, September 2004.

Motivational Interviewing for HIV Risk Reduction in India, Johns Hopkins Bloomberg School of Public Health, May 23-25, 2005.

Commonly Abused Drugs: Side Effects and Associated Behaviors, Wheeler Clinic, New Britain CT, June 1, 2005.

Reinforcement Based Treatment for Substance Abusers, Wheeler Clinic, New Britain Connecticut, July 12-13<sup>th</sup>, 2005.

Motivational Interviewing: Principles and Techniques, Johns Hopkins University Pro Health, August 8, 2006.

Family-Based Recovery Services: An Overview. Presented in conjunction with the Department of Children and Families, October 6, 2006.

Motivational Interviewing: Building Stronger Families. Presented to Building Stronger Families program, December 5, 2006.

Using the Addiction Severity Index as a Treatment Planning Tool. Presented to the Center for Addiction and Pregnancy, seminar rounds, September 12, 2007.

What is Evidence-Based Treatment? Presented to the Center for Addiction and Pregnancy, seminar rounds, October 10, 2007.

Family-Based Recovery Services: Training on the model: February 21<sup>st</sup>23<sup>rd</sup>, 2007.

Motivational Interviewing for Health Care Professionals: Presented at the Johns Hopkins Employee Health Center, April 2, 2007.

Motivational Interviewing: Principles and Techniques: Presented at the Center for Addiction and Pregnancy (CAP), April 4 & April 14<sup>th</sup> 2007.

Family-Based Recovery: Presented to FBR Services personnel across six FBR program sites in CT, May 21<sup>st</sup>- May 23<sup>rd</sup>, 2007.

Motivational Training and Patient Feedback: Presented to FBR Services personnel across six funded sites in Connecticut, May 31<sup>st</sup>- June 1<sup>st</sup>, 2007.

Reinforcement Based Treatment (RBT): Presented to Family Based Recovery Services personnel, June 27<sup>th</sup>-28<sup>th</sup>, 2007.

Reinforcement-Based Treatment (RBT) and Motivational Interviewing overview: Presented to Family Based Recovery Services personnel, June 28<sup>th</sup>, 2007.

Addiction Severity Index (ASI) training presented at the Office of Education on Addiction Services (OETAS), November 27<sup>th</sup>-28<sup>th</sup>, 2007. 11 CME.

Patient Feedback as a Motivational Tool: Presented to the Center for Addiction and Pregnancy, seminar rounds, January 28, 2008.

Motivational Interviewing: Booster Session: Presented to the Center for Addiction and Pregnancy, seminar rounds, February 20, 2008.

Family Based Recovery training presented to six FBR program sites in CT, March 5, 2008.

Motivational Interviewing for Advanced Clinicians. Presented at Wheeler Clinic, Plainville, CT., June 9, 2008. 6 CME.

Intermediate MI: From Thought to Behavior Change. Presented for city substance abuse clinicians through the Baltimore City Directorate, June 26-27, 2008. 11.5 CME.

Promoting Awareness of Motivational Incentives: Technique for HIV Outreach Workers, Keeping it Real CHATT conference, October 1, 2009. 1.5 CME

Motivational Interviewing in Conjunction with Supported-Employment Initiatives, Baltimore Substance Abuse Systems, July 9, July 23, and October 29, 2009, 15 CME.

Motivational Interviewing for Information and Referral to Substance Abuse Treatment, July 2011, 12 CME.

Promoting Awareness of Motivational Incentives (PAMI), Danya Institute, March 31, 2011, 6 CME.

## **SPECIALTY TRAINING/SERVICE**

Motivational Interviewing Network of Trainers (MINT), certified trainer, Quebec City, Canada, 2000.

Addiction Severity Index, certified, August 1998.

Structured Clinical Interview for DSM-IV, trained August 1998.

Motivational Enhancement Therapy (MET), certified June 1998.

Licensed Certified Social Worker, Clinical (LCSW-C), # 11992, 2003-present

Promoting Motivational Incentives (PAMI), Trained as Trainer, June 2008.

Friends Research Institutional Review Board Member, 2010- present

### **Clinical Extramural Funding**

Cornerstone Treatment Program

Baltimore Substance Abuse Systems (BSAS)

\$262,500

HIV prevention funding (BSAS and AIDS Administration)

\$10,000

## **ORGANIZATIONAL ACTIVITIES**

### **Editorial activities**

Journal reviewer (ad hoc):

Drug and Alcohol Dependence (2007-present)

Journal of Virology (2007-present)

Journal of Substance Abuse Treatment (2008- present)

## **RECOGNITION**

### **Invited Addresses**

Treatment Services for Pregnant Drug-Dependent Women Affected By Intimate Partner Violence. National Conference on Violence and Reproductive Health, Atlanta, GA, June 1999.

The Search for Effective Treatment for Pregnant Drug Dependent Women. Presented at the Maryland Association for Behavior Analysis annual conference, Baltimore, MD, October 4, 2000.

Methadone Dosing in Pregnancy: Treatment and Birth Outcomes. Presented at the College on Problems of Drug Dependence annual conference, Scottsdale, AZ, June 2001.

Contingency Management for Pregnant Drug-Dependent Women. Presented at the American Psychological Association 110<sup>th</sup> annual meeting in Chicago, IL, 2002.

Motivational Interviewing Workshop: Presented at the North Atlantic Technology Transfer Center conference, State College, PA, February 2003.

Gender Differences in Reinforcement-Based Treatment. Presented at the Contingency Management Workshop at the College on Problems of Drug Dependence annual meeting, June 2004.

Gender Specific Treatment for Women. Presented at the Smart Practice, Practical Science: Blending Treatment and Research Conference, National Institute on Drug Abuse (NIDA), June 6-7, 2005

Alcohol Use among Drug Dependent Pregnant Women. Presented at the College on Problems of Drug Dependence (CPDD) annual conference, Orlando, FL, July 17-21, 2005

Essential Elements of Reinforcement-Based Treatment for Pregnant Women: Blending Science and Clinical Practice, SAMHSA, NIDA, and ADAA co-sponsored conference, July 12-13, NIDA, 2006.

Reinforcement-Based Treatment (RBT) for Pregnant, Drug-Dependent Women. Presented at the American Psychological Association 113<sup>th</sup> annual meeting, New Orleans, LA, August 10<sup>th</sup>-13<sup>th</sup>, 2006.

S.T.A.R. Approach to Implementing Evidence Based Practice. Presented at the Baltimore City Directorate Conference, Ocean City, MD, September 21, 2007. 1.5 CME.

Low-cost Motivational Incentives for Pregnant Women. Presented at the Women, children and Family Treatment (WCFT) Program Grantee Meeting, Washington, D.C., June 16, 2009.

## ABSTRACT

Title of dissertation: A Comparison of Treatment Outcomes for Participants Receiving Reinforcement-Based Treatment (RBT) versus Participants Receiving RBT plus Recovery Housing (RBT + RH)

Lucille Michelle Tuten, Doctor of Philosophy, 2013

Dissertation directed by: Professor Donna Harrington  
School of Social Work

Opioid misuse is a serious and growing personal and public health hazard (McLellan & Turner, 2008). Although opioid medication therapies are effective for treating opioid misuse, alternative treatment options are needed for those who cannot access or do not desire medication therapies. RBT + RH is effective for increasing opioid and cocaine abstinence among opioid dependent individuals who have completed detoxification in Baltimore city (Gruber et al., 2000; Jones et al., 2005, Tuten et al., 2011). Results from this secondary data analysis study indicate that RBT and RBT + RH participants did not differ on the primary abstinence and secondary employment outcomes. However, regression analyses support that recovery housing was predictive of abstinence across several assessment points. Employment also was a predictive variable for opioid abstinence at three and six months but was not predictive for cocaine abstinence at one, three, and six months. Recovery housing was predictive of mean days worked at three and six month assessment, and was predictive of higher employment earnings at three month assessment. Abstinence was predictive of more days worked at three months and at six month assessment. Additionally, membership in the RBT group was predictive of more days worked and higher employment earnings at three month assessment. Sub-analyses showed that participants who accessed recovery housing--

whether self-pay (RBT +SPRH) or program sponsored (RBT +RH) -- had significantly improved abstinence and employment related outcomes compared to the RBT only group. The RBT + SPRH group participants showed the most consistent pattern of favorable abstinence and employment outcomes relative to RBT only group participants. The RBT + SPRH participants also reported more days worked three months compared to the RBT + RH group participants. Study findings suggest that recovery housing may play an important role in the success of RBT interventions. Further research is needed to evaluate the clinical and cost implications for providing case management for housing versus providing program sponsored recovery housing.

A Comparison of Treatment Outcomes for Participants Receiving Reinforcement-Based  
Treatment (RBT) versus Participants Receiving  
RBT plus Recovery Housing (RBT + RH)

By

Lucille Michelle Tuten

Dissertation submitted to the Faculty of the Graduate School of the  
University of Maryland, Baltimore in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy  
2013

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## Table of Contents

Chapter I. Introduction.....	1
Prevalence of Opioid Misuse .....	2
Co-occurrence of Cocaine Use among Opioid Users .....	4
Costs Associated with Opioid and other Illicit Substance Use.....	4
Treatment for Opioid Misuse.....	5
<i>Medication-assisted detoxification</i> .....	5
<i>Medication-maintenance treatment</i> .....	6
<i>Alternatives to medication-maintenance</i> .....	7
<b>Reinforcement-based treatment (RBT)</b> .....	8
Reinforcement theory foundation for RBT.....	9
History of the RBT model.....	10
Essential elements of RBT.....	12
Relevance to Social Work.....	15
Research Aims and Questions .....	16
Chapter II. Literature Review .....	19
Contingency Management .....	19
Abstinent-contingent housing .....	21
<b>Birmingham homeless cocaine studies</b> .....	21
<b>Baltimore RBT outcome studies</b> .....	24
Chapter III. Method .....	31
Data Sources .....	31
<b>Study one</b> .....	31

<b>Study two</b> .....	32
<b>Baseline assessment</b> .....	32
<b>ASI training and quality assurance</b> .....	33
<b>Structured clinical interview for DSM-IV</b> .....	35
<b>Treatment conditions</b> .....	35
Reinforcement-based treatment (RBT).....	35
Follow-up assessments.....	36
Case management for safe housing.....	38
Reinforcement-based treatment (RBT) plus recovery housing (RBT +RH) .....	38
Program paid recovery housing .....	39
Case management for housing .....	39
<b>Study Measures</b> .....	40
Demographic and pre-treatment variables .....	40
Primary outcome measures .....	41
Secondary outcome measures .....	42
<b>Preliminary data analysis</b> .....	42
Missing data .....	42
<b>Data analysis of pre-treatment and demographic comparisons</b> .....	43
Data analyses by research question.....	43
<b>Research Question 1</b> .....	43
<b>Research Question 2</b> .....	44
<b>Research Question 3</b> .....	44

<b>Research Question 4</b> .....	45
<b>Research Question 5</b> .....	45
<b>Research Question 6</b> .....	46
Chapter IV. Results.....	47
RBT versus RBT + RH Group Participants.....	47
Baseline characteristics .....	47
<b>Research Question 1</b> .....	50
Group comparisons on measure of opioid abstinence .....	50
Regression analyses for predicting opioid abstinence .....	50
<b>Research Question 2</b> .....	54
Group comparisons on measure of cocaine abstinence .....	54
Regression analyses for predicting cocaine abstinence .....	54
<b>Research Question 3</b> .....	54
Group comparisons on measure of opioid and cocaine abstinence .....	59
Regression analyses for predicting opioid and cocaine abstinence .....	59
<b>Research Question 4</b> .....	59
<b>Research Question 5</b> .....	63
Group comparisons on measure of mean days worked .....	63
Regression analyses for predicting mean days worked .....	63
<b>Research Question 6</b> .....	68
Group comparisons on measure of amount of employment earnings.....	68
Regression analyses for predicting mean employment earnings .....	72
Program Sponsored versus Self-Pay Housing .....	72

RBT only, RBT + SPRH, and RBT + RH Group Participants .....	76
<b>Baseline characteristics</b> .....	76
<b>Group comparisons on measure of opioid and cocaine abstinence.</b> .....	77
<b>Group comparisons on rates of employment.</b> .....	81
<b>Group comparisons on measure of mean days worked.</b> .....	81
<b>Group comparisons on measure of amount of employment earnings</b> .....	81
Summary of Findings.....	84
<b>Abstinence</b> .....	84
<b>Employment</b> .....	84
RBT only, RBT + SPRH and RBT + RH Participants .....	85
<b>Abstinence</b> .....	85
<b>Employment</b> .....	86
Chapter V. Discussion .....	87
Literature on RBT .....	87
RBT versus RBT + RH Participants .....	88
<b>Abstinence</b> .....	88
<b>Employment</b> .....	89
RBT only, RBT + SPRH and RBT + RH Participants .....	90
<b>Abstinence</b> .....	90
<b>Employment</b> .....	91
Future Research .....	91
Limitations and Strengths .....	92
Implications.....	94

Conclusion .....	96
Appendix I. ....	97
References.....	102

## List of Tables

Table 2.1 <i>Study Description and Findings from Birmingham Studies</i> .....	23
Table 3.3 <i>Recruitment, Study Design, Study Eligibility, Treatment Elements, and Discharge Criteria</i> .....	37
Table 4.2 <i>Demographic and Pre-Treatment Characteristics for RBT and RBT + RH Participants</i> .....	49
Table 4.3 <i>Percent Abstinent at One, Three, and Six Months for RBT and RBT + RH Participants</i> .....	51
Table 4.4 <i>Logistic Regression Analyses Predicting Opioid Abstinence at One Month</i> ....	52
Table 4.5 <i>Logistic Regression Analyses Predicting Opioid Abstinence at Three Months</i> .....	53
Table 4.6 <i>Logistic Regression Analyses Predicting Opioid Abstinence at Six Months</i> ....	55
Table 4.7 <i>Logistic Regression Analyses Predicting Cocaine Abstinence at One Month</i> ...56	
Table 4.8 <i>Logistic Regression Analyses Predicting Cocaine Abstinence at Three Months</i> .....	57
Table 4.9 <i>Logistic Regression Analyses Predicting Cocaine Abstinence at Six Months</i> .....	58
Table 4.10 <i>Logistic Regression Analyses Predicting Opioid and Cocaine Abstinence at One Month</i> .....	60
Table 4.11 <i>Logistic Regression Analyses Predicting Opioid and Cocaine Abstinence at Three Months</i> .....	61
Table 4.12 <i>Logistic Regression Analyses Predicting Opioid and Cocaine Abstinence at Six Months</i> .....	62
Table 4.13 <i>Percent Employed at One, Three, and Six Months for RBT and RBT + RH Participants</i> .....	64
Table 4.14 <i>Mean Days Worked and Employment Income at One, Three, and Six Months for RBT and RBT + RH Participants</i> .....	65

Table 4.15 <i>Repeated Measures for Days Worked over Time for RBT and RBT + RH Participants</i> .....	66
Table 4.16 <i>Multiple Regression Analyses Predicting Mean Days Worked at One Month</i> .....	67
Table 4.17 <i>Multiple Regression Analyses Predicting Mean Days Worked at Three Months</i> .....	69
Table 4.18 <i>Multiple Regression Analyses Predicting Mean Days Worked at Six Months</i> .....	70
Table 4.19 <i>Repeated Measures for Days Worked over Time for RBT and RBT + RH Participants</i> .....	71
Table 4.20 <i>Multiple Regression Analyses Predicting Mean Employment Earnings at One Month</i> .....	73
Table 4.21 <i>Multiple Regression Analyses Predicting Mean Employment Earnings at Three Months</i> .....	74
Table 4.22 <i>Multiple Regression Analyses Predicting Mean Employment Earnings at Six Months</i> .....	75
Table 4.23 <i>Demographic and Pre-Treatment Characteristics for RBT Only, RBT + SPRH, and RBT + RH Participants</i> .....	78
Table 4.24 <i>Demographic and Pre-Treatment Characteristics for RBT Only, RBT + SPRH, and RBT + RH Participants</i> .....	79
Table 4.25 <i>Percent Abstinent at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants</i> .....	80
Table 4.26 <i>Percent Employed at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants</i> .....	82
Table 4.27 <i>Mean Days Worked and Employment Income at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants</i> .....	83

## **List of Figures**

<i>Figure 1.1</i> RBT theory of problem and theory of change model.....	11
<i>Figure 3.1</i> Study one patients screened, excluded, and consented to RBT.....	33
<i>Figure 3.2</i> Study two patients screened, excluded, and randomized.....	34

## **Chapter I. Introduction**

Reinforcement-Based Treatment (RBT), which has typically included drug abstinence-contingent recovery housing as a component of the intervention, is an efficacious model for treating opioid misuse (Gruber, Chutuape, & Stitzer, 2000; Jones, Wong, Tuten, & Stitzer, 2005; Tuten, Defulio, Jones, & Stitzer, 2011v ). In a study of opioid-dependent patients ( $N=243$ ), Tuten et al. (2011) showed that retention in recovery housing for greater than 60 days was associated with improved drug abstinence outcomes. However, the cost associated with this comprehensive model may prohibit widespread adoption. Additionally, little is known about the contribution of the counseling and case management elements of RBT in the absence of paid recovery housing. To the extent that these treatment elements are effective for treating opioid misuse, RBT without paid recovery housing may be more feasible for implementation in community practice. This dissertation examines the relative efficacy of RBT + Case Management (RBT) versus RBT with abstinence contingent recovery housing (RBT + RH) in a sample of opioid-dependent individuals exiting medication-assisted detoxification in Baltimore city.

This dissertation is divided into five chapters. Chapter I provides a review of the background and prevalence of opioid misuse, a description of the theoretical background for and essential elements of RBT, the relevance of the dissertation to social work, and an outline of the research questions of interest. Chapter II includes a review of the relevant literature supporting the proposed study, Chapter III outlines the study method, Chapter IV describes the results of the study, and Chapter V provides a discussion of study findings.

## **Prevalence of Opioid Misuse**

Opioid misuse is a growing problem affecting broad segments of the U.S. population (McLellan & Turner, 2008). Based on findings from a survey of residents in the 48 contiguous states and the District of Columbia, it is estimated that 4.3 million U.S. individuals engage in regular (5 days per week for at least 4 weeks) opioid use (Kelly, Cook, Kaufman, Anderson, Rosenberg, & Mitchell, 2007). In 2007, approximately 335,000 individuals received treatment for heroin addiction, and an estimated 558,000 received treatment for other opioid (e.g., oxycontin, hydrocodone) abuse (Substance Abuse and Mental Health Services Administration (SAMHSA), National Survey on Drug Use and Health, 2009). The latter figure represents a substantial increase from 2002 estimates of 360,000 persons (Epstein, Phillips, & Preston, 2011). Based on the latest data available from the Treatment Episode Data Set (TEDS), 18.6% of all substance abuse admissions in 2007 were related to heroin use (13.6%) or use of prescription pain relievers (5%) (Substance Abuse and Mental Health Services Administration [SAMHSA], , Treatment Episode Data Set [TEDS], 2009).

Heroin trafficking and abuse are particularly prevalent in the Northeast Mid-Atlantic region (U.S. Department of Justice, National Drug Intelligence Center, 2009). Baltimore, Maryland, has been called the “heroin capital” of the United States, with as many as 1 in 10 city residents addicted to heroin (ABC News, 2011). Although it is difficult to quantify the actual numbers of individuals struggling with opioid addiction, more than 19,000 Baltimore residents sought treatment for opioid misuse, including use of prescription opioids, in 2011 alone (Alcohol and Drug Abuse Administration (ADAA) MD, Outlook and Outcomes, 2011).

The negative public health impact of opioid misuse is clear. Alarmingly, unintentional drug overdose has surpassed car accidents as the leading cause of accidental fatalities in the U.S. (National Institute for Health Statistics, 2009). Based on 2009 data from the Maryland Department of Health and Mental Hygiene (the latest mortality figures available), there were 245 heroin and other opioid related overdose deaths in the Baltimore metropolitan area. This figure represents an overall decline in opioid-related overdose deaths during the past decade; however, there has been an alarming increase in prescription opioid deaths. Overdose deaths involving prescription opioids increased by more than a third from 2007 to 2009, representing 30% of all intoxication deaths (Maryland Department of Health and Mental Hygiene [MD DHMH], 2010). The growing rate of overdose deaths is specifically related to the surge in prescription opioid misuse over the past decade (Okie, 2010).

Other adverse public health consequences are related to drug using behaviors, such as injection drug use and unprotected sex. Baltimore city has one of the nation's highest rates of intravenous drug use (Brady, Friedman, Cooper, Flom, Tempalski, & Gostnell, 2008), and also one of the highest rates of HIV infection (Centers for Disease Control and Prevention [CDC], HIV Surveillance Report, 2011). Opioids are commonly used via injection, a behavior that contributes considerably to incidence of new human immunodeficiency virus (HIV) cases (MacArthur et al., 2012). Data from the CDC show that there were 1783 new cases of HIV in Maryland in 2011, with approximately half of these cases diagnosed among Baltimore city residents Centers for Disease Control and Prevention [CDC], HIV Surveillance Report, 2011 Baltimore city has the second highest prevalence rate of injection drug use in the U.S. at 162 per 10,000 individuals (Nandi et

al., 2010). Unsafe sexual practices (e.g., exchange of unprotected sex for drugs or money for drugs) also are associated with opioid use, and increased risk for sexually transmitted infections (including HIV), hepatitis B and C, abscesses (at injection site), and tuberculosis. Opioid misuse also is associated with a host of medical co-morbidities (Epstein et al., 2011) that often go untreated due to lack of routine medical care.

### **Co-occurrence of Cocaine Use among Opioid Users**

Many individuals who abuse opioids also abuse other substances. In many urban areas, the concurrent use of opioids (particularly heroin) and crack cocaine is particularly common. In studies of opioid-dependent individuals in Baltimore city, 68%-81% of participants also used cocaine (DiPaula, Schwartz, Montoya, Barrett, & Tang, 2002; Gruber et al., 2000; Jones et al., 2005). In fact, opioids and cocaine are commonly used together intravenously in what is called “speedballing.” A primary reason for the co-use of these substances is that the drugs in combination may offset negative side effects resulting from either of the substances used alone (Newcombe, 2007). For example, the use of opioids with crack cocaine may diminish the agitation associated with crack use (Burnett, Roldan, & Adler, 2010). Both substances are associated with increased overdose deaths. First quarter 2009 data show that 88% of drug abuse deaths in Baltimore involved opioid intoxication and 38% of drug abuse deaths involved cocaine use; 94% of intoxication deaths involved more than one drug (Baltimore City Health Department, Office of Epidemiology and Planning, 2009).

### **Costs Associated with Opioid and other Illicit Substance Use**

The societal consequences of opioid use are similar to those of other illicit substances. Illicit drug use adversely affects individuals, families, communities, and

society as a whole. Specifically, illicit drug use is associated with psychiatric morbidities; criminal justice involvement; and social, familial, and vocational impairment (Brown, 2004). Based on 2007 figures, the economic costs associated with illicit substance use-- including healthcare expenses, lost wages, lost productivity, criminal activity, and drug use related accidents-- are \$193 billion annually (United States Department of Justice, National Drug Intelligence Center [NDIC] National Drug Threat Assessment, 2009). In fact, many of the top social problems faced by American society are associated with drug abuse, including drugged driving (National Highway Traffic Safety Administration, 2010; Substance Abuse and Mental Health Services Administration [SAMHSA], 2012), violent and non-violent crime (National Institute on Drug Abuse [NIDA], 2012), and child abuse (Dawe & Harnett, 2007; Donohue, Romero, & Hill, 2006; United States Department of Health and Human Services [USDHHS], 2009).

### **Treatment for Opioid Misuse**

Common treatments for opioid misuse include medication-assisted detoxification, medication maintenance therapy (e.g., methadone, buprenorphine), non-medication assisted outpatient therapy (e.g., RBT), and combinations of these treatment modalities.

***Medication-assisted detoxification.*** Medication-assisted detoxification involves the use of medications, either on an inpatient or outpatient basis, to minimize withdrawal symptoms in the patient. Common detoxification medications include methadone, an opioid agonist, or buprenorphine, a partial agonist, tapered over the course of the detoxification episode. These medications bind to opioid receptors to mimic the effects of narcotics and to minimize or eliminate withdrawal symptoms (Drug Policy Alliance, 2006; United National Office on Drugs and Crime [UNODC], 2012). Adjunctive

medications are typically provided as well for symptomatic relief, including alpha-2 adrenergic agonists such as clonidine and lofexidine. Medication-assisted detoxification—which is aimed solely at the medical management of acute withdrawal symptoms—is thus considered a precursor to treatment rather than a stand-alone treatment for opioid misuse. However, this form of treatment results in high patient utilization because it requires less of a time investment for the patient than other forms of treatment, such as outpatient therapy (Epstein et al., 2011). Unfortunately, medication-assisted detoxification is largely ineffective in the absence of follow up aftercare (Chutuape, Jasinski, Fingerhood, & Stitzer, 2001; Day & Strang, 2011; Gossop, Green, Phillips, & Bradley, 1989).

In a study of opioid dependent individuals exiting medical detoxification in Baltimore MD, Chutuape et al. (2001) found that 83% of patients had relapsed within 30 days of discharge. Studies estimate that 25% of clients discharged from detoxification services are readmitted to detoxification within a year (Mark, Vandivort-Warren, & Montejano, 2006; Ohio Department of Alcohol and Drug Addiction Services [ODADAS], 2006). One major problem with detoxification is the lack of continuing care available to transition patients from detoxification to ongoing substance abuse treatment. The long-standing bio-psycho-social issues related to opioid use, and the often long-term use reported by patients seeking treatment, argues for treatment intensity of sufficient nature and duration to effectively treat this intractable disorder (Tuten et al., 2012).

***Medication-maintenance treatment.*** In contrast to medication-assisted detoxification, medication maintenance treatment for opioid misuse is aimed at stabilizing patients on medication for the longer term. Optimally, maintenance therapies

are combined with psychosocial interventions, including group and individual counseling, to address the psychosocial variables maintaining drug use. Medication-assisted therapy typically involves the substitution of medically-managed opioid agonist or partial agonist (e.g., methadone, buprenorphine) for an illicit opioid (e.g., heroin) until stabilization occurs and then maintaining the patient on a therapeutic dose of the medication (Wechsberg, Kasten, Berkman, & Roussel, 2007). The effectiveness of these pharmacotherapies for reducing opioid use (e.g., Ball & Ross, 1991; Platt, 1995a, 1995b) has led to their increased acceptability and accessibility (Sees et al., 2000). The benefits of these therapies include not only increases in abstinence rates for illicit opioids, but also decreases in high risk drug related behaviors such as intravenous injection (Donny, Walsh, Bigelow, Eissenberg, & Stitzer, 2002).

***Alternatives to medication-maintenance.*** It is important to note that many opioid dependent individuals do not desire or do not qualify for opioid-agonist medications. There are several reasons that individuals who use opioids may not want medication based-therapy. For example, there remains a stigma associated with using medication therapies, especially because of the misuse of these medications among illicit drug users. Some individuals who avoid methadone treatment do so because of the stigma associated with methadone use in their communities, because they do not like the daily dosing structure required of methadone treatment, or because they fear the withdrawal from methadone (Peterson et al., 2010). Additionally, self-help programs, such as Narcotics Anonymous (NA) have generally frowned upon medication-based treatments, and individuals receiving medications generally are not considered abstinent even when illicit drug use has ceased (White, 2011). It also is important to note that there remain

barriers to receiving agonist medications, such as long wait lists, the cost of medication therapy, particularly for the uninsured, and lack of available treatment slots (Peterson et al., 2010). Lastly, some individuals--particularly those who have not used opioids for a prolonged period of time (typically a year or more)--may not qualify for opioid agonist medications.

***Non-medication assisted outpatient therapy.*** Non-medication assisted, often called “drug free” outpatient programs provide individual and group therapy to treat the psychosocial variables sustaining drug use. The programs are designed to treat individuals who are free from acute withdrawal symptoms (i.e., do not need or who have completed medication-assisted detoxification). As such, these programs are often referred to relapse prevention programs, because typically short-term abstinence has been initiated. and withdrawal symptoms are no longer present. Outpatient therapy is highly variable in terms of level of intensity (number of groups and individuals sessions offered), duration (from days to months or years), and theoretical frameworks employed (e.g., 12-step, confrontational styles, cognitive behavioral approaches, psychodynamic models, etc.).

***Reinforcement-based treatment (RBT).*** RBT was developed as an intensive outpatient treatment program to bridge the gap between detoxification services and aftercare among opioid-dependent individuals who do not desire medication-assisted treatment. RBT integrates behavioral and motivational interventions from evidence-based treatment models to form a multi-component treatment. Specifically, RBT incorporates aspects of the Community Reinforcement Approach (CRA) (National Institute on Drug Abuse, , 1998), a behavioral treatment model, and motivational interviewing (Miller &

Rollnick, 2012), an approach designed to enhance intrinsic motivation for change. In addition, RBT utilizes extensive case management services--especially related to the procurement of safe housing--to address the complex and basic needs of this vulnerable treatment population.

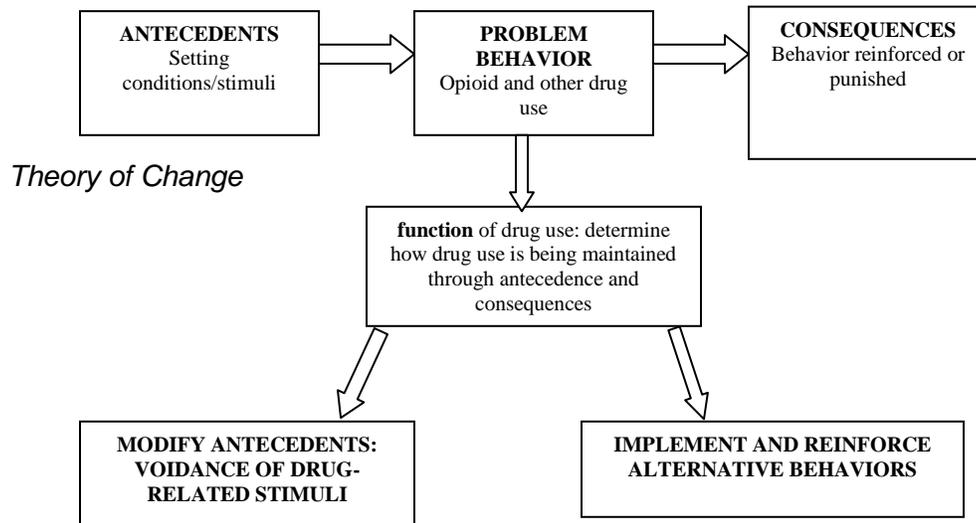
*Reinforcement theory foundation for RBT.* Laboratory and non-laboratory research in both animals and humans has shown that substance use is subject to the laws of learning (Higgins, Heil, & Lussier, 2004). Edward Thorndike, in his “Law of Effect” first proposed that learning occurs based on the individual’s satisfaction with the response to behavior; that is, behaviors that result in satisfying responses (e.g., food, reward) are more likely to reoccur and those that result in a non-satisfying or aversive response are less likely to reoccur in the future. Thorndike described this process of learning as instrumental conditioning (Konarski, Johnson, Crowell, & Whitman, 1981). Burrhus Frederick (B.F.) Skinner later expanded and detailed the laws of behavior in his theory of reinforcement, or operant conditioning. This theory postulates that much of behavior is initiated and maintained as a result of the consequences that follow the behavior; the consequence of reinforcement results in a higher probability of the behavior in the future (Silverman, Defulio, & Everly, 2011). According to operant conditioning theory, antecedents serve as stimuli that set the occasion for a response to be reinforced; these stimuli are referred to as discriminative stimuli (Ormrod, 1999). Figure 1.1 illustrates how operant theory applies to drug use behavior and the mechanism by which RBT seeks to modify the environmental context to increase the likelihood of drug abstinence. . For example, an opioid dependent individual who goes into a neighborhood where drug use is prevalent is exposed to discriminative stimuli that have long been associated with opioid

use. These stimuli set the occasion for the individual to react in ways that mimic behaviors that have been previously reinforced, such as scouting out drug dealers or looking for opportunities to exchange sex for opioids. These behaviors in turn result in the behavior of opioid use. The behavior of opioid use, in turn, results in feelings of euphoria or removal of withdrawal symptoms. These powerful consequences reinforce future opioid use. Interventions designed to interrupt these influences must provide alternatives that remove the establishing mechanisms for drug use (e.g., stimuli such as stress, people, or things paired with substance use). Additionally, behavioral alternatives to drug use must also be implemented so that individuals can receive reinforcement from alternative sources. According to this theory of drug use, it is insufficient to remove drug use as the function(s) served by the drugs—in the absence of reinforcing alternatives – will go unmet and either abstinence will not be achieved or it will not be maintained.

*History of the RBT model.* RBT is a rare example of an evidence-based intervention that has progressed from National Institute on Drug Abuse (NIDA) stage one feasibility (Gruber et al., 2000; Jones et al., 2005), to stage two testing (Tuten et al., 2012), to real world community practice (Tuten et al., 2012). RBT is currently the model of treatment for a fee-for-service community treatment program located in Baltimore, MD. Additionally, RBT is being used in combination with other interventions through two models funded by the Connecticut Department of Children and Families (DCF) to address substance use associated with child abuse and neglect. The first, Building Stronger Families (BSF), was implemented in 2005 and combines RBT with Multi-systemic Therapy (MST) to treat child maltreatment and parental substance abuse in families with an identified child between the ages of 6-17 (Swenson et al., 2009). This

Figure 1.1 RBT theory of problem and theory of change model

*Problem Initiation and Maintenance: Opioid Use*



*Note.* Adapted from Tuten, Jones, Ertel, Jakubowski, and Sperlein (2006).

model is currently being studied in a randomized trial funded through the National Institute on Drug Abuse (NIDA; PI: Cindy Schaeffer, 5R01DA029726-03). The second Connecticut DCF model, Family-Based Recovery (FBR), was funded in 2006 with the same goal of intervening with child maltreatment and parent substance abuse but with younger aged children, from birth to two years. FBR combines RBT with a parental attachment model, Coordinated Intervention for Women and Infants (CIWI), to address parental substance abuse and child maltreatment (Hanson, Vanderploeg, & Panzarella, 2011).

*Essential elements of RBT.* There are 10 elements of RBT that have been used in research and clinical applications of the model (adapted from Tuten et al., 2012).

1. Atmosphere of Reinforcement

A fundamental principle of RBT is that the treatment program should be reinforcing. Thus, treatment is delivered in a non-judgmental, non-confrontational manner and negative labels and stigmatizing terms (e.g., “addict,” “alcoholic,” “dirty,” “clean”) are avoided. RBT conceptualizes this positive approach as creating an “atmosphere of reinforcement.” There is a consistent focus on providing high quality customer service through staff training, client satisfaction surveys, and frequent discussion about how to improve the treatment experience for clients. Good consumer service is emphasized from initial point of contact through discharge.

2. Functional Assessment

The Functional Assessment (FA) is the primary assessment in RBT for evaluating the conditions under which drug use is occurring. The FA provides detailed information on the people, places, and things associated with the client’s drug use. Every individual

has a unique history with drug use; thus, treatment plans are individualized to address the unique patterns of drug use for each individual.

### 3. Removal or Reduction of Environmental Cues for Substance Use

Substance use is associated with a variety of stimuli, including paraphernalia, physiological precursors (e.g., stress, anxiety, adrenaline), people, and places. These cues can very quickly trigger drug use and thus must be identified and eliminated when possible. Housing is associated with drug use based on an individual's frequent use in the home or in a home identified for use (e.g., abandoned housing). Much effort is spent on identifying housing that is not associated with drug use and contracting with clients to commit to alternative housing when current housing is associated with drug use.

### 4. Client Feedback

Client feedback is a technique used in motivational interviewing (MI; Miller & Rollnick, 2002), to foster engagement and to support client retention in treatment. Thus, RBT employs this motivational technique within two weeks of treatment admission (when drop-out risk is high). Client feedback is a semi-structured session using MI techniques and principles. The session is used to summarize the client's healthy behaviors (e.g., attending treatment), history of drug use, history of success/drug abstinence, and risk behaviors. This element is another highly individualized component of treatment as clients receive normative comparison data on their drug use compared to other Americans in their age group

### 5. Employment or Education Goals

Employment is seen as a way to assist clients with financial stability, and also increase feelings of self-efficacy. In a very practical sense, it also consumes a lot of

time that would potentially be spent procuring and using drugs. The program provides manualized group and individual vocational training and assistance.

#### 6. Recreational Activities Inside and Outside of Treatment

The decision to abstain from drugs is an important personal choice with many benefits. However, the function that drug use has served for the individual leaves a void that must be replaced with reinforcing activities. Much effort is placed on helping the client to identify and engage in pleasurable and meaningful activities, particularly those that occur in the natural environment.

#### 7. Social Reinforcement for Accomplishments

Social Club is a weekly group that provides the opportunity for peer-reinforcement and support during the treatment process. Social Club includes a review of each client's planned goals and activities for the upcoming weekend to ensure adequate day planning. Additionally, each client is presented with a certificate indicating the number of days the client has remained in treatment. The presentation of attendance certificates is a formal process that naturally results in peer encouragement, reinforcement, and feedback. Peer social reinforcement is distinct from the reinforcement provided by program counselors, and thus is afforded its own time and space. It also provides an excellent opportunity for clients to practice social interaction skills (in a drug free environment), including receiving and giving compliments.

#### 8. Behavior Graphs

Graphs are a clinical tool designed to illustrate progress toward target behavior goals (e.g., treatment attendance, drug-free recreation, job-seeking) and success in treatment (i.e., drug abstinence). The use of graphs also allows the therapist to praise the

client on progress, and to revise treatment goals that are not working. The graphs are presented as periodic updates of the client's progress in treatment (i.e., how the treatment plan is working), with emphasis on successes as well as clear advice about additional changes needed to initiate abstinence or to sustain treatment success.

#### 9. Motivational Incentives

Clients receive tangible reinforcement for treatment gains. Tangible reinforcers, also known as incentives, include such items as stickers, certificates, hand-written notes, congratulations slips, prizes, and monetary vouchers. Target behaviors that are commonly reinforced through incentives include program attendance, drug abstinence, employment acquisition (or meeting goal targets for job-seeking), and recreational activities. Both tangible and intangible (e.g., praise) reinforcers are used to reward treatment progress.

#### 10. Outreach

If a client misses a treatment session, every effort is made to have immediate contact with the individual to convey concern about the missed session and to re-engage the client in treatment. Immediate outreach following a missed session or treatment day conveys to the client that the program cares about the client's well-being, and also emphasizes the need to maintain treatment contact to avoid a relapse or to minimize the effects of a relapse. Several forms of outreach are used to engage clients, including visits to the home, phone calls, letters, and contact with the client's social network.

### **Relevance to Social Work**

According to 2006 statistics, an estimated 21% of social workers were employed in mental health or substance abuse related positions (U.S. Department of Labor, Bureau of Labor Statistics, 2009). The wide-reaching effects of substance misuse, which affect

not only individuals but families, communities, and the larger society, underscore the need for accurate assessment and quality treatment for individuals experiencing substance use disorders (Tuten, 2011). Social workers, who are employed in a variety of settings and across diverse segments of the population, routinely come into contact with individuals suffering from or affected by substance use. Therefore, social workers are in a prime position to identify, assess, and treat substance use disorders in individuals and their families. Although social work—like other helping professions—has historically struggled with negativistic and moralistic views of addiction (Amodeo, Fassler, & Griffin, 2002), social workers also have contributed to diminishing the stigma associated with substance use, especially alcohol, and continue to play a key role in advocating for vulnerable populations.

The social work profession can also play an important role in improving substance abuse services by contributing to treatment models that address the multitude of environmental factors that impact treatment outcomes. One important avenue for doing so is through the development and advancement of evidence-based practices in the field of addiction. Social workers, who routinely treat individuals with substance use disorders, are in a position to develop, disseminate, and advance evidence-based interventions that treat the person in the environment.

### **Research Aims and Questions**

This dissertation examines two variants of behavioral treatment. One treatment provides RBT, which includes case management for housing assistance, but does not include paid recovery housing. The other intervention provides RBT plus paid, abstinence-contingent recovery housing (RBT + RH). Recovery housing is governed by structure

and rules (e.g., curfew, limitations on visitors), is provided in the community, and is typically owned and operated by individuals in recovery from substance use disorders. Thus, the primary aim of this study is to examine opioid and cocaine (separately and combined) abstinence outcomes at one, three, and six months for participants receiving one of two treatment interventions: (1) RBT or (2) RBT plus Recovery Housing (RBT + RH). This avenue of inquiry is important and the outcomes may indicate whether the more intensive form of RBT is superior in terms of drug abstinence outcomes compared to the less intensive form of the model. A second aim is to examine the employment factors of percent of participants employed, number of days worked and amount of income earned for the two groups at the one, three, and six month assessment periods. The third aim of the study is to evaluate whether demographic, pre-treatment, and intervention-specific variables are predictive of abstinence, days worked, or amount of money earned from employment at each follow-up assessment.

Study analyses are designed to answer six research questions, as follows:

Research Question 1: How do participants who received RBT compare with participants who received RBT + RH on the measure of opioid abstinence at one, three, and six month assessment?

Research Question 2: How do participants who received RBT compare with participants who received RBT + RH on the measure of cocaine abstinence at one, three, and six month assessment?

Research Question 3: How do participants who received RBT compare with participants who received RBT + RH on the measure of combined opioid and cocaine abstinence at one, three, and six month assessment?

Research Question 4: How do participants who received RBT compare with participants who received RBT + RH on rates of employment at one, three, and six month assessment?

Research Question 5: How do participants who received RBT compare with participants who received RBT + RH on the measure of days worked at one, three, and six month assessment

Research Question 6: How does RBT compare with RBT + RH on the measure of mean employment earnings (\$ amount) at one, three, and six month assessment?

## **Chapter II. Literature Review**

This chapter provides a brief review of contingency management interventions for the treatment of substance use disorders, including the behaviors often targeted for intervention and the types of incentives typically used to reinforce target behaviors. A more specific review of studies utilizing housing and substance abuse day treatment is provided as these studies are most relevant to the specific research questions examined herein.

### **Contingency Management**

Within the reinforcement theory conceptual framework, reinforcement-based interventions for treating substance use disorders have the overarching goal of systematically weakening the influence of reinforcement derived from drug use while increasing the frequency and magnitude of reinforcement derived from healthier alternative activities (Tuten et al., 2012). The study of reinforcement in substance abuse treatment settings is largely focused on the use of contingency management (CM) techniques, either in combination with standard drug and alcohol treatment or in addition to intensive behavioral interventions. “Contingency management (CM) involves the systematic delivery of reinforcing or punishing consequences contingent on the occurrence of a target response, and the withholding of those consequences in the absence of the target response” (Higgins et al., 2004, p. 444).

A large body of research spanning over three decades supports the use of CM for treating substance use disorders (Stitzer, Jones, Tuten, & Wong, 2011), particularly for the outcome measures of treatment retention and drug abstinence. Abstinence from substances is a primary goal of most drug and alcohol treatment programs, thus it is no

surprise that it is the focus of much of the clinical research on CM (Stitzer & Petry, 2006). CM has been used to effectively target substance use across a wide variety of substances, including: marijuana (Budney, Higgins, Delaney, Kent, & Bickel, 1991), cocaine (Epstein, Hawkins, Covi, Umbricht, & Preston, 2003; Higgins, Budney, Bickel, Hughes, Foerg, & Badger, 1994 ; Silverman, Wong, Umbricht-Schneiter, Montoya, Schuster, & Preston, 1998;), opioids (Bickel, Amass, Higgins, Bager, & Esch, 1997; Kidorf & Stitzer, 1996; Preston, Umbricht, & Epstein, 2002; Silverman et al., 1996), alcohol (Miller, 1975; Petry, Martin, Cooney, & Kranzler, 1998), cigarette smoking (Heil, Tidey, Holmes, Badger, & Higgins, 2003; Roll, Higgins, & Badger, 1996), benzodiazepine use (Stitzer, Bigelow, Liebson, & Hawthorne, 1982; Stitzer, Iguchi, & Felch, 1992), stimulant use (Petry, Peirce, Stitzer, Blaine, Roll, Cohen, & Obert, 2005), and supplemental benzodiazepine or cocaine use while on methadone (Silverman, Higgins, Brooner, Montoya, Cone, Schuster, & Preston, 1996b; Stitzer et al., 1992).

Three meta-analyses of CM interventions reported overall moderate effect sizes of .25 (Griffith, Rowan-Szal, Roark, & Simpson, 2000), .32 (Lussier et al., 2006) and .42 (Prendergast, Podus, Finney, Grenwell & Roll, 2006). Results from the most recent meta-analysis of CM interventions for treating substance use disorders with abstinence as the primary outcome show that CM is more effective in treating opioid use ( $d = 0.65$ ) and cocaine use ( $d = 0.66$ ), compared with tobacco ( $d = 0.31$ ) or multiple drugs ( $d = 0.42$ ).

Treatment retention is a common target of CM interventions, as increased retention in treatment is associated with improved longer term treatment outcomes (Hubbard, Craddock, & Anderson, 2003; Simpson, Joe, & Rowan-Szal, 1997). Other common behavioral targets include goal attainment (e.g., filling out job applications and

attending medical appointments) (Kadden & Mauriello, 1991; Petry, 2000) and compliance with taking medications either for substance use disorders (Grabowski, O'Brien, Greenstein, Ternes, Long, & Steinberg-Donato, 1979; Liebson, Tommasello, & Bigelow, 1978) or for medical issues such as HIV (Rigsby et al., 2000).

A wide range of incentives have been used in CM interventions. Some of the most widely studied incentives include cash (Rosado, Sigmon, Jones, & Stitzer, 2005), vouchers redeemable for goods (Higgins et al., 1994), and on-site retail items (including on site “stores” where clients can shop for items). Other incentives include clinic privileges (e.g., methadone take home doses) (Stitzer et al., 1992), employment (Silverman, Wong, Umbricht-Schneiter, Montoya, Schuster, & Preston, 1998), housing (Milby, Schumacher, Raczynski, Caldwell, Engle, Michael, & Carr, 1996; Jones et al., 2005), refunds or rebates (for clinic fees) (Epstein & Wing, 1984), payment of bills (Gruber et al., 2000), and participation in program sponsored activities such as recreational outings (Jones et al., 2005).

Abstinent-contingent housing. A novel form of reinforcement for individuals with substance use disorders involves the provision of day treatment and housing contingent on drug abstinence. This form of contingency management has mostly been studied in homeless cocaine abusers located in Birmingham, Alabama and among inner-city primarily opioid dependent individuals located in Baltimore, MD.

***Birmingham homeless cocaine studies.*** Milby and colleagues (Milby, Schumacher, McNamara, Wallace, Usdan, McGill, & Michael, 2000; Milby, Schumacher, Raczynski, Caldwell, Engle, Michael, & Carr, 1996; Milby, Schumacher, Vuchinich, Freedman, Kertesz, & Wallace, 2008; Milby, Schumacher, Wallace, Frison,

McNamara, Usand, & Michael, 2003; Milby, Schumacher, Wallace, Freedman, & Vuchinich, 2005) conducted four successive randomized trials from 1990 to 2006 to evaluate day treatment with and without housing for homeless cocaine dependent individuals. These studies examined various combinations of abstinent contingent or non-contingent housing and day treatment programming in a series of dismantling studies to evaluate various components of the interventions (Schumacher et al., 2007). Participants were homeless individuals who reported regular crack cocaine use. The majority of participants were male, African American, and in their mid-30s. Study interventions were delivered at Birmingham Health Care, an agency that treats homeless individuals. Study investigators were employed through the University of Alabama at Birmingham. See Table 2.1 for a description of the Birmingham studies and outcomes.

A meta-analysis of the four Birmingham studies (Schumacher et al., 2007) was conducted using weighted least squares to integrate findings from the nine treatment arms. Findings at the two month assessment show the lowest abstinence rates in the day treatment (DT) only condition, followed by CM only condition; the highest rates of abstinence were in the DT + CM condition. Overall, two month outcomes revealed a strong treatment effect for CM interventions ( $\chi^2(1) = 74.6, p < .0001$ ) but not for DT alone ( $\chi^2(1) = 1.65, p = .20$ ). Six month data showed a significant interaction of housing (abstinent contingent or non-abstinent contingent) by day treatment (DT versus no DT) ( $\chi^2(1) = 5.91, p = .02$ ). This interaction suggests that the provision of housing coupled with day treatment is beneficial, whereas day treatment alone does not confer significant benefit. Six month outcomes reveal the lowest abstinence rates in the DT only condition, followed by the CM only condition, followed by the CM + DT condition. Importantly, a

Table 2.1

*Study Description and Findings from Birmingham Studies*

Authors	Design	n	Study Condition(s)	Primary Outcome	Abstinence Prevalence Estimate (SE)
Study I. Milby et al., 1996	Randomized	131	Enhanced care (EC), which included paid recovery housing n=69) versus usual care (n=62)  EC condition consisted of two phases. Phase I (2 months duration), EC received daily groups, monthly social activities, and abstinent contingent housing. Phase II, the EC condition received abstinent contingent housing, work therapy and twice weekly relapse prevention groups. The UC condition received the same treatment as EC in phase I; however, in phase II, participants did not receive abstinent-contingent housing.  UC participants received twice weekly individual and group counseling medical services, housing referrals, vocational services, and monthly social activities.	Cocaine toxicology results at 2 and 6 months	UC: 2 months: 0.37 (0.06) UC: 6 months: 0.46 (0.06) EC: 2 months: 0.70 (0.05) EC: 6 months: 0.62 (0.05)
Study II. Milby et al., 2000; Milby et al., 2003	Randomized	110	Day Treatment plus abstinence-contingent housing and work therapy (DT +: n=56) versus DT (n=54)  DT +: Same EC features as described in phases I and II in study I. EC also received work therapy and vouchers for goal achievement during phase I (therapeutic goals management [TGM])  DT: Same UC features as described in study I.	Cocaine, marijuana, and alcohol toxicology results twice weekly	DT: 2 months: 0.41 (0.04) DT: 6 months: 0.15 (0.04) DT+: 2 months: 0.71 (0.04) DT+: 6 months: 0.41 (0.06)
Study III Milby et al., 2005	Randomized	196	DT plus abstinence-contingent housing (ACH) (n=63) versus day treatment plus non-abstinent contingent housing (n=67) versus DT plus no housing (n=66)  ACH: Phase I. DT with TGM plus abstinence-contingent housing Phase II. Abstinence-contingent housing plus non-abstinence-contingent work therapy and aftercare  NACH: Phase I. DT with TGM plus non-abstinence-contingent housing  Phase II. Non-abstinence-contingent housing and work therapy and aftercare  DT plus no housing: Phase I. DT with TGM  Phase II. Non-abstinence contingent work therapy and aftercare.	Cocaine, marijuana, and alcohol toxicology results twice weekly	NH: 2 months: 0.41 (0.04) NH: 6 months: 0.18 (0.03) NACH: 2 months: 0.60 (0.03) NACH: 6 months: 0.40 (0.04) ACH: 2 months: 0.69 (0.46) ACH: 6 months: 0.46 (0.46) Weeks of abstinence NH: 5.28, NACH: 4.68, ACH: 7.32, NH and ACH (NH versus ACH: =.024)

Table 2.1

*Study Description and Findings from Birmingham Studies (continued)*

Study IV. Milby et al., 2008	Randomized	206	<p>CM (n=103) versus CM plus work therapy plus day treatment (CM +: n=103)</p> <p>CM: contingency managed housing and work therapy</p> <p>CM +: CM (housing and work therapy) plus DT</p> <p>Phase I. CM (housing and work therapy) plus DT with TGM</p> <p>Phase I. contingency managed housing and work therapy plus aftercare</p>	Cocaine, marijuana, and alcohol toxicology results three times weekly	<p>CM: 2 months: 0.73 (0.03)</p> <p>CM: 6 months: 0.58 (0.04)</p> <p>CM+: 2 months: 0.79 (0.03)</p> <p>CM+: 6 months: 0.64 (0.03)</p>
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six month benefit for DT was only apparent if coupled with CM. Pairwise tests indicate that CM conditions were superior to DT at six months ( $p < .006$ ); there were no significant differences between the CM and CM + DT conditions at the six month assessment.

Study III (Milby et al., 2005) specifically examined the relative efficacy of abstinent-contingent housing (ACH) versus non abstinent contingent housing (NACH) as well as a no housing condition (day treatment [DT] only). Results from this study show that the abstinent-contingent participants had higher point prevalence rates of drug and alcohol abstinence compared to the non-abstinent contingent condition participants; however, these differences failed to reach significance. On the measure continuous weeks of abstinence, the ACH condition participants also had more consecutive weeks of abstinence compared to the NACH condition participants, suggesting additional benefits associated with the abstinent-contingent component of the housing incentive program.

***Baltimore RBT outcome studies.*** Four studies conducted between 1997 and 2007 (Gruber et al., 2000; Jones et al., 2005; Jones, O’Grady, & Tuten, 2011; Tuten et al.,

2012) in Baltimore, MD utilized abstinent-contingent housing in addition to day treatment with opioid-dependent individuals. The Jones et al. (2011) study targeted pregnant women who were receiving methadone treatment and thus is excluded from this review. The three remaining RBT studies enrolled individuals who had recently completed opioid detoxification and were interested in medication-free outpatient services. Participants in these studies need not be homeless, but endorsed housing as a need at the time of study screening.

The first outcome evaluation study of RBT enrolled participants in 1997-1998 and evaluated short term (three month) abstinence outcomes (Gruber et al., 2000). Patients who had completed opioid detoxification were randomly assigned to RBT ( $n=28$ ) or to usual care (UC;  $n=24$ ), which included standard referral to community aftercare treatment. RBT, delivered in the context of a day treatment program, was offered daily for one month and three times per week for an additional two months. Payment for recovery housing was available for a one month period and was contingent on opioid and cocaine abstinence. In addition, recreation and other group activities and program benefits (with the exception of individual counseling and outreach) required abstinence for participation. Outcomes at one month post treatment revealed that 61% of opioid users assigned to RBT versus 17% of those referred to community treatment resources were enrolled in outpatient treatment ( $p > 0.01$ ), a finding that emphasizes the lack of aftercare received by individuals exiting detoxification. Further, 50% of RBT versus 21% of UC participants reported 30 days of abstinence post-detoxification and tested opioid and cocaine negative ( $p < 0.05$ ). By three months, the majority of the participants in both groups were no longer engaged in substance abuse treatment and drug use

outcomes were non-significantly different across the conditions. This initial study of RBT showed promise for improving during-treatment outcomes and suggested that enrollment in the intensive RBT for a longer period of time might confer additional benefits for opioid dependent individuals exiting detoxification.

A second randomized study was conducted in 2000-2001 to evaluate the longer term outcomes for RBT with a larger sample (Jones et al., 2005). This study randomly assigned 130 recently detoxified patients to receive RBT ( $n=66$ ) or usual care ( $n=64$ ). Abstinence-contingent treatment elements were similar to those studied by Gruber et al. (2000); however, recovery housing incentives were available for three months, with an additional three months of behavioral treatment available in the absence of paid housing. The results of this study showed that RBT condition participants were more likely to test negative for opioids and cocaine compared to the UC condition at one (42% versus 15%) and three (38% versus 17%) month follow-up ( $p < .05$ ). Group differences missed significance at 6 and 12 months. Interestingly, the proportion of UC condition participants who were abstinent increased over time while the proportion of RBT condition participants who were abstinent decreased. This finding is likely attributable to the fact that 70% of UC condition individuals-- who had only been provided referrals at the time of detoxification release-- accessed methadone treatment. This increase in the number of methadone-treated individuals is consistent with improvements in this condition over time. The RBT condition participants also spent more days working compared to UC at three months (11.0 days versus 4.7 days), six months (10.8 versus 8.9 days), and 12 months (10.3 days versus 5.4 days) (all  $p < .05$ ). Likewise, RBT participants earned more legal income compared to UC at three months (\$498 versus \$2409), six

months (\$651 versus \$326), and 12 months (\$629 versus \$281). These differences in employment functioning are likely attributable to the vocational component of the treatment model.

Another study was conducted between 2001 and 2004 to replicate the Jones et al. (2005) study and to more fully examine the contribution of recovery housing in the RBT model (Tuten et al., 2012). Opioid-dependent participants ( $N=243$ ) exiting detoxification were randomly assigned to receive RBT plus recovery housing (RBT + RH,  $n=81$ ), recovery housing alone (RH,  $n=81$ ), or usual care (UC,  $n=81$ ). Outcomes for all conditions were assessed at one, three, and six months post-treatment enrollment. The primary outcome measure was opioid and cocaine abstinence at each assessment period. Results showed a graded response among the treatment conditions; participants in the RBT + RH condition were more likely to be opioid and cocaine abstinent at all three assessment points compared to UC (one month= 60% versus 5%; three months =53% versus 15%; six months= 37% versus 20%., all  $p <.05$ ). RH participants were more likely to be opioid and cocaine abstinent at one month (44% versus 5%) and three months (37% versus 15%), compared to UC (all  $p <.05$ ), but not at six months (28% versus 20%). The two experimental conditions also significantly differed, with RBT + RH participants having higher rates of abstinence at one month (60% versus 44%) and three months (53% versus 37%) (all  $p <.05$ ), but not at six months (37% versus 28%).

Participants assigned to RBT + RH remained in recovery housing longer than those in the RH condition (49.5 and 32.2 mean days, respectively,  $p = 0.0014$ ). A mediation analysis indicated that retention in recovery housing for more than 60 days was associated with improved treatment outcomes. Notably, those assigned to the RBT + RH

condition also were more likely to remain in recovery housing for more than 60 days compared to the RH condition (54% of RBT+RH versus 31% of RH,  $\chi^2(2) = 10.15, p = 0.006$ ). On the measure of employment, the RH condition had higher rates of money earned compared to UC at the three month assessment; the RBT + RH condition had higher rates of money earned from employment compared to UC at both the three and six month assessments.

Overall, these findings suggest that both the RBT + RH and RH conditions were superior to UC on multiple treatment outcomes. However, the most intensive condition, which includes behavioral counseling coupled with paid, abstinent-contingent recovery housing (RBT + RH), appears to provide the largest contribution to improved treatment outcomes in this study population of opioid dependent individuals who have completed detoxification.

Findings from studies evaluating the use of housing as a contingency for abstinence appear promising for cocaine and opioid dependent individuals who are precariously housed or homeless. The Birmingham studies show a strong effect for CM (paid housing) versus DT, which underscores the importance of the housing contingency for improving abstinence rates. In fact, these studies show that DT provides the most benefit when combined with CM (Schumacher et al., 2007). Findings to date indicate that the provision of abstinence-contingent housing may be a sufficient intervention for improving abstinence in crack cocaine using homeless persons. The benefit associated with adding day treatment (group and individual treatment) to this intervention is unclear, although there may be benefits conferred by this combination of interventions on

measures other than abstinence (e.g., improvements on other psychosocial variables such as HIV risk behaviors).

The Baltimore studies show that RBT is an effective intervention for preventing relapse and that more intensive forms of the treatment may provide additional benefit in terms of sustained drug abstinence. RBT studies show that the primary outcome of abstinence is most notable when CM is in place and shortly after the incentives are removed; however, the effects for CM diminish over time after the intervention is removed. However, there is evidence that there are benefits beyond the measure of abstinence for RBT in the area of increased employment (Jones et al., 2005; Tuten et al., 2011). The Tuten et al. (2011) study shows that housing plays an important role in sustaining abstinence among opioid dependent individuals, and that individuals receiving behavioral counseling in addition to paid housing remain in recovery housing for longer periods of time.

Although substance use is often prohibited in community housing (i.e., halfway houses, recovery houses, sober houses) these forms of housing do not apply consistent methods for assessing and providing contingencies for drug and alcohol use. For example, many community houses do not test for drug or alcohol use at all and many houses use democratic methods for determining whether residents are removed from housing when drug use is detected or suspected. Research on the use of housing as a well-controlled form of contingency management for abstinence is sparse.

The Birmingham studies provide evidence that abstinent-contingent housing is effective for retaining and treating homeless cocaine abusers. The Baltimore studies suggest that housing as a form of contingency is effective for increasing abstinence

among cocaine and opioid users. Additional research is needed to support the promising findings from these studies. Furthermore, research is needed to determine how abstinent-contingent housing fares versus lower cost day treatment incentives as provided in RBT (e.g., paid recreation, lunch, transportation) on the key substance abuse treatment outcomes, including abstinence and other psychosocial variables, such as employment. This dissertation compares participants receiving RBT versus participants receiving RBT + RH. This comparison examines two models of behavioral treatment, a model using outpatient treatment, which includes management for housing, and a model that provides outpatient treatment plus abstinent-contingent housing. The comparison of these two forms of contingency management is important for extending the research in this area, and has considerable clinical relevance, as it can guide how resources are allocated to maximize treatment effect.

### **Chapter III. Method**

The first section of this chapter provides a review of the sources of data for the study. The second section provides a synopsis of the recruitment, intervention, and assessment methods of the two studies from which data were derived. The third section provides a review of the primary and secondary measures examined in the study. Next, the data analyses used in the study are described.

#### **Data Sources**

This secondary data analysis study is derived from two Institutional Review Board (IRB) approved studies conducted on the Johns Hopkins Bayview Medical Campus (JHBMC) by the same team of research investigators (Jones et al., 2005; Tuten et al., 2011). Participants from both studies were recruited from two programs on campus providing medication-assisted detoxification services: one program provided a three day detoxification and the other program provided a 7 to 14 day detoxification. Inclusion and exclusion criteria for the two studies were the same. Study eligible patients were between 18 and 60 years of age, met DSM-IV criteria for current opioid dependence and completed an on campus medication-assisted detoxification program. Study applicants were excluded if they were prescribed opioid agonist medication for maintenance (i.e., methadone or buprenorphine), were experiencing acute medical or psychiatric illness, or were pregnant. Assessment and recruitment procedures were the same for these two studies, as described below.

**Study one.** Study one was a non-randomized study designed to evaluate the efficacy of RBT for treating opioid-dependent individuals who had completed medication-assisted detoxification. Participants ( $n=55$ ) were recruited from 9/18/2004 to

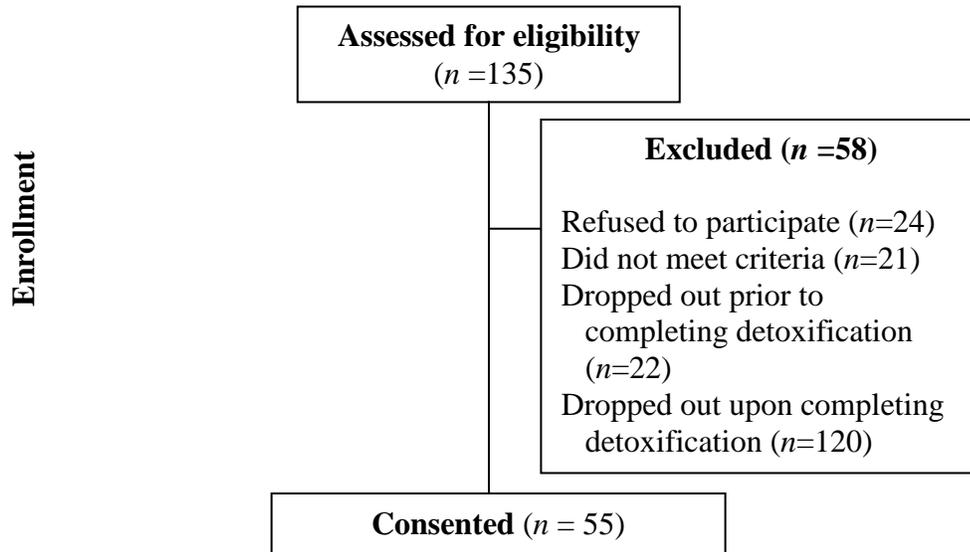
5/24/2006. Figure 3.1 provides information on the number of patients screened, excluded, and included in the RBT study.

**Study two.** Study two was a randomized clinical trial designed to examine the efficacy of three conditions for treating opioid-dependent individuals who had completed medication-assisted detoxification: Reinforcement-Based Treatment plus Recovery Housing (RBT + RH:  $n=80$ ), Recovery Housing Alone (RH:  $n=83$ ), and usual care (UC:  $n=80$ ). Participants for this study ( $N=243$ ) were recruited from 04/10/2001 to 02/21/2004 (see Figure 3.2 for a flow diagram of participant recruitment and study condition allocation). The 80 participants assigned to the RBT + RH group are included in the current study.

The following study methods were the same for the two conditions from study one and study two.

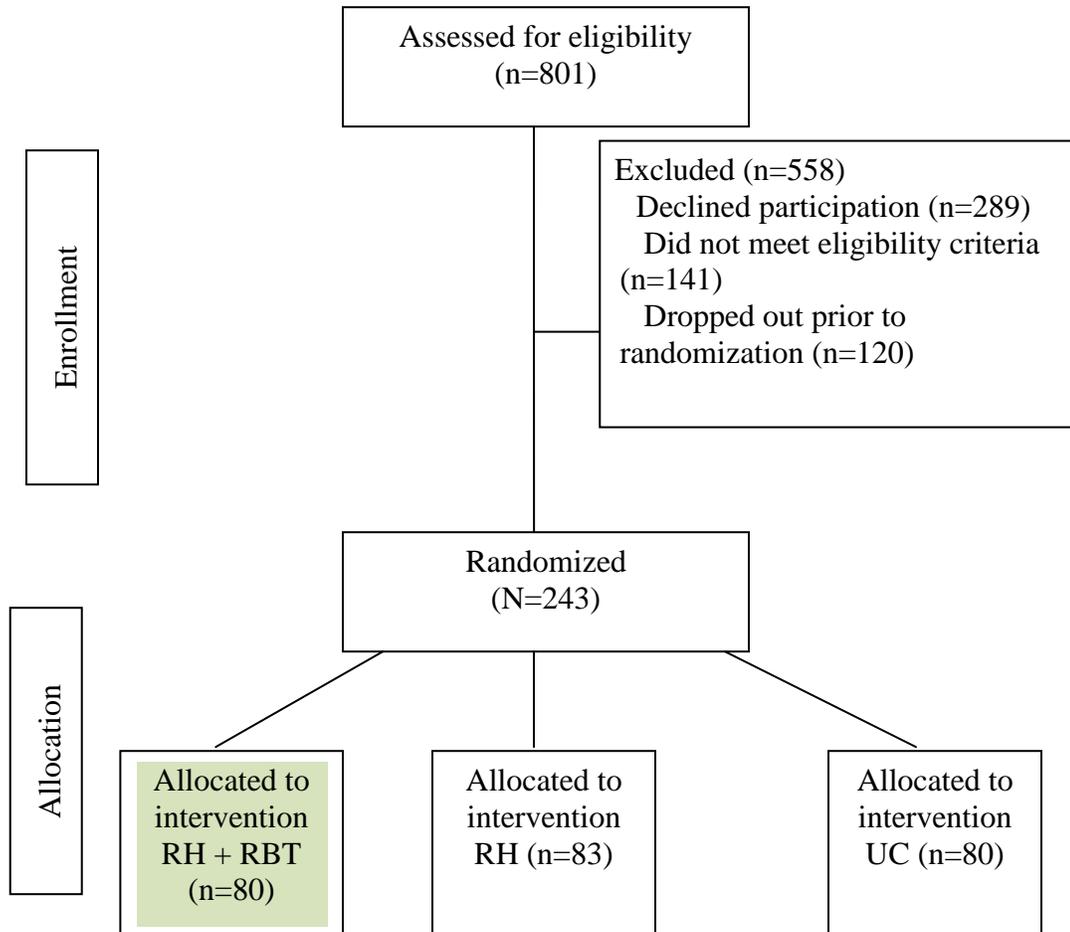
**Baseline assessment.** On the day of discharge from the detoxification program, study participants were escorted by research staff directly to the outpatient clinic where they completed an initial assessment battery (IAB). The IAB consisted of two standardized assessments: (1) the Addiction Severity Index (ASI: McLellan et al., 1992) is a semi-structured interview to assess for psychosocial functioning in seven domains impacted by drug and alcohol use, including medical, employment, drug and alcohol use, family/social functioning, legal status, and psychiatric functioning. (2) The Structured Clinical Interview for DSM-IV (SCID-I, e-module: First, Spitzer, Gibbon, & Williams, 1996) assessed lifetime and current DSM-IV substance abuse/dependence diagnoses.

Figure 3.1 Study one patients screened, excluded, and consented to RBT



**ASI training and quality assurance.** ASI interviewer training was conducted by an ASI expert and included a didactic discussion of each ASI item and observation of videotapes provided by the test makers. Subsequently, interviewers observed a minimum of three patient interviews administered by an expert interviewer, and then administered two to three participant interviews under the observation of the expert interviewer who provided feedback following the session. Ongoing inter-rater reliability for severity items ("ASI rounds") was conducted on a monthly basis. During this group reliability session, an ASI "case" was reviewed by the group of trained interviewers and interviewers provided severity scores for each of the ASI domains. Severity ratings among interviewers were discussed until all scores were within a three-point range of each other. Additionally, a staff member trained in quality assurance reviewed all interviews following administration to address and resolve coding or interview errors with the interviewers.

Figure 3.2 Study two patients screened, excluded, and randomized



**Structured clinical interview for DSM-IV.** SCID Interviewer training included didactic discussions of the instrument, observation of videotapes provided by the test makers, and a passing score on a knowledge assessment of DSM-IV criteria. Interviewers then conducted SCID sessions under the observation of an expert interviewer until 100% concordance with the expert interviewer was reached.

**Treatment conditions.** The eligibility criteria, interventions (10 elements of RBT), baseline and follow assessment, urinalysis schedule, and discharge criteria, were the same for both groups. However, participants in the RBT + RH group received paid recovery housing for a period of 12 weeks whereas the RBT participants received intensive case management services to assist them with identifying and procuring housing. See Table 3.3 for a description of the recruitment sites, study design, eligibility criteria, outpatient treatment schedule, and discharge criteria for the two studies.

*Reinforcement-based treatment (RBT).* Participants who consented to the RBT condition were expected to attend outpatient treatment seven days per week during the first three weeks of treatment, four days per week in weeks four through 12, and twice per week in the final 12 weeks of the 24 week program. If participants failed to show for a session, therapists began a systematic outreach protocol to re-engage them that involved phone calls, letters, and home visits. In the final 12 weeks of treatment, contact was reduced to twice a week for all RBT participants, and incentives for food (lunch vouchers) and recreation were no longer offered. Patients were discharged from the program if they missed seven consecutive counseling sessions in weeks one through three (Phase I; one week with no contact), missed 14 consecutive sessions in weeks four through 12 (Phase II; two weeks with no contact), or had no contact for 21 consecutive

days in weeks 13–24 (Phase III; three weeks with no contact). Individual counseling sessions were scheduled two to three times a week. A minimum of four behavioral goals were identified for each participant (e.g., drug abstinence, treatment attendance, employment-seeking, recreational activities) and progress was depicted in graphic form to provide visual feedback and support for goal attainment. Provision of a drug-positive urine sample resulted in time-out from group activities. A functional assessment of the relapse was conducted, a revised treatment plan was implemented, and daily individual therapy sessions were held; following urine-verified abstinence, the individual was once again eligible to participate in day treatment group activities. Urine testing for opioids and cocaine was conducted at each clinic visit using on-track test sticks with metabolite concentration cut-offs of 300 ng/ml. Participants testing negative for opioids and cocaine could participate in the full range of treatment components that included skills building group, lunch in the hospital cafeteria, Job Club, and a program sponsored recreational activity in the community. On Fridays, “social club” included a program sponsored lunch, day planning by group members for the upcoming weekend, and a ceremony during which participants received certificates for continuous days of attendance in the program.

*Follow-up assessments.* Follow-up assessments were scheduled at one, three, and six months after treatment initiation. Follow-up assessment consisted of administration of the ASI and collection of an observed urine sample. Urine samples were tested off-site for opioids, methadone, cocaine, and benzodiazepines using the enzyme-multiplied immunoassay technique (EMIT; Syva Corp., Palo Alto, CA).

Table 3.3

<i>Recruitment, Study Design, Study Eligibility, Treatment Elements, and Discharge Criteria</i>		
Study Elements	Study One RBT	Study Two RBT + RH
Recruitment		
Recruited from two detoxification units on Johns Hopkins Bayview Campus	X	X
Agreed to move into recovery housing	---	X
Study Design		
Randomized	---	X
Eligibility criteria		
18-60 years of age	X	X
Opioid dependent	X	X
No acute medical or psychiatric needs	X	X
Completed detoxification	X	X
Outpatient Treatment		
24 weeks of outpatient therapy (phases I-III)	X	X
Discharge Criteria		
Discharge for non-attendance based on no face to face contact (seven days in phase I., 14 days in phase II., and 21 days in phase III)	X	X
Housing case management		
Intensive case management for housing procurement	X	X
Program paid recovery housing Payment for 12 weeks contingent on abstinence	----	X

Participants were compensated \$25.00 in gift certificates for completing each follow-up assessment.

*Case management for safe housing.* Although recovery housing was not provided in the RBT study, participants living in environments with easy access to drugs or who were using drugs in the current residence were strongly encouraged to seek alternative housing, including recovery housing. RBT therapists assisted participants with identifying recovery or other safe housing and brainstormed methods of payment with participants, participant family members (who sometimes paid for participant housing), and recovery house owners to facilitate recovery house entry. On occasion, recovery house owners would allow participants to reside in recovery housing in exchange for public assistance benefits or in exchange for construction work on houses operated by the recovery house owner. Therapists also transported participants to recovery housing for informational visits to help encourage consideration of recovery housing. When applicable, time spent (number of days) in recovery housing was recorded for all RBT participants.

*Reinforcement-based treatment (RBT) plus recovery housing (RBT +RH).*

Participants randomized to the RBT +RH condition met the same eligibility criteria, attended 24 weeks of outpatient treatment as specified above for RBT (phases I-III), followed the same baseline and follow assessment and urinalysis schedule, and were subject to the same discharge criteria as those described above for the RBT study. However, the RBT + RH condition was part of a larger three condition randomized trial. As part of the consent procedures for this randomized trial, potential participants expressed willingness to enter recovery housing if so assigned. Participants assigned to

the he RBT + RH condition received paid recovery housing in addition to the outpatient treatment services described for the RBT study.

*Program paid recovery housing.* At the end of the first treatment day, RBT + RH participants were escorted to recovery housing. Participants also were transported the following morning from recovery housing to the RBT program. RBT + RH participants subsequently received bus tokens for transportation to treatment for a 12 week period. RBT + RH participants received rental payment for recovery housing for a 12 week period contingent on abstinence from opioids, cocaine, and alcohol. When drug or alcohol use was detected, the participant was removed from the recovery house and placed into alternative housing that had been previously identified. Participants typically resided with family members or in homeless shelters following discharge from recovery housing. Re-entry was facilitated by therapists for those who re-initiated abstinence from opioids and cocaine following a relapse.

*Case management for housing.* Although all individuals recruited for the RBT + RH agreed to reside in recovery housing if randomized to this study condition, some individuals refused to enter recovery housing on the day of detoxification discharge. Additionally, some participants were removed from recovery housing due to drug use, non-compliance with house rules, child care issues, or conflicts with fellow residents. If a participant decided to leave recovery housing or was removed from housing, RBT therapists assisted the client with locating alternative housing. RBT + RH participants completed an alternative housing plan at the initiation of treatment wherein housing options were listed and discussed. This housing plan was designed to assist RBT therapists in the event that the participant left paid recovery housing. Alternative housing

included homeless shelters, the homes of family members, and occasionally other recovery housing.

Study Measures. Treatment condition (coded  $RBT=0$  and  $RBT+RH=1$ ) was the independent variable for all analyses.

*Demographic and pre-treatment variables.* The following continuous variables and corresponding questions (where applicable) were included in the analyses, as derived from a demographic data form or the ASI: What is your date of birth? Date of birth was translated to *age in years* as of date of consent. How many years of education have you completed? Education was coded as *number of years of education completed in lifetime* (one exception: Generalized Educational Equivalency= 12). How many days in the past 30 days prior to treatment entry have you used heroin or other opioids? Days of heroin and other opioid use were collapsed into *number of days of opioid use*. How many months in your lifetime have you used heroin or other opioids? Lifetime heroin and other opioid use were collapsed and coded as *number of months of opioid use*. How many days in the past 30 days prior to treatment entry have you used cocaine? Past 30 days cocaine use was coded as *number of days of cocaine use*. How many months in your lifetime have you used cocaine? Lifetime cocaine use was coded as *number of months of cocaine use*. How many times have you been treated for drug abuse in your lifetime? Lifetime treatment variable was coded as *number of prior treatment episodes*.

The following questions and corresponding dichotomously coded variables were included in the analyses: what race do you consider yourself? The sample fell into two racial categories and thus were collapsed into *Caucasian = 0* and *African American = 1*. What is your gender? Gender was coded as *female = 0* and *male = 1*. What is your marital

status? The responses available were never married, married, divorced, separated, and widowed. Marital status categories were collapsed into *never married*= 0, or *previously married*= 1. Are you currently employed? Participants were coded as *unemployed*= 0 or *employed*= 1. What routes of drug administration have you used? The ASI interviewer coded most severe route reported as specified in the ASI, and the responses were categories as *no intravenous use*= 0, *intravenous use*= 1. Finally, participants were coded based on whether or not they remained in recovery housing overnight. Those who did not remain in recovery housing overnight were coded= 0, and those who *accessed recovery housing were coded*= 1).

*Primary outcome measures.* Opioid abstinence and cocaine abstinence were assessed separately at one, three, and six months follow-up assessment. Abstinence was defined as the submission of a negative urine sample and self-reported abstinence in past 30-days on ASI interview. The corresponding ASI questions assessing for opioid use were: “How many days have you used heroin in the past 30 days?” and “How many days have you used opioids in the past 30 days? Those who reported any days of use or tested positive for opioids were coded as *opioid non-abstinent*= 0. Participants who self-reported no days of opioid use and submitted a drug negative urine sample were coded as *opioid abstinent*= 1). The corresponding ASI question assessing for cocaine use was: “How many days have you used cocaine in the past 30 days?” Those who reported any days of use or tested positive for cocaine were coded as *cocaine non-abstinent*= 0. Participants who self-reported no days of cocaine use and submitted a drug negative urine sample were coded as *cocaine abstinent*= 1). Conversely, any days of self-reported drug use in the prior 30 days or a positive urinalysis results was considered non-abstinent. The

measure of combined opioid and cocaine abstinence was defined as specified above; however, the participant had to report no days of use for both opioids and cocaine and have a negative urinalysis for opioids and cocaine to be coded as *opioid and cocaine abstinent*= 1.

*Secondary outcome measures.* Three employment variables were assessed at each of the ASI follow-up assessments: 1) whether employed at each follow-up (*unemployed*= 0, *employed*= 1), 2) mean days employed during the prior 30 days (*number of days of employment*), and 3) mean amount of employment earnings in the prior 30 days (*net dollar amount of employment earnings*). The corresponding ASI questions were as follows: 1) "Are you currently employed?" 2) "How many days were you paid for working during the past 30 days?" and 3) "How much money did you receive from employment (net income) in the past 30 days?"

**Preliminary data analysis.** Distributions for variables were checked for normality and transformed when necessary. Specifically, mean days worked and mean amount of employment earnings were positively skewed because of the high rate of unemployment (zero days of employment and zero earnings). These variables were transformed using natural logarithm (ln) to meet the normality assumption.

*Missing data.* Missing outcome data were treated as missing (missing cases were excluded) in all analyses.

An alpha level of  $p < .05$  was used for all analyses. All analyses were performed using the Statistical Package for Social Sciences (SPSS) version 20.0 for Windows (SPSS, Inc., 2011).

**Data analysis of pre-treatment and demographic comparisons.** Chi-square analyses were used to compare the RBT and RBT + RH group participants on the dichotomous variables of race, gender, marital status, employment, and intravenous drug use. ANOVA<sup>1</sup> was used to compare the two groups on the continuous measures of age, education, number of days of opioid use in the prior 30 days, number of days of cocaine use in the prior 30 days, lifetime months of opioid use, lifetime months of cocaine use, and number of prior treatment episodes.

Data analyses by research question. The study research questions and corresponding data analysis techniques are described below.

**Research Question 1: How do participants who received RBT compare with participants who received RBT + RH on the measure of opioid abstinence at one, three, and six month assessment?**

Chi-square analyses were used to examine differences between the RBT and RBT + RH group on the dichotomous outcome of opioid abstinence at one, three, and six month follow-up assessment.

Three separate logistic regression analyses using simultaneous entry were conducted to predict opioid abstinence at the one, three, and six month assessment. The variables of age and gender were included to assess for potential demographic influences. Although recent well controlled studies show that women and men have similar treatment retention and outcomes (Greenfield et al., 2007), gender was included in the model because of disproportionate numbers of men in the study sample, and the potential barrier that women participants may have faced to accessing or remaining in recovery housing due to childcare issues (i.e., recovery houses did not house children).

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<sup>1</sup> The two group ANOVAs conducted for this dissertation are equivalent to independent samples *t*-tests.

Additionally, two drug use severity variables were entered to control for potential drug use severity factors: lifetime number of treatment episodes (Adamson, Sellman, & Frampton, 2009) and intravenous drug use at treatment entry (Roll, Prendergast, Richardson, Burdon, & Rameriz, 2005). Two intervention specific variables also were included in the model: treatment group and whether or not the participants accessed recovery housing.

**Research Question 2: How do participants who received RBT compare with participants who received RBT + RH on the measure of cocaine abstinence at one, three, and six month assessment?**

Chi-square analyses were used to examine differences between the RBT and RBT + RH group on the dichotomous outcome of cocaine abstinence at one, three, and six month follow-up assessment.

As in research question 1, three separate logistic regression analyses with simultaneous entry were conducted to predict cocaine abstinence at the one, three, and six month assessment. The RBT and RBT + RH sample included participants who did not report cocaine use in the 30 days prior to treatment entry (25% for both groups). Therefore, an additional co-predictor of cocaine use at treatment entry was included in the cocaine specific analyses.

**Research Question 3: How do participants who received RBT compare with participants who received RBT + RH on the measure of combined opioid and cocaine abstinence at one, three, and six month assessment?**

Chi-square analyses were used to examine differences between the RBT and RBT + RH group on the dichotomous outcome of combined opioid and cocaine abstinence at one, three, and six month follow-up assessment.

As in research questions one and two, three separate logistic regression analyses with the same predictors and method of entry as described above were used to predict opioid and cocaine abstinence at the one, three, and six month assessment. Cocaine use at treatment entry was included in these models as specified in question two.

**Research Question 4: How do participants who received RBT compare with participants who received RBT + RH on rates of employment?**

Chi-square analyses were used to examine differences between the RBT and RBT + RH group on the dichotomous outcome of employment at one, three, and six month follow-up assessment.

**Research Question 5: How do participants who received RBT compare with participants who received RBT + RH on the measure of days worked at one, three, and six month assessment.**

*Bivariate analyses.* ANOVA was used to examine differences between the RBT and RBT + RH group participants on mean days worked earnings (ln transformed) at the one, three, and six month assessment.

*Regression analyses.* Multiple regression with simultaneous entry was used to predict mean days worked (ln transformed) at the one, three, and six month assessment. The predictors of age, gender, intravenous drug use, opioid and cocaine abstinence, accessed recovery housing, and group were included in the model.

**Research Question 6: How does RBT compare with RBT + RH on the measure of mean employment earnings (\$ amount) at one, three, and six month assessment?**

*Bivariate analyses.* ANOVA was used to examine differences between the RBT and RBT + RH group participants on mean employment earnings (using natural logarithm) at the one, three, and six month assessment.

*Regression analyses.* Multiple regression with simultaneous entry was used to predict mean employment earnings (using natural logarithm) at the one, three, and six month assessment. The predictors of age, gender, intravenous drug use, opioid and cocaine abstinence, accessed recovery housing, and group were included in the model.

## **Chapter IV. Results**

This chapter describes the results of RBT and RBT + RH comparisons and is divided into six sections. The first section describes the demographic and pre-treatment characteristics of the RBT and RBT + RH participants. The second section describes the group comparisons on the primary outcome measure of percent of participants who were opioid, cocaine, and combined opioid and cocaine abstinent at one, three, and six months. Logistic regression analyses also were used to examine variables that may be predictive of abstinence, as described in the Method chapter. The third section describes the secondary outcome employment measures, including percent of participants employed, mean days worked and mean employment earnings for RBT and RBT +RH participants at one, three, and six months. Multiple regression analyses was used to examine the variables that may be predictive of days worked and employment earnings as described in the Method chapter. Results for the primary and secondary outcomes measures are organized by research questions one through six. The fifth section of this chapter describes subgroup analyses stemming from RBT and RBT + RH comparisons. The final section provides a summary of the study findings.

### **RBT versus RBT + RH Group Participants**

Baseline characteristics. Demographically, the RBT and RBT + RH groups were similar and there were no statistically significant differences on age, race, gender, marital status, years of education, percent unemployed, past thirty day and lifetime opioid and cocaine use, number or prior treatment episodes, and rates of intravenous drug use. See Tables 4.1 and 4.2 for continuous and categorical, respectively, pre-treatment and demographic characteristics by group. Participants were in their late 30s on average, were

Table 4.1

*Demographic and Pre-Treatment Characteristics for RBT and RBT + RH Participants*

	Total Sample <i>M (SD)</i>	RBT ( <i>n</i> =55) <i>M (SD)</i>	RBT + RH ( <i>n</i> =80) <i>M (SD)</i>	<i>F</i>	<i>p</i>
Age	39.7 (8.5)	40.9 (8.0)	38.0 (8.7)	1.816	.180
Education years	11.5 (1.7)	11.6 (1.5)	11.5 (1.9)	.183	.670
Days opioid use in 30 days prior to admission	27.9 (5.9)	27.5 (6.6)	28.1 (5.4)	.395	.231
Lifetime months opioid use,	132.1 (92.0)	137.2 (93.1)	129.0 (91.1)	.287	.593
Days cocaine use in 30 days prior to admission	13.6 (12.8)	13.5 (12.6)	13.6 (13.0)	.001	.972
Lifetime months cocaine use	72.7 (86.5)	73.4 (85.5)	72.2 (88.2)	.006	.939
Lifetime drug treatment episodes	3.6 (4.5)	3.7 (4.3)	3.6 (4.7)	.037	.847

Table 4.2

*Demographic and Pre-Treatment Characteristics for RBT and RBT + RH Participants*

	Total Sample %	RBT (n=55) %	RBT + RH (n=80) %	$\chi^2$	<i>p</i>
Race					
African American	77.8	82.0	75.0	.877	.235
Gender					
Male	76.0	70.9	79.0	1.085	.201
Marital status					
Never married	49.6	43.6	55.0	1.684	.131
Employed	4.4	5.5	3.7	.223	.471
Intravenous drug use	53.3	45.5	58.8	2.315	.089

predominately African American and male, the majority had a high school education, and approximately one half reported having never been married. Participants reported opioid use for most days out of the past 30 days prior to treatment. Participants reported use of crack cocaine approximately half of the month prior to treatment enrollment. Approximately half of the participants used at least one substance intravenously.

**Research Question 1: How do participants who received RBT compare with participants who received RBT + RH on the measure of opioid abstinence at one, three, and six month assessment?**

*Group comparisons on measure of opioid abstinence.* The RBT + RH group participants had higher one month opioid abstinence rates compared to the RBT group participants (70% versus 53%,  $p=.06$ ); however, this difference did not reach significance at  $p < .05$ . The two groups did not differ on percent of participants who were abstinent at three and six month follow-up assessment (See Table 4.3).

*Regression analyses for predicting opioid abstinence.* The regression model for predicting opioid abstinence at one month was significant ( $p=.009$ ). Those who accessed recovery housing were more likely to be opioid abstinent at one month compared to participants who did not access recovery housing (OR=5.489,  $p=.002$ ; see Table 4.4). The model predicting opioid abstinence at three months also was significant ( $p=.003$ ). Participants who accessed recovery housing were more likely to be opioid abstinent at three months compared to participants who did not access recovery housing (OR=4.319,  $p=.011$ ). Additionally, those who were employed at three months were more likely to be opioid abstinent at three months compared to participants who were unemployed (OR=3.315,  $p=.008$ ; see Table 4.5). Finally, the model for predicting opioid abstinence at

Table 4.3

*Percent Abstinent at One, Three, and Six Months for RBT and RBT + RH Participants*

	Total Sample		RBT (n) %	RBT + RH		$\chi^2$	p
	(n)	%		(n)	%		
<b>Opioid abstinence</b>							
One month	(114)	63.2	(45) 53.3	(69) 69.6	3.084	.060	
Three months	(119)	58.8	(50) 54.0	(69) 62.3	.828	.235	
Six months	(110)	50.0	(46) 50.0	(64) 50.0	.000	.577	
<b>Cocaine abstinence</b>							
One month	(84)	69.0	(34) 61.8	(50) 74.0	1.418	.171	
Three months	(87)	62.1	(37) 54.1	(50) 68.0	1.757	.135	
Six months	(78)	53.8	(35) 51.4	(43) 55.8	.149	.437	
<b>Opioid and cocaine abstinence</b>							
One month	(113)	74.3	(50) 46.0	(69) 55.7	1.102	.147	
Three months	(119)	65.5	(50) 48.0	(69) 59.4	1.526	.194	
Six months	(107)	60.7	(46) 45.7	(64) 46.9	.016	.282	

Note. Cocaine abstinence analyzed for participants who reported recent pre-treatment cocaine use.

Table 4.4

*Logistic Regression Analyses Predicting Opioid Abstinence at One Month*

N=111	B	SE B	Wald's $\chi^2$	df	<i>p</i>	Odds ratio	CI
Control variables							
Age	.028	.028	1.027	1	.311	1.029	.974, 1.086
Gender	.410	.528	.602	1	.438	1.506	.535, 2.291
IV drug use	-.489	.464	1.109	1	.292	.613	.247, 1.524
Prior treatment episodes	-.020	.044	.211	1	.646	.980	.898, 1.069
Accessed recovery housing	1.703	.558	9.302	1	.002	5.489	1.838, 16.394
Employed	.575	.477	1.448	1	.229	1.776	.697, 4.528
Group	-.237	.544	.190	.1	.663	.789	.272, 2.291
Model			18.894	7	.009		
Hosmer and Lemeshow test			3.779	8	.876		

Table 4.5

*Logistic Regression Analyses Predicting Opioid Abstinence at Three Months*

N= 115	B	SE B	Wald's $\chi^2$	df	p	Odds ratio	CI
Control variables							
Age	.039	.028	2.011	1	.156	1.040	.985, 1.098
Gender	-.752	.550	1.870	1	.171	.471	.160, 1.385
IV drug use	-.488	.450	1.174	1	.279	.614	.254, 1.484
Prior treatment episodes	.017	.048	.124	1	.724	1.017	.925, 1.118
Accessed recovery housing	1.463	.575	6.479	1	.011	4.319	1.400, 13.326
Employed	1.199	.449	7.134	1	.008	3.315	1.376, 7.990
Group	-.197	.553	.127	1	.772	.821	.278, 2.427
Model			22.028	7	.003		
Hosmer and Lemeshow test			10.997	8	.202		

six months also was significant. Participants who accessed recovery housing were more likely to be opioid abstinent at six months than participants who did not access recovery housing (OR=4.072,  $p=.018$ ). Participants who were employed were also more likely to be opioid abstinent at six months compared to participants who were unemployed (OR=3.286,  $p=.019$ ; see Table 4.6).

**Research Question 2: How do participants who received RBT compare with participants who received RBT + RH on the measure of cocaine abstinence at one, three, and six month assessment?**

*Group comparisons on measure of cocaine abstinence.* On the measure of cocaine abstinence, the two groups did not differ on percent of participants who were abstinent from cocaine at one, three, or six months (see Table 4.3).

*Regression analyses for predicting cocaine abstinence.* The model predicting cocaine abstinence at one month was significant ( $p=.001$ ). Participants who accessed recovery housing were more likely to be cocaine abstinent at one month compared to participants who did not access recovery housing (OR=8.637,  $p=.001$ ; see Table 4.7). The model predicting cocaine abstinence at three months also was significant ( $p=.005$ ). Participants who accessed recovery housing were more likely to be cocaine abstinent at three months compared to participants who did not access recovery housing (OR=5.638,  $p=.003$ ; see Table 4.8). The model for predicting cocaine abstinence at six months was non-significant (see Table 4.9).

**Research Question 3: How do participants who received RBT compare with participants who received RBT + RH on the measure of combined opioid and cocaine abstinence at one, three, and six month assessment?**

Table 4.6

*Logistic Regression Analyses Predicting Opioid Abstinence at Six Months*

N=111	B	SE B	Wald's $\chi^2$	df	p	Odds ratio	CI
Control variables							
Age	.041	.030	1.852	1	.173	1.042	.982-1.105
Gender	-.610	.571	1.142	1	.285	.543	.177, 1.664
IV drug use	.004	.462	.000	1	.994	1.004	.406, 2.482
Prior treatment episodes	.054	.050	1.164	1	.281	1.055	.957, 1.164
Accessed recovery housing	1.404	.596	5.555	1	.018	4.072	1.267, 13.088
Employed	1.190	.505	5.548	1	.019	3.286	1.221, 8.843
Group	-.560	.553	1.023	1	.312	.571	.193, 1.690
Model			17.187	7	.016		
Hosmer and Lemeshow test			2.327	8	.969		

Table 4.7  
*Logistic Regression Analyses Predicting Cocaine Abstinence at One Month*

N=111	B	SE B	Wald's $\chi^2$	df	<i>p</i>	Odds ratio	CI
Control variables							
Age	.024	.031	.616	1	.433	1.025	.964, 1.089
Gender	.791	.579	1.863	1	.172	2.205	.708, 6.862
Cocaine use at treatment entry	1.178	.741	2.528	1	.112	.308	.072, 1.316
IV drug use	-.935	.545	2.936	1	.087	.393	.135, 1.144
Prior treatment episodes	.005	.054	.009	1	.924	1.005	.904, 1.118
Accessed recovery housing	2.156	.654	10.861	1	.001	8.637	2.396, 31.133
Employed	.488	.557	.766	1	.381	1.629	.546, 4.856
Group	.409	.644	.403	1	.525	.664	.188, 2.348
Model			25.278	8	.001		
Hosmer and Lemeshow test			5.137	8	.743		

Table 4.8

*Logistic Regression Analyses Predicting Cocaine Abstinence at Three Months*

N=110	B	SE B	Wald's $\chi^2$	df	p	Odds ratio	CI
Control variables							
Age	.019	.029	.440	1	.507	1.019	.964, 1.078
Gender	-.565	.554	1.038	1	.308	.569	.192, 1.684
Cocaine use at treatment entry	-1.047	.613	2.917	1	.088	.351	.106, 1.167
IV drug use	.319	.460	.481	1	.488	1.375	.559, 3.386
Prior treatment episodes	-.037	.044	.699	1	.403	.964	.885, 1.051
Accessed recovery housing	1.730	.582	8.832	1	.003	5.638	1.802, 17.640
Employed	.525	.460	1.301	1	.254	1.690	.686, 4.161
Group	-.119	.566	.044	1	.834	.888	.293, 2.695
Model			22.203	8	.005		
Hosmer and Lemeshow test			1.794	8	.987		

Table 4.9

*Logistic Regression Analyses Predicting Cocaine Abstinence at Six Months*

N=103	B	SE B	Wald's $\chi^2$	df	<i>p</i>	Odds ratio	CI
Control variables							
Age	.005	.029	.032	1	.858	1.005	.950, 1.063
Gender	-.277	.574	.234	1	.629	.758	.246, 2.333
Cocaine use at treatment entry	-.728	.535	1.850	1	.174	.483	.169, 1.379
IV drug use	-.028	.465	.004	1	.952	.973	.391, 2.417
Prior treatment episodes	.069	.052	1.751	1	.186	1.071	.967, 1.186
Accessed recovery housing	.633	.571	1.229	1	.268	1.883	.615, 5.763
Employed	1.136	.496	5.246	1	.022	3.114	1.178, 8.232
Group	-.040	.542	.005	1	.941	.961	.332, 2.778
Model			10.399	8	.238		
Homer and Lemeshow test			3.885	8	.867		

*Group comparisons on measure of opioid and cocaine abstinence.* On the measure of combined opioid and cocaine abstinence there were no significant differences between the RBT and RBT + RH group participants at one, three, or six month assessment (see Table 4.3).

*Regression analyses for predicting opioid and cocaine abstinence.* The model for predicting combined opioid and cocaine abstinence at one month was non-significant (see Table 4.10). The model for predicting opioid and cocaine abstinence at three months was significant ( $p=.002$ ). Participants who accessed recovery housing were more likely to be abstinent from both opioids and cocaine at three months compared to participants who did not access recovery housing (OR=5.674,  $p=.003$ ). Those who were employed were also more likely to be opioid and cocaine abstinent at three months compared to participants who were unemployed (OR=3.102,  $p=.012$ ). Additionally, those who did not use cocaine at treatment entry were more likely to be opioid and cocaine abstinent compared to those who used cocaine at treatment entry (OR=3.102,  $p=.012$ ; see table 4.11). The model for predicting abstinence at six months also was significant ( $p=.020$ ). Participants who accessed recovery housing were more likely to be abstinent at six months compared to those who did not access recovery housing (OR=3.770,  $p=.022$ ). Those who were employed were also more likely to be opioid and cocaine abstinent at six months compared to those who were unemployed (OR=3.624,  $p=.014$ ; see Table 4.12)

**Research Question 4: How do participants who received RBT compare with participants who received RBT + RH on rates of employment?**

Table 4.10

*Logistic Regression Analyses Predicting Opioid and Cocaine Abstinence at One Month*

N=111	B	SE B	Wald's $\chi^2$	df	p	Odds ratio	CI
Control variables							
Age	.017	.026	.442	1	.506	1.017	.967, 1.071
Gender	.020	.508	.002	1	.969	1.020	.377, 2.761
Cocaine use at treatment entry	.142	.509	.078	1	.780	1.153	.425, 3.127
IV drug use	-.169	.433	.153	1	.696	.844	.361, 1.973
Prior treatment episodes	-.051	.043	1.433	1	.231	.950	.874, 1.033
Accessed recovery housing	1.540	.552	7.788	1	.005	4.666	1.582, 13.765
Employed	.002	.434	.000	1	.997	1.002	.428, 2.344
Group	-.443	.511	.751	1	.386	.642	.236, 1.749
Model			12.108	8	.146		
Hosmer and Lemeshow test			13.006	8	.112		

Table 4.11

*Logistic Regression Analyses Predicting Opioid and Cocaine Abstinence at Three Months*

N= 115	B	SE B	Wald's $\chi^2$	df	<i>p</i>	Odds ratio	CI
Control variables							
Age	-.018	.027	.416	1	.519	1.018	1.794, 1.073
Gender	-1.042	.561	3.448	1	.063	.353	.117, 1.060
Cocaine use at treatment entry	-.360	.529	.462	1	.012	3.102	1.280, 1.970
IV drug use	.100	.444	.051	1	.821	1.106	.463, 2.638
Prior treatment episodes	-.004	.044	.009	1	.923	.996	.913, 1.086
Accessed recovery housing	1.736	.587	8.731	1	.003	5.674	1.794, 17.945
Employed	1.132	.452	6.284	1	.012	3.102	1.280, 7.516
Group	-.286	.551	.269	1	.604	.752	.255, 2.212
Model			23.993	8	.002		
Hosmer and Lemeshow test			10.754	8	.216		

Table 4.12

*Logistic Regression Analyses Predicting Opioid and Cocaine Abstinence at Six Months*

N= 111	B	SE B	Wald's $\chi^2$	df	p	Odds ratio	CI
Control variables							
Age	.032	.030	1.154	1	.283	1.032	.974, 1.094
Gender	-.651	.573	1.290	1	.256	.521	.170, 1.604
Cocaine use at treatment entry							
IV drug use	-.515	.514	1.004	1	.316	.598	.218, 1.636
Prior treatment episodes	.253	.464	.297	1	.586	1.288	.518, 3.200
Accessed recovery housing	.079	.051	2.354	1	.125	1.082	.978, 1.197
Employed	1.327	.581	5.215	1	.022	3.770	1.207, 11.775
Group	1.287	.522	6.081	1	.014	3.624	1.302, 10.082
	-.529	.541	.956	1	.328	.589	.204, 1.701
Model			18.200	8	.020		
Hosmer and Lemeshow test			6.225	8	.622		

Table 4.13 shows the percent of RBT and RBT + RH participants employed at one, three, and six month assessment. Both groups showed impressive increases in employment from baseline. Employment rates were 4% for the total sample at baseline and rose to 68% overall at the six month assessment. The rates of employment did not significantly differ between the groups at the one, three, and six month assessment points.

**Research Question 5: How do participants who received RBT compare with participants who received RBT + RH on the measure of days worked at one, three, and six month assessment?**

*Group comparisons on measure of mean days worked.* There were no significant differences between the RBT and RBT + RH group participants on the measure of days worked at the one, three, or six month assessment (see Table 4.14). Results from a repeated measures ANOVA showed a significant main effect of time on days worked ( $p < .0005$ ; see table 4.15). Both the RBT and RBT + RH group participants showed significant increases in the number of days worked from one month to three month follow-up assessment. However, the time by group interaction was non-significant, indicating that there was not a significant difference between groups in the rate of increase in days worked over time. The mean number of days worked was 4.2 at one month assessment, rose to 10.7 at three months, and remained fairly steady (11.5) at six months (see Table 4.14).

*Regression analyses for predicting mean days worked.* The model for predicting mean days worked at one month was non-significant (see Table 4.16). The model for predicting mean days worked at three months was significant ( $p = .009$ ). Participants who

Table 4.13

*Percent Employed at One, Three, and Six Months for RBT and RBT + RH Participants*

	Total sample ( <i>n</i> ) %	RBT ( <i>n</i> ) %	RBT + RH ( <i>n</i> ) %	$\chi^2$	<i>p</i>
Employed					
One month	(113) 34.5	(44) 29.5	(69) 37.7	.787	.248
Three months	(121) 60.3	(52) 63.5	(69) 58.0	.374	.337
Six months	(110) 68.2	(48) 68.8	(62) 67.7	.013	.539

Table 4.14

*Mean Days Worked and Employment Income at One, Three, and Six Months for RBT and RBT + RH Participants*

	Total sample (n) M (SD)	RBT (n) M (SD)	RBT + RH (n) M (SD)	F	p
Employment days					
One month	(113) 4.2 (7.0)	(44) 3.5 (5.7)	(69) 4.6 (7.6)	.671	.414
Three months	(121) 10.7 (10.5)	(52) 12.5 (11.2)	(69) 9.3 (9.9)	2.703	.103
Six months	(110) 11.5 (10.7)	(48) 10.6 (10.6)	(62) 12.1 (10.8)	.545	.462
Employment earnings in dollars					
One month	(65) 395.4 (614.3)	(20) 386.9 (696.7)	(45) 399.2 (582.4)	.005	.941
Three months	(76) 1250.9 (1177.0)	(34) 1474.0 (1308.0)	(42) 1070.3 (1040.0)	2.247	.138
Six months	(72) 1236.7 (901.3)	(31) 1270.3 (1018.4)	(41) 1211.3 (814.0)	.075	.785

Note. F and p-values are based on natural logarithm (ln) transformed variables for days worked and amount earned. Mean, non-transformed means, are retained for descriptive purposes.

Table 4.15  
 Repeated Measures for Days Worked over Time for RBT and RBT + RH Participants

Source of Variation	DF	Sums of Squares	Mean Squares	F	p
<b>Within Subjects</b>					
Time	2	58.959	29.48	24.059	<.0005
Group by time	1	0.11	0.011	0.008	0.928
Error	99	132.963	1,343		
<b>Between subjects</b>					
Group	1	1.106	1.106	0.374	0.542
Error	99	292.933	2.959		

Note. F and p-values are based on natural logarithm (ln) transformed variables for days worked and amount earned.

Table 4.16

*Multiple Regression Analyses Predicting Mean Days Worked at One Month*

N=111	B	SE B	Beta	<i>t</i>	<i>p</i>
Age	-.002	.015	-.013	-.128	.898
Gender	.487	.286	.173	1.701	.092
IV drug use	.068	.241	.029	.283	.778
Abstinence	.056	.240	.024	.234	.816
Prior treatment episodes	.014	.024	.059	.597	.552
Accessed recovery housing	.011	.305	.004	.035	.972
Group	.044	.276	.018	.160	.873
				Model	.744
R <sup>2</sup>	.040				
Adjusted R <sup>2</sup>	-.025				
SE	1.19616				
F	.614				

accessed recovery housing reported significantly more days worked than those who did not access recovery housing ( $p=.020$ ). Participants in the RBT group reported significantly more days worked than those in the RBT + RH group ( $p=.012$ ; see Table 4.17). The model for predicting mean days worked at six months also was significant ( $p=.007$ ). Participants who accessed recovery housing reported significantly more days worked than those who did not access recovery housing ( $p=.001$ ). Additionally, participants who were opioid and cocaine abstinent reported significantly more days worked than those who were non-abstinent ( $p=.001$ ; see Table 4.18).

**Research Question 6: How does RBT compare with RBT + RH on the measure of mean employment earnings (\$ amount) at one, three, and six month assessment?**

*Group comparisons on measure of amount of employment earnings.* There were no significant differences between the groups on the measure of amount of employment earnings at the one, three, or six month assessment (see Table 4.14). Results from a repeated measures ANOVA showed a significant main effect of time on employment earnings ( $p<.0005$ ; see table 4.19). Both the RBT and RBT + RH group participants showed significant increases in the number of days worked from one month to three month follow-up assessment. However, the time by group interaction was non-significant, indicating that there was not a significant difference between groups in the rate of increase in amount of employment earnings over time. Mean income for the total sample was \$395 at one month, rose to a mean of \$1250 at the three month assessment ( $p=.005$ ), and remained stable at the six month assessment (\$1237; see Table 4.14).

Table 4.17

*Multiple Regression Analyses Predicting Mean Days Worked at Three Months*

N=115	B	SE B	Beta	<i>t</i>	<i>p</i>
Age	-.017	.016	-.094	-1.031	.305
Gender	.384	.320	.113	1.202	.232
IV drug use	.158	.264	.056	.597	.551
Abstinence	.528	.269	.188	1.960	.053
Prior treatment episodes	-.033	.027	-.110	-1.228	.222
Accessed recovery housing	.809	.344	.273	2.355	.020
Group	-.785	.308	-.278	-2.552	.012
				Model	.009
R <sup>2</sup>	.157				
Adjusted R <sup>2</sup>	.102				
SE	1.33431				
F	2.856				
	2.856				

Table 4.18

*Multiple Regression Analyses Predicting Mean Days Worked at Six Months*

N=115	B	SE B	Beta	<i>t</i>	<i>p</i>
Age	.009	.018	.047	.486	.628
Gender	.208	.345	.059	.603	.548
IV drug use	-.186	.279	-.065	-.666	.507
Abstinence	.985	.274	.347	3.596	.001
Prior treatment episodes	-.033	.027	-.110	-1.228	.222
Accessed recovery housing	.284	.347	.094	.818	.001
Group	-.003	.320	-.001	-.009	.993
				Model	.007
R <sup>2</sup>	.418				
Adjusted R <sup>2</sup>	.116				
SE	1.33801				
F	2.965				

Table 4.19

*Repeated Measures for Days Worked over Time for RBT and RBT + RH Participants*

Source of Variation	DF	Sums of Squares	Mean Squares	F	p
<b>Within Subjects</b>					
Time	2	58.959	29.48	24.059	<.0005
Group by time	1	0.11	0.011	0.008	0.928
Error	99	132.963	1,343		
<b>Between subjects</b>					
Group	1	1.106	1.106	0.374	0.542
Error	99	292.933	2.959		

Note. F and p-values are based on natural logarithm (ln) transformed variables for days worked and amount earned.

*Regression analyses for predicting mean employment earnings.* The model for predicting mean employment earnings at one month was non-significant (see Table 4.20). The model for predicting mean employment earnings at three months was significant ( $p=.001$ ). Those who were opioid and cocaine abstinent at three months had higher mean earnings compared to those who were non-abstinent ( $p=.041$ ). Participants who accessed recovery housing were also more likely to report higher employment earnings than those who did not access recovery housing ( $p=.009$ ). Lastly, participants in the RBT group reported significantly higher employment earnings compared to those in the RBT + RH group (see Table 4.21). The model for predicting mean employment earnings at six months also was significant ( $p=.012$ ). Participants who were opioid and cocaine abstinent at six months reported higher employment earnings than those who were non-abstinent ( $p=.001$ ; see Table 4.22).

### **Program Sponsored versus Self-Pay Housing**

Not surprisingly, there was a significant difference in the number of participants from the RBT and RBT + RH groups who accessed recovery housing ( $\chi^2=40.748$ ;  $p<.0005$ ). The RBT participants did not receive paid recovery housing as a component of treatment; thus, it was not expected that they would access housing at the same rate as the RBT + RH group. All participants consenting to the study agreed to move into recovery housing prior to random assignment if assigned to the RBT+RH condition. However, a minority of participants ( $n=11$ ) randomized to recovery housing did not access it per study protocol. A total of 69 of the 80 participants assigned to the RBT + RH condition (86%) accessed recovery housing. One third of the RBT participants ( $n=18$ ; 33%)

Table 4.20

*Multiple Regression Analyses Predicting Mean Employment Earnings at One Month*

N=111	B	SE B	Beta	<i>t</i>	<i>p</i>
Age	-.006	.016	-.036	-.366	.715
Gender	.416	.309	.137	1.347	.181
IV drug use	.090	.260	.035	.346	.730
Abstinence	.142	.259	.056	.548	.585
Prior treatment episodes	-.003	.026	-.012	-.126	.900
Accessed recovery housing	.169	.329	.062	.515	.608
Group	-.014	.298	-.006	-.048	.961
				Model	.793
R <sup>2</sup>	.036				
Adjusted R <sup>2</sup>	-.029				
SE	1.29145				
F	.552				

Table 4.21

*Multiple Regression Analyses Predicting Mean Employment Earnings at Three Months*

N=115	B	SE B	Beta	<i>t</i>	<i>p</i>
Age	-.040	.037	-.094	-1.060	.291
Gender	1.528	.742	.189	2.061	.042
IV drug use	.384	.613	.057	.626	.532
Abstinence	1.289	.625	.193	2.063	.041
Prior treatment episodes	-.062	.062	-.088	-1.002	.318
Accessed recovery housing	2.124	.797	.302	2.666	.009
Group	-1.990	.713	-.296	-2.790	.006
				Model	.001
R <sup>2</sup>	.198				
Adjusted R <sup>2</sup>	.146				
SE	3.09405				
F	3.780				

Table 4.22

*Multiple Regression Analyses Predicting Mean Employment Earnings at Six Months*

N=106	B	SE B	Beta	<i>t</i>	<i>p</i>
Age	.024	.042	.055	.566	.572
Gender	.795	.807	.096	.984	.327
IV drug use	-.593	.653	-.090	-.909	.366
Abstinence	2.150	.641	.326	3.354	.001
Prior treatment episodes	-.120	.063	-.178	-1.900	.060
Accessed recovery housing	.616	.813	.088	.757	.451
Group	-.188	.749	-.028	-.251	.802
				Model	.012
R <sup>2</sup>	.164				
Adjusted R <sup>2</sup>	.104				
SE	3.13118				
F	2.746				

accessed non-program sponsored (i.e., self-pay) recovery housing during the treatment episode. As described in the Method chapter, intensive case management was used to identify drug-free housing and resources for payment. The high rate of recovery house procurement in this group raised the question of how those who accessed self-pay housing may have differed from those without housing on the various treatment outcomes. Therefore, additional analyses were conducted to further examine the bivariate abstinence and employment outcomes for participants who accessed recovery housing (self-pay or program paid) versus participants who only attended day treatment. Thus, three groups of participants were compared for the sub-analyses: those who received RBT day treatment without paid recovery housing (RBT only,  $n=37$ ), those who received RBT and accessed self-pay recovery housing (RBT + SPRH,  $n=18$ ), and those who received RBT + RH ( $n=80$ ). The full intention to treat RBT + RH group ( $n=80$ ) was retained in the sub-analyses based on intention to treat (without removing the 11 participants who did not access recovery housing per study protocol); however, sub-analyses also were conducted with these non-housed participants removed. Overall, results show a similar pattern of outcomes for the three groups (see Appendix I).

### **RBT only, RBT + SPRH, and RBT + RH Group Participants**

**Baseline characteristics.** There were no significant demographic or pre-treatment differences among the three groups. The RBT + SPRH group has fewer males (62%)

compared to the RBT only (89%), and RBT + RH (79%) groups; however this difference did not reach significance at the  $p < .05$  level ( $p = .056$ ). See Tables 4.23 and 4.24 for continuous and categorical variables, respectively.

**Group comparisons on measure of opioid and cocaine abstinence.** Table 4.25 depicts the percent of opioid abstinent participants, percent of cocaine abstinent participants, and the percent of opioid and cocaine abstinent participants for the RBT only, RBT+SPRH, and RBT + RH participants. The RBT + SPRH and the RBT + RH groups had significantly higher rates of opioid abstinence at one month compared to the RBT only group (71% and 70% versus 43%,  $p = .037$ ). The three groups did not differ on rates of opioid abstinence at the three month assessment. However, the RBT + SPRH had significantly higher rates of opioid abstinence at six month assessment compared to the RBT only group (77% versus 35%,  $p = .023$ ). The RBT only and RBT + RH did not differ on rates of opioid abstinence at six months ( $p = .069$ , not presented in table). On the measure of cocaine abstinence, the RBT + SPRH and the RBT + RH groups had significantly higher rates of abstinence compared to the RBT only group at both the one(88% and 80% versus 52%,  $p = .007$ ) and three month (71% and 73% versus 43%,  $p = .009$ ) assessments. The three groups did not differ on the measure of cocaine abstinence at the six month follow-up assessment.

The RBT + SPRH and RBT + RH had higher one month rates of combined opioid and cocaine abstinence compared to the RBT only group (versus 67% and 56% versus 34% ,  $p = .052$ ); however, this difference did not reach significance at  $p < .05$ . Combined opioid and cocaine abstinent rates were also higher at three months for the RBT + SPRH and RBT + RH groups compared to the RBT only group (71% and 47%

Table 4.23

*Demographic and Pre-Treatment Characteristics for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n=37)	RBT + SPRH RH (n=18)	RBT + RH (n=80)	<i>F</i>	<i>p</i>
Age, M (SD)	40.1 (8.0)	42.7 (7.8)	38.9 (8.7)	1.479	.232
Education years, M (SD)	11.4 (1.3)	12.1 (1.9)	11.5 (1.9)	.937	.394
Days opioid use in 30 days prior to admission, M (SD)	26.4 (7.8)	29.7 (1.2)	28.1 (5.4)	2.176	.118
Lifetime months opioid use, M (SD)	137.4 (100.6)	136.7 (78.1)	129.0 (91.1)	.143	.867
Days cocaine use in 30 days prior to admission, M (SD)	14.2 (12.6)	12.3 (13.1)	13.6 (13.0)	.130	.878
Lifetime months cocaine use, M (SD)	72.6 (77.2)	75.1 (103.1)	72.2 (88.2)	.008	.992
Lifetime drug treatment episodes, M (SD)	3.5 (3.2)	4.1 (6.0)	3.6 (4.7)	.115	.891

Table 4.24

*Demographic and Pre-Treatment Characteristics for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n=18)	RBT + SPRH (n=37)	RBT + RH (n=80)	$\chi^2$	<i>p</i>
Race					
African American (%)	77.8	83.8	75.0	1.129	.569
Gender					
Male (%)	88.9	62.2	79.0	5.768	.056
Marital status					
Never married (%)	61.1	35.1	55.0	4.952	.084
Unemployed (%)	72.2	97.3	96.3	2.239	.326
Intravenous drug use (%)	61.1	37.8	58.8	4.950	.084

Table 4.25

*Percent Abstinent at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n) %	RBT + SPRH (n) %	RBT + RH (n) %	$\chi^2$	<i>p</i>
<b>Opioid abstinence</b>					
One month	(28) 42.9	(17) 70.6	(69) 69.6	6.580	.037
Three months	(32) 46.9	(18) 66.7	(69) 62.3	2.691	.260
Six months	(29) 34.5	(17) 76.5	(64) 50.0	7.558	.023
<b>Cocaine abstinence</b>					
One month	(27) 51.9	(17) 88.2	(69) 79.7	9.921	.007
Three months	(32) 42.9	(17) 70.6	(69) 72.5	9.386	.009
Six months	(29) 44.8	(18) 66.7	(61) 63.9	5.105	.078
<b>Opioid and cocaine abstinence</b>					
One month	(32) 34.4	(18) 66.7	(70) 55.7	5.913	.052
Three months	(32) 37.5	(18) 66.7	(69) 59.4	5.479	.065
Six months	(29) 31.0	(17) 70.6	(64) 46.9	6.759	.034

versus 31% ,  $p=.065$ ), but the differences again failed to reach significance at  $p < .05$ .

The RBT + SPRH group participants had significantly higher rates of combined opioid and cocaine abstinence when compared to the RBT only group at six months assessment (31% versus 71%  $p=.034$ ).

**Group comparisons on rates of employment.** Table 4.26 shows the percent of participants employed at the one, three, and six month assessments for the RBT only, RBT + SPRH, and RBT + RH participants. Employment rates were similar for the three groups at the one month and six month assessment. However, participants in the RBT+ SPRH were more likely to be employed at three months compared to both the RBT + RH and the RBT only group participants (89% versus 58% and 50%,  $p=.020$ ).

**Group comparisons on measure of mean days worked.** Table 4.27 shows the mean days worked and income earned for the RBT only, RBT + SPRH, and RBT + RH participants. All three RBT groups were similar on days of employment at one month follow-up assessment. However, the RBT + SPRH participants had significantly more days of employment at three months compared to the RBT only and the RBT + RH groups (19.0 days versus 9.0 days and 9.0 days,  $p=.001$ ). Additionally, the RBT + SPRH participants reported significantly more days of employment compared to the RBT only group participants at the six month follow-up assessment (16.0 days versus 8.0 days,  $p=.016$ ).

**Group comparisons on measure of amount of employment earnings.** The three groups were also similar on amount of earnings at the one month follow up assessment. However, the RBT + SPRH had significantly higher employment earnings at three months (\$1827.00 versus \$506.00,  $p=.001$ ) and six months (\$1313.00 versus

Table 4.26

*Percent Employed at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n) %	RBT + SPRH (n) %	RBT + RH (n) %	$\chi^2$	<i>p</i>
Employed					
One month	(27) 18.5	(17) 47.1	(69) 37.7	4.546	.103
Three months	(34) 50.0	(18) 88.9	(69) 58.0	7.811	.020
Six months	(31) 58.1	(17) 88.2	(62) 67.7	4.619	.099

Table 4.27

*Mean Days Worked and Employment Income at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n), M (SD)	RBT + SPRH (n), M (SD)	RBT + RH (n), M (SD)	<i>F</i>	<i>p</i>
Employment days					
One month	(27) 2.1 (4.5)	(17) 5.8 (6.8)	(69) 4.6 (7.6)	1.029	.361
Three months	(34) 8.9 (11.2)	(18) 19.3 (7.4)	(69) 9.3 (9.9)	7.467	.001
Six months	(31) 7.5 (9.8)	(17) 16.4 (9.8)	(62) 12.1 (10.8)	4.175	.018
Employment earnings in dollars					
One month	(27) 68.9 (129.4)	(17) 345.8 (775.5)	(69) 260.3 (506.1)	1.860	.161
Three months	(34) 506.6 (761.7)	(18) 1827.2 (1579.2)	(69) 651.5 (963.7)	7.782	.001
Six months	(31) 550.3 (827.9)	(17) 1312.9 (1169.4)	(62) 801.0 (876.6)	4.482	.014

Note. *F* and *p*-values are based on ln transformed variables for days worked and amount earned. Means are retained for descriptive purposes.

\$550.00,  $p=.014$ ) compared to the RBT only group. There were no significant differences between the RBT + SPRH group and the RBT + RH group on amount of earnings at one, three, or six month follow-up assessment (see table 4.27).

### **Summary of Findings**

**Abstinence.** The RBT and RBT + RH group participants had similar rates of opioid, cocaine, and combined opioid and cocaine abstinence at one, three, and six months. Regression analyses showed, however, that participants who accessed recovery housing were more likely to be abstinent from opioids at all three assessment points compared to participants who did not access recovery housing. Participants who were employed were also more likely to be opioid abstinent at three and six month assessment when compared to those who were unemployed. Employment was not predictive of opioid abstinence at one month assessment. Participants who accessed recovery housing were also more likely to be cocaine abstinent at one and three month assessment. Recovery housing was not predictive of cocaine abstinence at three month assessment. Employment was not a predictive variable of cocaine abstinence at one, three, and six month assessment. Finally, participants who accessed recovery housing were more likely to be opioid and cocaine abstinent at three and six month assessment. The model for predicting combined opioid and cocaine abstinence at one month was non-significant.

**Employment.** There were no significant differences on the measures of rate of employment, days worked, or amount of employment earnings between the RBT and RBT + RH participants and one, three, and six month assessment. The regression model for predicting mean days worked at one month was non-significant. However, participants who accessed recovery housing, and participants in the RBT group reported

significantly more days worked at three month assessment. Additionally, participants who accessed recovery housing and participants who were opioid and cocaine abstinent reported significantly more days worked at six month assessment. On the measure of employment earnings, the model at one month was non-significant. However, the model for predicting mean employment earnings at three months showed that participants who accessed recovery housing, participants who were opioid and cocaine abstinent, and participants in the RBT group reported higher mean earnings. The model for predicting abstinence at six months showed that participants who were cocaine and opioid abstinent reported significantly higher employment earnings when compared to those who were non-abstinent.

#### **RBT only, RBT + SPRH and RBT + RH Participants**

**Abstinence.** The RBT + SPRH group participants had significantly higher one and six month opioid abstinence rates compared to the RBT only group. The two groups did not differ on three month opioid abstinence rates. The RBT + SPRH and the RBT + RH groups had significantly higher three month cocaine abstinence rates compared to RBT only participants. There were no differences among the three groups on rates of cocaine abstinence at six months. On the measure of opioid and cocaine abstinence, both the RBT + SPRH and RBT + RH groups had higher one month abstinence rates compared to the RBT only group, though this difference failed to reach significance ( $p=.052$ ). The RBT + SPRH and RBT + RH participants had significantly higher rates of combined opioid and cocaine abstinence at three months compared to the RBT only group participants. The RBT + SPRH group participants also has higher combined opioid and cocaine abstinent rates compared to the RBT only group participants

**Employment.** There were no differences among group participants on the measure of rate of employment at one month. However, the RBT + SPRH group participants had higher rates of employment at three months, and higher employment earnings at three and six months when compared to the RBT only group participants. Additionally, the RBT + SPRH group participants had higher rates of employment at three months when compared to the RBT + RH group participants. The RBT + SPRH and the RBT + RH group participants did not differ on days of employment or amount of earnings at one, three, and six month assessment. Additionally, the RBT + SPRH and RBT only group participants did not differ on the measure of days worked at one month assessment. However, the RBT + SPRH had significantly more days of employment at three and six month assessment when compared to RBT only group participants.

## **Chapter V. Discussion**

This chapter is divided into six sections. The first section describes how the current study adds to the literature on RBT. The second section provides a discussion of RBT and RBT + RH group abstinence and employment outcomes. The third section of the chapter provides a discussion of the sub-analyses for the RBT only, RBT + SPRH, and RBT + RH outcomes. The fourth section provides a discussion of the implications of the study in terms of future research. The fifth section of the chapter describes the limitations and strengths of the study. Lastly, the implications of the study findings are discussed.

### **Literature on RBT**

The current study adds to the literature supporting the efficacy of RBT + RH for increasing abstinence among opioid dependent individuals who have completed detoxification. Opioid and cocaine abstinence rates reported in the current study are consistent with those reported previously. For example, one month abstinence rates for RBT + RH participants were 50% in the Gruber et al. (2000) study, 42% in the Jones et al. (2005) study, and 56% in the current study. Findings from regression analyses in the this secondary data analysis study highlight the important role of recovery housing for maintaining abstinence for RBT participants. These analyses are consistent with a recent randomized study comparing RBT + RH (the same group used in the current study) and recovery housing alone which showed that recovery house retention of greater than 60 days was predictive of more favorable abstinence outcomes (Tuten et al., 2011). The current study is the first to examine the outcomes of RBT outpatient therapy with housing case management (RBT) versus RBT + RH. The addition of the RBT group in these

analyses provides important information about the relative efficacy of two variants of RBT.

### **RBT versus RBT + RH Participants**

**Abstinence.** Comparisons for the intent to treat RBT and RBT + RH group participants show that the two groups did not significantly differ on the primary outcome measure of opioid, cocaine, and combined opioid and cocaine abstinence at the one, three, and six month follow-up assessment. The lack of abstinence differences between these two groups is surprising because the RBT + RH group participants received a seemingly potent reinforcer of paid recovery housing for a period of three months. However, the lack of significant differences between the RBT and RBT + RH group participants is likely attributable to diminished intervention differences stemming from the numbers of RBT participants who accessed self-pay recovery housing ( $n=18$ , 33%).

Regression analyses provide a more complete picture of the factors influencing the primary abstinence outcomes of the study. Living in recovery housing was predictive of opioid and cocaine and combined opioid and cocaine abstinence across multiple follow-up assessments. This finding suggests that recovery housing is an active component RBT-- whether acquired through self-pay or program sponsored. A recent study suggests that lengths of stay exceeding 60 days are associated with improved treatment outcomes (Tuten et al., 2011). However, it may be that shorter term stays (a "time out" from substance use) are sufficient for increasing abstinence for some individuals while others need longer term housing. It is important to note that recovery housing is a special type of structured housing designed for individuals in recovery with substantial structure (e.g., limits on visitors, house rules). For example, many recovery

houses expect that residents attend outpatient treatment and attend narcotics anonymous or alcoholics anonymous meetings. It is unknown whether housing environments without recovery-oriented rules and structure are as effective for promoting abstinence.

**Employment.** The RBT + RH and RBT group participants had similar employment rates, mean days worked, and employment earnings at each of the follow-up assessments. The rates of employment were high for the two groups (68% at six months). The modest employment rates at one month are likely due to the time invested in job searches (e.g., identifying positions, applying, interviewing, delays in hiring). The two groups showed significant increases in days of employment and employment earnings from one month to three month assessment, after which these measures remained fairly stable. The significant employment improvements are consistent with the intensive vocational component of the model, which provided various methods for improving employability for participants (e.g., skill building, resume assistance, practice at mock applications) and direct employment assistance (e.g., taking participants to job interviews, dropping off applications, counseling directed at maintaining employment). The RBT and RBT + RH group participants participated in similar vocational training and assistance interventions, thus the lack of differences between the groups on this outcome measure is consistent with the intervention similarities.

Variables entered into the regression were non-significant for predicting mean days worked or mean employment earnings, which is consistent with overall low percentage of employment at this time point for all participants. However, the three and six month regression analyses reveal a number of the variables associated with increased days worked and employment earnings, including living in recovery housing,

membership in the RBT group, and opioid and cocaine abstinence. The structured living environment of recovery housing may have provided residents with social networking and informal referral sources for employment that supplemented the vocational assistance provided in the program. The effect of group membership in RBT is likely impacted by the numbers of participants in this group who were living in self-pay recovery housing. These individuals may have been motivated to work more to pay for housing. Findings also indicate that abstinence was a predictive variable for higher mean days worked and employment earnings. This finding may be related to the abstinent contingency for recovery housing (i.e., abstinence was monitored and required of residents). However, it also highlights improved employment functioning as a rather immediate benefit of abstinence; this improve employment functioning may in turn improve the ability for individuals to finance their own housing.

#### **RBT only, RBT + SPRH and RBT + RH Participants**

**Abstinence.** RBT + SPRH participants had a pattern of overall superior opioid, cocaine, and combined opioid and cocaine abstinence outcomes when compared to those who received RBT only. The impressive outcomes for the RBT + SPRH group participants support the efficacy of the self-pay recovery housing when compared to RBT only. Additionally, rates of abstinence for this group of participants were similar to those of the RBT + RH group participants at each of the follow-up assessments. The similarity in abstinence outcomes for RBT + SPRH and RBT + RH group participants underscores the similarities in the type of intervention (i.e., housing) received by the participants, albeit one group accessed self-pay versus program-sponsored housing. RBT + SPRH may

represent a select group of participants (33% of RBT sample) who were sufficiently motivated and resourceful to access recovery housing.

**Employment.** The employment findings for the RBT + SPRH group participants are particularly notable. The RBT + SPRH group participants had higher rates of employment at three months when compared to the RBT only group participants compared to the RBT + RH group participants. The RBT + SPRH group participants also had significantly more days of employment at three and six month assessment when compared to both the RBT only and RBT + RH group participants. The improvements in the employment functioning among RBT + SPRH participants may be attributable to factors not related to study intervention given the lack of random assignment for the current study. However, it may also be that the RBT +SPRH group participants were required to procure employment and to work more frequently to pay for housing, which would not otherwise be provided to them. This suggests that for some individuals case management for housing and vocational assistance are effective for getting individuals to access and pay for their own housing.

### **Future Research**

The RBT model is comprehensive in scope and intensity. One important area for future research is identifying which of the 10 identified elements of RBT actually contribute to improved abstinence and employment outcomes. The current study highlights the need for further research to evaluate the impact of RBT variants on substance abuse treatment outcomes. Further research is needed to determine which individuals may benefit from intensive case management versus paid recovery housing. This line of research is important for determining how clinical and financial services

should be allocated and targeted. To this end, cost effectiveness studies are needed to evaluate the costs and benefits of delivering RBT versus RBT + RH in terms of financial burden versus clinical benefits. The current study suggests that intensive case management was helpful at facilitating recovery house entry for a significant minority of individuals; however, the majority of individuals did not access self-pay recovery housing. An important area of inquiry is the identification of the barriers to accessing recovery housing and for whom these barriers are most prohibitive. This information is necessary for informing future interventions so that a greater proportion of individuals can access and benefit from the housing element of treatment. It is also important to note that recovery house variables not measured in this study, including structure, rules, and informal ways of helping, may have impacted participant outcomes. Another key area for research is determining the optimal length of stay in recovery housing for producing improved treatment outcomes. Randomized studies also are needed to compare RBT + SPRH and RBT + RH interventions to better evaluate the contribution of self-pay versus program-sponsored housing on abstinence and employment outcomes. Additionally, the impact of RBT on other psychosocial factors such as HIV risk behaviors related to drug use has yet to be evaluated. Lastly, the longer term impact of RBT interventions requires further evaluation of the diminishing effects on key outcomes over time, including guidance on how best to provide continuing care in the treatment of substance use disorders, which by nature are chronic and associated with repeated episodes of relapse.

### **Limitations and Strengths**

This dissertation has a number of limitations of note. The study is based on secondary data sources and thus the researcher was unable to control the research

methods employed or review raw sources of data. The study draws participants from two separate studies, one arm of a randomized trial and the participants of a non-randomized study. This lack of random assignment limits the conclusions that can be drawn about the effectiveness of RBT versus RBT + RH and the sub-analyses. Both studies utilized the same RBT outpatient elements; however, it cannot be said that they received the same treatment as they were exposed to the treatment interventions at different points in time and thus were subject to unknown extraneous influences that cannot be controlled without random assignment. Additionally, the sub-analyses in the study may not be sufficiently powered to detect small, but potentially clinically relevant, outcome differences between the groups. Another limitation is the short assessment timeframe, which was limited to the six months during which treatment interventions were provided (three months to include incentives). Additionally, alcohol use was not routinely monitored as part of the contingency management program; therefore clinically relevant information on the rates of alcohol use and any potential impact of the study interventions on alcohol consumption is not available.

The study also has considerable strengths. First, the study fills an important gap in the limited literature on RBT. Previous studies have shown the RBT + RH (Gruber et al., 2000; Jones et al., 2005; Tuten et al., 2012 ) and RH alone (Tuten et al., 2012) are effective treatments for opioid misuse. The current study is the first to compare RBT to RBT + RH and to examine the differences between those who accessed self-pay versus program-sponsored recovery housing. Another strength of the study is the conservative evaluation of abstinence that required a point prevalence measure at each assessment and self-reported abstinence during the previous 30 days. This measure combined a

quantitative measure of abstinence (urinalysis) with a self-report measure (i.e., ASI) to gain a more accurate measure of drug use during intervening assessment periods. The measurement of abstinence based on both quantitative and self-report data may have provided a more accurate assessment of drug use compared to a point-prevalence estimate (i.e., urinalysis results) at follow-up assessment. Finally, the study utilized regression analyses which provide a more in depth analysis of the multiple factors impacting the abstinence and employment outcomes for RBT participants.

### **Implications**

The impressive abstinence and employment outcomes for the RBT + SPRH group participants have important clinical implications. From a cost perspective, the provision of behavioral treatment with intensive case management is more feasible for community adaptation because housing was not program-sponsored. However, the intensive nature of the behavioral treatment employed and the level of intensive case management required to produce the rates of individuals accessing recovery housing was substantial. Consequently, the intervention may remain prohibitive because of the need for smaller caseload ratios and time allocation necessary for the intensive case management for housing procurement. These limitations should be considered in the context of improved outcomes, however, which may outweigh any added clinical burden. It is not known whether the housing case management services offered are effective in the context of RBT, or whether this element may produce favorable outcomes as embedded in standard outpatient approaches.

It is noteworthy that the vast majority (77%) of RBT participants did not access housing, despite the case management services targeted to this end. These RBT only

participants had had poorer treatment outcomes when compared to the RBT + SPRH and RBT + RH participants. These findings suggest that the most impressive benefits of treatment (those associated with intensive case management for housing) is were effective for a significant minority of individuals but that most participants did not have the financial means to access recovery housing, faced barriers other than financial hardship (i.e., childcare), or did not desire recovery housing. The fact that the majority of individuals did not access recovery housing suggests that the majority of individuals can expect to have outcomes consistent with those for the RBT only group. These outcomes, though inferior to the outcomes for the RBT + RH group, are superior to the abstinence and employment outcomes reported opioid dependent individuals who completed detoxification only (e.g., Gruber et al., 2000; Jones et al., 2005). Therefore, RBT, which provides continuing care following detoxification in the form of outpatient treatment, is preferable to detoxification alone, and RBT + RH confers additional benefits in terms of improved abstinence and employment outcomes.

## **Conclusion**

Findings from the main comparisons for the RBT and RBT + RH group participants show no differences in the key outcome variables of abstinence and employment. The lack of differences between these groups appears related to the numbers of RBT participants who accessed recovery housing, a group for which outcomes were particularly impressive. Regression analyses and sub-analyses for the RBT only, RBT + SPRH and RBT + RH group participants suggest that recovery housing plays an important role in the improved abstinence and employment outcomes. Research is needed to further explore the role of self-pay and program sponsored abstinence-contingent housing, including further assessment of the barriers and factors impacting who is able to access this structured form of housing. However, RBT remains an important option for individuals who have completed detoxification as usual care outcomes for these individuals are particularly poor in the absence of continuing treatment.

## Appendix I.

Table 1

*Demographic and Pre-Treatment Characteristics for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n=37)	RBT + SPRH RH (n=18)	RBT + RH (n=69)	<i>F</i>	<i>p</i>
Age, M (SD)	40.1 (8.0)	42.7 (7.8)	39.7(8.7)	.926	.399
Education years, M (SD)	11.4 (1.3)	12.1 (1.9)	11.4 (1.8)	1.090	.340
Days opioid use in 30 days prior to admission, M (SD)	26.4 (7.8)	29.7 (1.2)	27.8 (5.7)	1.879	.157
Lifetime months opioid use, M (SD)	137.4 (100.6)	136.7 (78.1)	129.5 (91.1)	.107	.899
Days cocaine use in 30 days prior to admission, M (SD)	14.2 (12.6)	12.3 (13.1)	13.1 (12.7)	.152	.859
Lifetime months cocaine use, M (SD)	72.6 (77.2)	75.1 (103.1)	73.3 (88.4)	.005	.995
Lifetime drug treatment episodes, M (SD)	3.5 (3.2)	4.1 (6.0)	3.5(4.8)	.130	.878

Table 2

*Demographic and Pre-Treatment Characteristics for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n=18)	RBT + SPRH (n=37)	RBT + RH (n=69)	$\chi^2$	<i>p</i>
Race					
African American (%)	77.8	83.8	76.8	.727	.695
Gender					
Male (%)	88.9	62.2	79.7	6.009	.050
Marital status					
Never married (%)	61.1	35.1	52.2	4.165	.125
Unemployed (%)	72.2	97.3	95.7	1.941	.379
Intravenous drug use (%)	61.1	37.8	58.0	4.552	.103

Table 3

*Percent Abstinent at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n) %	RBT + SPRH (n) %	RBT + RH (n) %	$\chi^2$	<i>p</i>
Opioid abstinence					
One month	(28) 42.9	(17) 70.6	(61) 77.0	10.264	.006
Three months	(32) 46.9	(18) 66.7	(62) 69.4	4.710	.095
Six months	(29) 34.5	(17) 76.5	(58) 51.7	7.591	.022
Cocaine abstinence					
One month	(27) 51.9	(17) 88.2	(61) 85.2	13.252	.001
Three months	(32) 42.9	(17) 70.6	(62) 77.4	11.938	.003
Six months	(29) 44.8	(18) 66.7	(55) 63.6	5.105	.081
Opioid and cocaine abstinence					
One month	(32) 34.4	(18) 66.7	(62) 61.3	7.453	.024
Three months	(32) 37.5	(18) 66.7	(62) 66.1	7.759	.021
Six months	(29) 31.0	(17) 70.6	(58) 48.3	6.800	.033

Table 4

*Percent Employed at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n) %	RBT + SPRH (n) %	RBT + RH (n) %	$\chi^2$	<i>p</i>
Employed					
One month	(27) 18.5	(17) 47.1	(60) 38.3	4.620	.099
Three months	(34) 50.0	(18) 88.9	(60) 61.7	7.633	.022
Six months	(31) 58.1	(17) 88.2	(54) 68.5	4.643	.098

Table 5

*Mean Days Worked and Employment Income at One, Three, and Six Months for RBT Only, RBT + SPRH, and RBT + RH Participants*

	RBT only (n), M (SD)	RBT + SPRH (n), M (SD)	RBT + RH (n), M (SD)	<i>F</i>	<i>p</i>
Employment days					
One month	(27) 2.1 (4.5)	(17) 5.8 (6.8)	(60) 3.8 (6.3)	1.932	.150
Three months	(34) 8.9 (11.2)	(18) 19.3 (7.4)	(60) 9.5 (9.5)	7.719	.001
Six months	(31) 7.5 (9.8)	(17) 16.4 (9.8)	(54) 12.1 (10.6)	4.589	.012
Employment earnings in dollars					
One month	(27) 68.9 (129.4)	(17) 345.8 (775.5)	(60) 259.4 (512.7)	1.057	.351
Three months	(34) 506.6 (761.7)	(18) 1827.2 (1579.2)	(60) 709.2 (998.6)	7.249	.001
Six months	(31) 550.3 (827.9)	(17) 1312.9 (1169.4)	(54) 791.9 (874.0)	4.243	.017

## References

- ABC News (2011, March 14). Part I: Baltimore is the U.S. heroin capital. Retrieved from <http://abcnews.go.com/US/story?id=92699&page=1>.
- Adamson, S.J., Sellman, J.D., & Frampton, C.M.A. (2009). Patient predictors of alcohol treatment outcome: A systematic review. *Journal of Substance Abuse Treatment*, 36, 75–86. Retrieved from: <http://www.scopus.com/record/display.url?eid=2-s2.0-56349168844&origin=inward&txGid=ht9alQIOgdUFgblEDzyhIT4%3a1>
- Alcohol and Drug Abuse Administration (ADAA), Maryland (2011). *Outlook and outcomes*. Retrieved from [http://maryland-adaa.org/content\\_documents/OandO/FY11O&O\\_2.pdf](http://maryland-adaa.org/content_documents/OandO/FY11O&O_2.pdf).
- Amodeo, M., Fassler, I., & Griffin, M. (2002). MSWs with and without substance abuse training: Agency, community, and personal outcomes. *Substance Abuse*, 23, 3-16. doi:10.1080/08897070209511471
- Ball, J.C., & Ross, A. (1991). *The effectiveness of methadone maintenance treatment: Patients, programs, services, and outcomes*. New York, NY: Springer-Verlag.
- Baltimore City Health Department, Office of Epidemiology and Planning (first quarter, 2009). *Intoxication deaths associated with drugs of abuse or alcohol, Baltimore, Maryland*. Retrieved from [http://www.baltimorehealth.org/info/2008\\_07\\_24.IntoxicationDeaths.pdf](http://www.baltimorehealth.org/info/2008_07_24.IntoxicationDeaths.pdf)
- Bickel, W.K., Amass, L., Higgins, S.T., Badger, G.L., & Esch R.A., (1997a). Effects of adding behavioral treatment to opioid detoxification with buprenorphine.

*Journal of Consulting & Clinical Psychology*, 65, 803-810.

doi:10.1037//0022-006X.65.5.803

Brady, Friedman, Cooper, Flom, Tempalski, & Gostnell (2008). Estimating the prevalence of injection drug users in the U.S. and in large U.S. metropolitan areas from 1992 to 2002. *Journal of Urban Health*, 85 (3), 323-351.

Brewer, D.D., Catalano, R.F., Haggerty, K., Gainey, R.R., & Fleming, C.B. (1998). A meta-analysis of predictors of continued drug use during and after treatment for opiate addiction. *Addiction*, 93, 73–92. Retrieved from:

<http://www.ncbi.nlm.nih.gov/pubmed/9624713>

Budney, A.J., Higgins, S.T., Delaney, D.D., Kent, L., Bickel, W.K. (1991). Contingent reinforcement of abstinence with individuals abusing cocaine and marijuana.

*Journal of Applied Behavioral Analysis*, 24, 657-665.

Burnett, L.B., Roldan, C. J., Adler, J. (2010, March 19). Cocaine Toxicity. eMedicine, Retrieved from <http://emedicine.medscape.com/article/813959-overview>.

Brown, H. (2004). Heroin dependence. *Wisconsin Medical Journal*, 103, 20-26.

Centers for Disease Control and Prevention (CDC), HIV Surveillance Report, 2011. Vol. 23. Retrieved from

[http://www.cdc.gov/hiv/topics/surveillance/resources/reports/#surveillance\\_](http://www.cdc.gov/hiv/topics/surveillance/resources/reports/#surveillance_)

Chutuape, M.A., Jasinski, D.R., Fingerhood, M.I., & Stitzer, M.L. (2001) One- three- and six-month outcomes after brief inpatient opioid detoxification. *American Journal of Drug and Alcohol Abuse*, 27, 19-44. doi:10.1081/ADA-100103117

- Dawe S., & Harnett P. (2007). Reducing potential for child abuse among methadone-maintained parents: results from a randomized controlled trial. *Journal of Substance Abuse Treatment*, 32(4), 381-390.
- Day, E., & Strang, J. (2011) Outpatient versus inpatient opioid detoxification: A randomised controlled trial. *Journal of Substance Abuse Treatment*, 40(1), 56–66.
- DeBellis, M.D., Broussard, E.R., Herring, D.J., Wexler, S., Moritz, G., & Benitez, J.G. (2001). Psychiatric co-morbidity in caregivers and children involved in maltreatment: A pilot research study with policy implications. *Child Abuse & Neglect*, 25, 923-944.
- DiPaula, B.A., Schwartz, R., Montoya, I.D., Barret, D., & Tang, C. (2002). Heroin detoxification with buprenorphine on an inpatient psychiatric unit. *Journal of Substance Abuse Treatment*, 23, 163-169. doi:10.1016/S0740-5472(02)00244-1
- Donohue, B., Romero, V., & Hill, Heather (2006). Treatment of co-occurring child maltreatment and substance abuse. *Aggression and Violent Behavior*, 11, 626–640.
- Donny E.C., Walsh S.L., Bigelow G.E., Eisenberg T., & Stitzer M.L. (2002) High dose methadone produces superior opioid blockade and comparable withdrawal suppression to lower doses in opioid-dependent humans. *Psychopharmacology*, 161, 202-212.
- Drug Policy Alliance (2006). *About Methadone and Buprenorphine* (2<sup>nd</sup> ed). Drug Policy Alliance, New York. ISBN: 1-930517-27-0.
- Epstein, D.H., Hawkins, W.E., Covi, L., Umbricht, A., & Preston, K.L. (2003). Cognitive behavioral therapy plus contingency management for cocaine use:

- Findings during treatment and across 12-month follow-ups. *Psychology of Addictive Behaviors*, 17, 73-82.
- Epstein, D.H., Phillips, K.A., & Preston, K.L. (2011). Opioids. In Ruiz, P., & Strain, E.C. (Eds.), *Lowinson and Ruiz's substance abuse: A comprehensive textbook* (5<sup>th</sup> ed) (pp 161-190). Philadelphia, PA: Lippincott Williams & Wilkins.
- First, M., Spitzer, R., Gibbon, M., & Williams, J. (1995). *Structured Clinical Interview for DSM-IV Axis-I Disorders*. New York, NY: State Psychiatric Institute: Biometrics Research.
- Grabowski, J., O'Brien, C.P., Greenstein, R., Ternes, J., Long, M., & Steinberg-Donato, S.(1979). Effects of contingent payment on compliance with a naltrexone regimen. *American Journal of Drug Abuse*, 6, 355-365.  
doi:10.3109/00952997909001724
- Greenfield, S.F., Brooks, A.J., Gordon, S.M., Green, C.A., Kropp, F., McHugh, K., . . . & Miele, G.M. (2007). Substance abuse treatment entry, retention, and outcome in women: A review of the literature. *Drug and Alcohol Dependence*, 86, 1-21.
- Griffith, J.D., Rowan-Szal, J.A., Roark, R.R., & Simpson, D.D. (2000). Contingency management in outpatient methadone treatment: A meta-analysis. *Drug and Alcohol Dependence*, 58, 55-66.
- Gruber, K., Chutuape, M.A., & Stitzer, M.L. (2000). Reinforcement-based intensive outpatient treatment of inner city opioid misusers: A short-term evaluation. *Drug and Alcohol Dependence*, 57(3), 211-223.
- Gossop, M., Green, L., Phillips, G., & Bradley, B. (1989). Lapse, relapse, and

survival among opioid addicts immediately after treatment: A prospective follow-up study. *British Journal of Psychiatry*, 154, 348-353.

Hanson, K., Vanderploeg, J., & Panzarella, P.(Eds). (2011). Family-based recovery: a home based treatment for families affected by parental substance abuse. *Proceedings from the National Conference on Substance Abuse, Child Welfare, and the Courts. National Harbor, MD*. Retrieved from:  
[http://www.cffutures.org/files/conference2011/sessions/A12/PPT-Family\\_Based\\_Recovery.pdf](http://www.cffutures.org/files/conference2011/sessions/A12/PPT-Family_Based_Recovery.pdf)

Heil, S.H., Tidey, J.W., Holmes H.W., Badger, G.J., & Higgins, S.T., (2003). A contingent payment model of smoking cessation: effects on abstinence and withdrawal. *Nicotine and Tobacco Research*, 5, 205-213.  
doi:10.1080/14622200307234

Higgins, S.T., Budney, A.J., Bickel, W.K., Hughes, J.R., Foerg, F., & Badger, G. (1994). Incentives improve outcome in outpatient behavioral treatment of cocaine dependence. *Archives of General Psychiatry*, 51 (7), 568-576.

Higgins, S.T., Heil, S.H., & Lussier, J.P. (2004). Clinical implications of reinforcement as a determinant of substance use disorders. *Annual Review of Psychology*, 55, 431-461.

Hubbard, R.L., Craddock, S.G., & Anderson, J. (2003). Overview of 5-year follow up outcomes in the drug abuse outcomes studies (DATOS). *Journal of Substance Abuse Treatment*, 25, 125-134. doi:10.1016/S0740-5472(03)00130-2

Jones, H., O'Grady, K., & Tuten, M. (2011) Reinforcement-Based Treatment improves the maternal treatment and neonatal outcomes of pregnant patients enrolled in

- comprehensive care treatment, *The American Journal on Addictions*, 20, 196-204.  
doi: 10.1111/j.1521-0391.2011.00119.x
- Jones, H.E., Wong, C.J., Tuten, M., & Stitzer, M.L. (2005). Reinforcement-based therapy: 12 month evaluation of an outpatient drug-free treatment for heroin abusers. *Drug and Alcohol Dependence*, 79, 119-128.
- Kadden, R.M., Mauriello, I.J. (1991). Enhancing participation in substance abuse treatment using an incentive system. *Journal of Substance Abuse Treatment*, 8, 113-124. doi:10.1016/0740-5472(91)90002-R
- Kelly, J.P., Cook, S.F., Kaufman, D.W., Anderson, T., Rosenberg, L., & Mitchell, A.A. (2008). Prevalence and characteristics of opioid use in the US adult population. *Pain*, 138, 507-513.
- Kidorf, M., & Stitzer, M.L. (1996). Contingent use of take-homes and split-dosing to reduce illicit drug use of methadone patients. *Behavior Therapy*, 27, 41-51.  
doi:10.1016/S0005-7894(96)80034-7
- Konarski, E.A., Johnson, M.R., Crowell, C.R., & Whitman, T. L. (1981). An alternative approach to reinforcement for applied researchers: Response deprivation. *Behavior Therapy*, 12, 653-666. doi:10.1016/S0005-7894(81)80137-2
- Liebson, I., Tommasello, A., & Bigelow, G., (1978). A behavioral treatment of alcoholic methadone patients. *Annals of Internal Medicine*, 89, 342-344. Retrieved from <http://www.annals.org/content/89/3/342.short>
- Lussier, J.P., Heil, S.H., Mogeon, J.A., Badger, G.J., & Higgins, S.T. (2006). A meta-analysis of voucher-based reinforcement therapy for substance use disorders. *Addiction*, 101, 192-203.

- MacArthur, G.J., Minozzi, S., Martin, N., Vickerman, P., Deren, S., Bruneau, J., & . . .  
Hickman, M. (2012). Opiate substitution treatment and HIV transmission in  
people who inject drugs: Systematic review and meta analysis. *British Medical  
Journal*, 345: e595. doi: <http://dx.doi.org/10.1136/bmj.e5945>.
- Mark, T.L., Vandivort-Warren, R., & Montejano, L.B. (2006). Factors affecting  
detoxification readmission: Analysis of public sector data from three states.  
*Journal of Substance Abuse Treatment*, 31(4), 439-445.
- Maryland Department of Health and Mental Hygiene (2010). *Surveillance report:  
Indicators of misuse and abuse of prescription drugs in Maryland*. Retrieved  
from  
[http://goccp.maryland.gov/Legislation/2011/DrugFS.pdf?PHPSESSID=628d  
21b4330a985ff4aa8a211355f541](http://goccp.maryland.gov/Legislation/2011/DrugFS.pdf?PHPSESSID=628d21b4330a985ff4aa8a211355f541)
- Maryland Newslines (2003, May 24). How serious is the AIDS epidemic in  
Maryland? Interviews with researchers, advocates, lawmakers and victims reveal  
some grim statistics. Retrieved from:  
<http://www.newslines.umd.edu/health/specialreports/aids/hivintro050903.htm>
- McLellan, A.T., Kushner, H., Metzger, D., Peters, R., Smith, I., Grissom, G., . . . &  
Argeriou, M. (1992). The fifth edition of the Addiction Severity Index. *Journal  
of Substance Abuse Treatment*, 9, 199-213.
- McLellan, T., & Turner, B. (2008). Prescription opioids, overdose deaths, and  
physician responsibility. *Journal of the American Medical Association*, 300(22),  
2672-2673. doi: 10.1001/jama.2008.793

- Milby, J.B., Schumaker, J.E., McNamara, C., Wallace, D., Usdan, S., McGill, T., & Michael, M (2000). Initiating abstinence in cocaine abusing dually diagnosed homeless persons. *Drug and Alcohol Dependence*, 60, 55-67.
- Milby, J.B., Schumaker, J.E., Raczynski, J.M., Caldwell, E., Engle, M., Michael, M., & Carr, J. (1996). Sufficient conditions for effective treatment of substance-abusing homeless persons. *Drug and Alcohol Dependence*, 43, 39-47.
- Milby, J.B., Schumaker, J.E., Vuchinich, R.E., Freedman, M.J., Kertesz, S., & Wallace D. (2008). Towards cost-effective initial care for substance-abusing homeless. *Journal of Substance Abuse Treatment*, 34(2):180-91.  
doi:10.1016/j.jsat.2007.03.003
- Milby, J.B., Schumacher, J.E., Wallace, D., Freedman, M.J., & Vuchinich, R.E. (2005). To house or not to house: The effects of providing housing to homeless substance abusers in treatment. *The American Journal of Public Health*, 95, 1259-1265.
- Milby, J. B., Schumacher, J. E., Wallace, D., Frison, S., McNamara, C., Usdan, S., & Michael, M. (2003). Day treatment with contingency management for cocaine abuse in homeless persons: 12-month follow-up. *Journal of Consulting and Clinical Psychology*. 71 (3) 619-621.
- Miller, P. (1975). A behavioral intervention program for public drunkenness offenders. *Archives of General Psychiatry*, 35, 335-340. Retrieved from <http://archpsyc.ama-assn.org/cgi/reprint/32/7/915.pdf>
- Miller, W. R., & Rollnick, S. (2012). *Motivational interviewing: Preparing people for change* (3<sup>rd</sup> ed.). New York, NY: Guilford.

- Nandi, A., Glass, T.A., Cole, S.R., Chu, H., Galea, S., Celentano, D.D., & . . . Mehta, S.H. (2010). Neighborhood poverty and injection cessation in a sample of injection drug users. *American Journal of Epidemiology*, *171*(4), 391-398. doi: 10.1093/aje/kwp416
- National Institute for Health Statistics. (2009). *Increase in fatal poisonings involving opioid analgesics in the United States, 1999–2006* (NCHS data brief, no 22). Hyattsville, MD.
- National Drug Intelligence Center (NDIC) (2009). *National drug threat assessment*. Retrieved from <http://www.justice.gov/ndic/products.htm>
- National Highway Traffic Safety Administration (2010). *Drug involvement of fatally injured drivers*. (NHTSA Publication No. DOT HS 811 415). Washington, DC: U.S. Government Printing. Retrieved from <http://www-nrd.nhtsa.dot.gov/Pubs/811415.pdf>
- National Institute on Drug Abuse. (1998). *A community reinforcement plus vouchers approach: Treating cocaine addiction. Therapy Manuals for Drug Addiction* (DHHS Publication No. 98-4309). Washington DC: U.S. Government Printing Office.
- National Institute of Justice. (2000). *1999 annual report on drug abuse among adult and juvenile arrestees*. (U.S. Department of Justice, National Institute of Justice, Publication No. 181426). Washington, DC: U.S. Government Printing. Retrieved from <https://www.ncjrs.gov/pdffiles1/nij/181426.pdf>
- Newcombe, R. (2007) *A Speedball wake-up call [PPT document]*. Retrieved from [http://www.lifeline.org.uk/docs/SB\\_WakeUpCall.ppt#350,1,Slide 1](http://www.lifeline.org.uk/docs/SB_WakeUpCall.ppt#350,1,Slide 1)

- Ohio Department of Alcohol and Drug Addiction Services [ODADAS] (2006).  
*Relapse rates lower when treatment follows detox*. Retrieved from  
<http://www.odadas.ohio.gov/public/>.
- Okie, S. (2010). A flood of opioids, a rising tide of deaths. Perspective. *New England Journal of Medicine, Perspective*, 363 (21), 1981-1985. Retrieved from  
<http://chroniccare.rehab.washington.edu/resources/documents/floodofopioidsnejm.pdf>
- Ormrod, J.E. (1999). *Human Learning* (3rd ed.). Upper Saddle River, NJ: Prentice-Hall.
- Osterling, K., & Austin, M.J. (2008). Substance Abuse interventions for parents involved in the child welfare system: Evidence and implications. *Journal of Evidence-Based Social Work*, 5, 157-189, doi: 10.1300/J394v05n01-07.
- Peterson, J.A., Schwartz, R.P., Mitchell, S.G., Reisinger, H.S., Kelly, S.M., O'Grady, K.E., Brown, B.S., & Agar, M.H. (2010). Why don't out-of-treatment individuals enter methadone treatment programmes? *International Journal of Drug Policy*, 21, 36-42.
- Petry, N.M. (2000). A comprehensive guide to the application of contingency management procedures in clinical settings. *Drug & Alcohol Dependence*. 58, 9-25. doi:10.1016/S0376-8716(99)00071-X
- Petry N.M., Martin B., Cooney J., & Kranzler H. (1998). Give them prizes, and they will come: Contingency management for treatment of alcohol dependence. *Journal of Consulting and Clinical Psychology*, 68, 250-257.
- Petry, N.M., Peirce, J.M., Stitzer M.L., Blaine, J., Roll, J.M., Cohen, A., & Obert, J.,

- (2005). Effect of prize-based incentives on outcomes in stimulant abusers in outpatient psychosocial treatment programs. *Archives of General Psychiatry*, *62*, 1448-1156.
- Platt, J.J. (1995a). *Heroin addiction (Vol. 2). The addict, the treatment process, and social control*. Melbourne, FL: Kreiger Publishing Co.
- Platt, J.J. (1995b). *Heroin addiction (Vol. 3). Treatment advances and AIDS*. Melbourne, FL: Krieger Publishing Co.
- Prendergast, M., Podus, D., Finney, J., Greenwell, L., & Roll, J. (2006). Contingency management for treatment of substance use disorders: A meta-analysis. *Addiction*, *101*, 1546-1560. PMID:17034434.
- Preston, K.L., Umbricht, A., & Epstein, D.H., (2002). Abstinence reinforcement maintenance contingency and one-year follow-up. *Drug & Alcohol Dependence*, *67*, 125-137. doi:10.1016/S0376-8716(02)00023-6
- Rigsby, M.O., Rosen, M.I., Beauvais, J.E., Cramer, J.A., Rainey, P.M., O'Malley, S.S., . . . & Rounsaville, B. J. (2000). Cue-dose training with monetary reinforcement: Pilot study of an antiretroviral adherence intervention, *Journal of General Internal Medicine*, *15* (12), 841-847. doi: 10.1046/j.1525-1497.2000.00127.x
- Roll, J.M., Higgins, S.T., & Badger G.J., (1996). An experimental comparison of three different schedules of reinforcement of drug abstinence using cigarette smoking as an exemplar. *Journal of Applied Behavior Analysis*, *29*, 495-505.
- Roll, J.M., Prendergast, M., Richardson, K., Burdon, W., & Ramirez, A. (2005). Identifying predictors of treatment outcome in a drug court program. *American Journal of Drug and Alcohol Abuse*, *31* (4), 641-656.

- Rosado, J., Sigmon, S.C., Jones, H.E., & Stitzer, M.L. (2005). Cash value of voucher reinforcers in pregnant drug-dependent women. *Experimental and Clinical Psychopharmacology*, *13* (1), 41-47.
- Sees, K. L., Delucchi, K. L., Masson, C., Rosen, A., Clark, H. W., Robillard, H., Banys, P., & Hall, S. M. (2000). Methadone maintenance vs 180-day psychosocially enriched detoxification for treatment of opioid misuse: a randomized controlled trial. *Journal of the American Medical Association*, *283*, 1303-1310.
- Shumacher, J.E., Milby, J.B., Wallace, D., Meehan, D-C., Kertesz, S., Vuchinich, R., & . . . Usdan, S. (2007). Meta-analysis of day treatment and contingency-management dismantling research: Birmingham homeless cocaine studies (1990-2006). *Journal of Consulting and Clinical Psychology*, *75*(5), 823-828. doi: 10.1037/0022-006X.75.5.823
- Silverman, K., Defulio, A., & Everly, J.J. (2011). Behavioral aspects. In Ruiz, P., & Strain, E.C. *Lowinson and Ruiz's Substance abuse: A comprehensive textbook* (5<sup>th</sup> ed) (pp. 88-98). Philadelphia, PA: Lippincott Williams & Wilkins.
- Silverman, K., Higgins, S.T., Brooner, R.K., Montoya, I.D., Cone, E.J., Schuster, C.R., & Preston, K.L. (1996). Sustained cocaine abstinence in methadone maintained patients through voucher-based reinforcement therapy. *Archives of General Psychiatry*, *53*, 409-415.
- Silverman, K., Wong C.J., Higgins, S.T., Brooner, R.K, Montoya, I.D., Contoreggi C., & . . . Preston, K.L. (1996). Increasing opiate abstinence through voucher-based reinforcement therapy. *Drug and Alcohol Dependence*, *41*, 157-165.
- Silverman, K., Wong, C.J, Umbricht-Schneiter, A., Montoya, I.D., Schuster, C.R., &

- Preston, K.L., (1998). Broad beneficial effects of cocaine abstinence reinforcement among methadone patients. *Journal Consulting and Clinical Psychology, 66*, 811-824.
- Simpson, D.D., Joe, G.W., & Rowan-Szal, G.A. (1997). Drug abuse treatment retention and process effects on follow-up outcomes. *Drug and Alcohol Dependence, 47*, 227-235. doi:10.1016/S0376-8716(97)00099-9
- Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological Methodology 1982* (pp. 290-312). Washington DC: American Sociological Association.
- SPSS Inc. (2011). *SPSS Base 20.0 for Windows user's guide*. SPSS Inc., Armonk, NY: IBM Corp.
- Stitzer, M.L., Bigelow, G.E., Liebson, I.A., & Hawthorne, J.W. (1982). Contingent reinforcement for benzodiazepine-free urines: evaluation of a drug abuse treatment intervention. *Journal of Applied Behavior Analysis, 15*, 493-503.
- Stitzer, M.L., Iguchi, M.Y., & Felch, L.J. (1992). Contingent take-home incentive: Effects on drug use of methadone maintenance patients. *Journal of Consulting and Clinical Psychology, 60*, 927-934.
- Stitzer, M., & Petry, N. (2006). Contingency management for treatment of substance abuse. *Annual Review of Clinical Psychology, 2*, 411-434.
- Stitzer, M.L., Jones, H.E., Tuten, M., & Wong, C (2011). Community reinforcement approach and contingency management interventions for substance abuse. In: WM Cox and E. Klinger, eds. *Handbook of Motivational Counseling*. John Wiley and Sons (3<sup>rd</sup> ed.). Doi: 10.1002/9780470979952.ch23

- Substance Abuse and Mental Health Services Administration (2012). *The NSDUH report: state estimates of drunk and drugged driving*. Rockville, MD (Center for Behavioral Health Statistics and Quality, NSDUH Publication No. 109, Rockville, MD). Retrieved from <http://www.samhsa.gov/data/2k12/NSDUH109/SR109StateEstDrunkDrugDriving2012.htm>
- Substance Abuse and Mental Health Services Administration. (2009). Results from the 2008 National Survey on Drug Use and Health: National Findings (Office of Applied Studies, NSDUH Series H-36, HHS Publication No. SMA 09-4434). Rockville, MD.
- Swenson, C., Schaeffer, C., Tuerk, E., Henggeler, S., Tuten, M., Panzerella, P. . . . & Guillorn, A. (2009). Adapting multisystemic therapy for co-occurring child maltreatment and parental substance abuse: The building stronger families project, *Emotional and Behavioral Disorders in Youth, Winter*, 3-9.  
Retrieved from <http://www.mstcan.com/BSF%20Feasibility%20Study.pdf>
- Tuten, M. (2011). Social worker education and training in the care of persons with substance use disorders. In Ruiz, P., & Strain, E.C.: *Lowinson and Ruiz's substance abuse: A comprehensive textbook* (5<sup>th</sup> ed.) (pp. 975-980). Philadelphia, PA: Lippincott Williams & Wilkins.
- Tuten, M., Defulio, A., Jones, H., & Stitzer, M. (2011). A randomized trial of reinforcement-based treatment and recovery housing. *Addiction*, 107, 5, 973-982.

- Tuten, M., Jones, H., Ertel, J., Jakubowski, J., & Sperlein, J. (2006). Reinforcement-based treatment: A novel approach to treating substance abuse during pregnancy, *Counselor Magazine*, 7 (3), 22-29
- Tuten, M., Jones, H., Schaeffer, C., & Stitzer, M. (2012). *Reinforcement-Based Treatment (RBT): A practical guide to the behavioral treatment of substance use disorders*. Washington, D.C.: American Psychological Association Press.
- U.S. Department of Health and Human Services (2009). *Protecting Children in Families Affected by Substance Use Disorders*. (Administration for Children and Families, Office of Child Abuse and Neglect, Publication No. 282-98-0895). Washington, DC: Child Welfare Information Gateway. Retrieved from <http://www.childwelfare.gov/pubs/usermanuals/substanceuse/substanceuse.pdf>
- U.S. Department of Justice (2003). *Heroin in the Northeast: A regional drug threat assessment*. (National Drug Intelligence Center., Publication No. 2011-Q0317-001). Retrieved from <http://www.justice.gov/ndic/pubs5/5787/5787p.pdf>.
- United Nations Office on Drugs and Crime (2012). *World drug report 2012* (United Nations, Publication No. E.12.XI.1). Retrieved from [http://www.unodc.org/documents/data-and-analysis/WDR2012/WDR\\_2012\\_web\\_small.pdf](http://www.unodc.org/documents/data-and-analysis/WDR2012/WDR_2012_web_small.pdf)
- Bureau of Labor Statistics (2009), U.S. Department of Labor (Eds). Social work. In *Occupational outlook handbook, 2009*. Retrieved from <http://www.bls.gov/ooh/>

- National Center for Health Statistics (2011). *Drug poisoning deaths in the United States, 1980–2008*. (NCHS data brief, no 81). Hyattsville, MD. Retrieved from <http://www.cdc.gov/nchs/data/databriefs/db81.pdf>.
- Wechsberg, W.M., Kasten, J.J., Berkman, N.D., & Roussel, A.E. (2007). *Methadone maintenance treatment in the U.S.: A practical question and answer guide*. New York, NY: Springer Publishing Company.
- White, W. (2011). *Narcotics Anonymous and the pharmacotherapeutic treatment of opioid addiction in the United States*. Philadelphia Department of Behavioral Health and Intellectual disability Services, Philadelphia, PA, and the Great Lakes Addiction Technology Transfer Center, Chicago, IL. Retrieved from [http://atforum.com/addiction-resources/documents/2011NAandMedication\\_assistedTreatment.pdf](http://atforum.com/addiction-resources/documents/2011NAandMedication_assistedTreatment.pdf)