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Eval Rev 2007; 31; 585

DOI: 10.1177/0193841X07307771

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An Eight-Year Perspective on the Relationship Between the Duration of Abstinence and Other Aspects of Recovery

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Using data from 1,162 people entering treatment and followed up (> 94%) for 8 years, this article examines the relationship between the duration of abstinence (1 month to 5 or more years) and other aspects of recovery (e.g., health, mental health, coping responses, legal involvement, vocational involvement, housing, peers, social and spiritual support), including the trend and at what point changes occur. It also examines how the duration of abstinence at a given point is related to the odds of sustaining abstinence in the subsequent year. The findings demonstrate the rich patterns of change associated with the course of long-term recovery.

Keywords: *alcohol; drug; addiction; recovery; life course*

1. Introduction

1.1 Problem and Research Questions

Although substance use disorders are increasingly recognized as chronic relapsing conditions that often span decades and require multiple episodes of treatment and/or self-help (Anglin, Hser, and Grella 1997; Anglin et al. 2001; Dennis, Scott et al. 2003; Dennis and Scott [in press]; Hser et al. 1997; Hser et al. 2001; McAweeney et al. 2005; McLellan et al. 2000; Moos and Moos 2005, 2006; Scott, Foss, and Dennis 2005a, 2005b; Simpson, Joe, and Broome 2002; Vaillant 1988; Weisner, Matzger, and Kaskutas 2003; White 1996), approximately 60% of the people with lifetime substance disorders do eventually reach a state of sustained abstinence (Cunningham 1999a, 1999b;

Dawson 1996; Dennis et al. 2005; Kessler 1994; Robins and Regier 1991). This has led to multiple calls to define and better understand and study “recovery” in terms of not only abstinence but improvements in health, mental health, coping, housing, social and spiritual support, illegal activity, and vocational engagement (Betty Ford Consensus Panel [in press]; Laudet, Morgen, and White 2006; Laudet, White, and Storey [in press]; White 2005). This article provides one of the first empirical examinations of how the “duration of abstinence” from substance use predicts improvements in these other areas.

A life course perspective (Elder 1985) was adopted to guide these analyses. This approach has proven useful in examining changes throughout time related to HIV/AIDS risk behaviors (Corless and Nicholas 2000), crime (Laub and Sampson 2001; Loeber and LeBlanc 1990; Piquero, Farrington, and Blumstein 2003; Sampson and Laub 2005), mental health (Pescosolido and Boyer 1999), and most recently for the course of substance use disorders (Grella et al. [in press]; Hser et al. 2005; Hser, Longshore, and Anglin 2007 [this issue]; National Institute on Alcohol Abuse and Alcoholism 2006; Rush et al. [in press] White 2005). Three key concepts embedded in the life course perspective are turning points, timing, and capital. Turning points are when a trajectory changes direction; for this article, the focus is on the initiation of abstinence for at least a month. Timing is important because not everyone sustains abstinence for the same amount of time. Timing is also relevant to understanding how long abstinence has to be sustained to see changes in other aspects of recovery. The term *recovery capital* is used to reflect resources that can be accumulated throughout time (e.g., health, mental health, housing, crime free, employment, strong family and social relations, and life satisfaction) as abstinence is sustained. Whereas most studies organize data around the turning point of treatment (intake or discharge) and then predict “abstinence” at a given time point a few months later, here the data are organized around the onset and duration of abstinence (up to 8 years) predicting recovery capital at Year 8.

Using data from 1,162 adults living in a large metropolitan area who sought substance abuse treatment in 1998 and who were subsequently interviewed

Authors' Note: This article was supported by National Institute on Drug Abuse (NIDA) Grant DA15523 and used data collected under this grant and the earlier Center for Substance Abuse Treatment (CSAT) Grant No. T100664 and Contract No. 270-97-7011. The authors would like to thank Joan Unsicker and Christopher Roberts for their assistance in preparing the article. The opinions are those of the authors and do not reflect official positions of the government. Please address correspondence to Michael L. Dennis, Chestnut Health Systems, 720 West Chestnut Bloomington, IL 61701; e-mail: Mdennis@chestnut.org.

annually between Years 2 and 8 (greater than 94% follow-up rate each year), this study addresses the following four questions:

1. How do health, mental health, and coping vary by duration of abstinence?
2. How do illegal activity, incarceration, employment, and family income vary by duration of abstinence?
3. How do housing, clean and sober friends, recovery environment, self-efficacy to resist relapse, and social and spiritual support vary by duration of abstinence?
4. How does the likelihood of sustaining abstinence another year vary by the duration of abstinence?

The analyses used to answer these questions compare people at Year 8 in terms of the duration of their abstinence (1 to 12 months, 1 to 3 years, 3 to 5 years, and 5 or more years). Given that this is an observational study, comparisons are made in terms of the baseline, Year 8, and change scores (i.e., differences within individuals). The latter helps to control for the small amounts of individual differences at baseline that were observed.

1.2 Expected Impact of the Duration of Abstinence on Other Aspects of Recovery

Although there are few studies that examine the duration of abstinence, many studies have explicitly reported on the relationship between abstinence (or drug use) and the range of variables at which we are looking. Below is a short summary.

1.2.1 Health, mental health, and coping. Abstinence is generally associated with better health, mental health, and coping. Among people in the community, less substance use is associated with lower rates of chronic health and psychiatric problems, which are in turn associated with high societal costs and death (Mokdad et al. 2004). Among people presenting to primary care, people who are abstinent have approximately only 75% as many health and mental health conditions as those who are currently using, including arthritis, headache, lower back pain, depression, and anxiety (Mertens et al. 2003; Weisner et al. 2003). In treatment settings, the severity of mental disorders is a significant predictor of who enters treatment, is retained, and relapses (Chi, Satre, and Weisner 2006; Chi and Weisner [in press]; Dennis et al. 2005; Rounsaville et al. 1982; Rounsaville et al. 1986; Rush et al. [in press]; Scott et al. 2005a; Xie, Drake, and McHugo 2006). Abstinence is also associated

with less “avoidance” coping styles, such as cognitive avoidance and emotional discharge, as well as more “approach” coping styles, such as logical analysis, seeking guidance, problem solving, seeking alternative rewards, and positive reappraisal (Carpenter and Hasin 1999; Chung et al. 2001; Finney and Moos 1995; Holahan et al. 2003; Moggi et al. 1999; Moos and Moos 2005). Thus, we expect the duration of abstinence to be associated with improvements in health, mental health, and coping.

1.2.2 Illegal activity, incarceration, vocational activity, and poverty. Abstinence has generally been associated with reductions in illegal activity, incarceration, poverty, and improvements in vocational activity. Reductions in substance use are associated with relatively rapid reductions in illegal activity and illegal income (Dismuke et al. 2004; Scott, Foss et al. 2003). Although this often involves some period of residential treatment or incarceration, such costs are typically offset by reductions in other costs to society, increased employment, and increased productivity (Bray et al. 2000; French, Salome, and Carney 2002; McCollister and French 2003; Rajkumar and French 1997; Single et al. 1998). Beyond just use, substance dependence is also associated with both lower employment rates for both genders and fewer hours of work for men (Bray et al. 2000). Thus, we expect the duration of abstinence to be associated with decreased crime and increased employment and income.

1.2.3 Social and environmental supports. Abstinence is generally associated with being housed and having some friends, fewer problems in the recovery environment, and more personal, family, social, and spiritual support. Days homeless and number of clean and sober friends were two of the key predictors of both who transitions from using in the community to abstinence and who is able to remain abstinent during the course of a 1- to 2-year period (Scott et al. 2005a). Risks (e.g., substance use among family, friends, and victimization) and protective factors (e.g., treatment and self-help participation, peers in recovery) in the recovery environment and self-efficacy to resist relapse were also among the major predictors of transitions from using to recovery and relapse (Humphreys, Moos, and Cohen 1997; Schutte et al. 2001; Scott et al. 2005b). The general association between relapse and stress has also been found to be moderated by the extent of support one gets from self-perceived personal strengths, family, and social peers (Jessor, Turbin, and Costa 1998, Laudet et al. 2004; Miller 1998; Miller et al. 1996; Procidano and Heller 1983; Schutte et al. 2001). Thus, we expect the duration

of abstinence to be associated with reductions in housing problems and environmental risk as well as improvements in social and spiritual support.

1.3 Likelihood of Sustaining Abstinence

We found no studies to date using the “duration of abstinence” to predict the likelihood of sustaining abstinence for another year. However, a recent extensive review by Moos and Moos (2007) found one or more of four dozen studies reporting that the odds of sustaining abstinence was positively associated with abstinence self-efficacy, approach coping styles, vocational engagement, income, having clean and sober friends, and having social and spiritual support and inversely related to an avoidance approach coping style. A problem with this literature is that most studies only looked at one or two variables, and across studies, the results were not always consistent. For instance, although some studies (e.g., Kushner et al. 2005; Somer 2003) found that the severity of mental disorders was associated with sustaining abstinence longer, others did not (e.g., Di Sclafani, Finn, and Fein 2007). Using a multinomial logistic regression on the first 3 years of data from this study, Scott et al. (2005a) found that the odds of “sustaining recovery another year” were higher for females, those with more legal involvement, those having more clean and sober friends, and weeks of treatment but lower for those with more treatment episodes or who were homeless. Grella et al. ([in press]) used the first 5 years of data from this study to demonstrate that women were one third less likely to relapse and that they had a different mix of the above predictors. Similar findings of women being more likely to sustain abstinence have also been reported in community outreach programs targeting injection drug users (Shah et al. 2005). Thus, an evaluation of the extent to which the likelihood of sustaining abstinence goes up with the duration of abstinence needs to also consider a wide range of other potential variables in a multivariate framework.

2. Method

2.1 Data Source

A cohort of 1,326 adults (85% participation rate) were recruited between 1996 and 1998 from sequential admissions to a network of 22 substance abuse treatment programs (10 outpatient drug-free programs, 5 intensive outpatient drug-free programs, 3 methadone maintenance programs, 2

short-term inpatient programs, 1 long-term inpatient program, and 1 halfway house) operated in a large metropolitan area (Scott, Foss, and Dennis 2003, 2005a; Scott, Foss, and Sherman 2003a, 2003b; Scott, Muck, and Foss 2000). Follow-up interviews were completed with 94% to 97% of the living participants at 6 months and 2, 3, 4, 5, 6, 7, and 8 years poststudy enrollment (99% have one or more interviews; 80% have all eight follow-up interviews). Of the 1,162 participants (96% of those living from the original sample) who completed their 8-year interview, 661 (57%) were dropped because they were currently using based on self-reported use in the past month or a positive urine test. The analyses here focus on the remaining 501 (43%) who were abstinent at least a month. Following recommendations to use all available information in a longitudinal study (see Kranzler et al. 1994; Kranzler et al. 1997), data from all interviews and urine tests in all waves were used to determine the date of last use of any substance (including alcohol, amphetamines/methamphetamines, barbiturates, cannabis, crack/cocaine, hallucinogens, heroin/opioids, inhalants, PCP, or other sedatives, hypnotics, and tranquilizers) or a positive urine test (for amphetamines, cannabinoids, cocaine, opiates, or phencyclidine). The duration of abstinence was then calculated (based on the date of the Year 8 interview minus the date of last use) and categorized into four groups for the second analysis: 232 (46% of 501) with 1 month to 12 months of abstinence, 127 (25%) with 1 year to 3 years of abstinence, 65 (13%) with 3 years to 5 years, and 77 (15%) with 5 or more years of abstinence.

2.2 Participants

2.2.1 Eligibility and informed consent. To be eligible, participants had to (a) reside in the city of Chicago or declare themselves homeless, (b) report alcohol or drug use in the past 6 months (or the 6 months before being in a controlled environment), (c) present for treatment at one of the publicly funded treatment programs in the study, and (d) be 18 years of age or older. Individuals who were seeking treatment as a result of a DUI Level 2 or higher conviction were also excluded because their treatment placement decisions were typically made outside the treatment system being studied (i.e., by a court officer). Informed and voluntary consent to participate was sought under the supervision of the state's and Chestnut's Institutional Review Board. Approximately 85% of all eligible participants agreed to participate in the parent study.

2.2.2 Participant characteristics. The first part of Table 1 gives the participants' baseline characteristics by duration of abstinence group. Differences were tested using the Pearson Chi-square test for categorical variables and the Wilcoxon-Mann-Whitney rank-order tests for continuous measures; significance at $\alpha = .05$ is based on exact p values for both tests. At intake to the study, participants were mostly African American (89%), female (61%), and between the ages of 30 to 49 (68%; $M = 34.1$). Most were unemployed (84%), had never been married (65%), and about half had received a high school degree or its equivalent (53%). Most had a history of physical (28%), emotional (39%), and/or sexual (21%) victimization. About 38% considered themselves homeless, with 12% living on the street or in a homeless shelter in the 6 months prior to intake. In terms of their substance use severity, they averaged an age of first use at 16, 14 years of regular use, 16 days of use out of 30, and 2 prior times in treatment (65% with 1 or more). There was a significant difference ($p < .05$) between the duration of abstinence groups in the years of use at baseline (14 vs. 14 vs. 13 vs. 16 years of use). The most common substances used regularly (5 or more of 30 days) were cocaine (36%), alcohol (27%), heroin (27%), and cannabis (7%). There were significant differences between the duration of abstinence groups in terms of the identification of alcohol problems (24% vs. 28% vs. 19% vs. 40%) and cocaine problems (31% vs. 35% vs. 42% vs. 52%). Participants self-reported symptoms suggesting a range of other problems, including major depression (39%), generalized anxiety disorder (36%), lifetime arrests (78%), lifetime convictions (53%), lifetime incarceration of 1 or more months (44%), and currently being on probation or parole (31%). Again, there was a significant difference between the duration of abstinence groups in terms of the percentage with lifetime convictions (57% vs. 58% vs. 46% vs. 34%), lifetime incarceration (50% vs. 43% vs. 37% vs. 31%), and currently being on probation or parole (37% vs. 29% vs. 32% vs. 16%). Given that there are some baseline differences, it was decided to do the analysis to supplement the Year 8 outcomes with a change score (i.e., using the individual as his or her own control and at least partially controlling for baseline differences).

The second part of Table 1 shows the status of the four duration of abstinence groups at Year 8 with significant differences in each. Those with shorter durations of abstinence were significantly more likely to be in substance abuse treatment (15% vs. 6% vs. 5% vs. 1%) or incarcerated (28% vs. 21% vs. 14% vs. 5%) and less likely to be in sustained remission (49% vs. 99% vs. 100% vs. 100%) based on *Diagnostic and Statistical Manual of Mental Disorder* (4th ed., text revision; American Psychological Association, 2000).

Table 1
Participant Characteristics at Baseline and Year 8

Characteristic at Baseline ^a	Length of Abstinence at Year 8			
	30 Days to 1 Year (<i>n</i> = 232)	1 to 3 Years (<i>n</i> = 127)	3 to 5 Years (<i>n</i> = 65)	5 or More Years (<i>n</i> = 77)
Race				
African American	90	83	90	92
White	4	6	5	4
Other	6	11	5	4
Female	61	58	60	68
Age				
18 to 29	35	27	31	17
30 to 49	64	69	66	81
50 and older	2	5	3	3
Unemployment	82	84	85	88
Never married	70	65	71	66
High school degree/GED	54	54	43	56
Lifetime physical abuse	25	28	35	33
Lifetime emotional abuse	38	37	43	39
Lifetime sexual abuse	21	20	25	21
Homeless, self-described	37	32	42	47
Living on the street/homeless shelter	12	13	9	13
Age of first use (in years)	16	16	18	16
Years of regular substance use (in years)	14	14	13	16*
Days of substance use (of 30) (in days)	15	17	16	18
Any prior substance abuse treatment	63	58	75	59
Regular alcohol use ^b	24	28	19	40*
Regular cocaine use ^b	31	35	42	52*
Regular heroin use ^b	28	29	25	23
Regular cannabis use ^b	7	7	3	8
Major depression	34	41	43	48
Generalized anxiety disorder	35	42	39	48
Arrested, lifetime	82	80	71	71
Conviction, lifetime	57	58	46	34*
Incarcerated, lifetime	50	43	37	31*
On probation/parole	37	29	32	16*
Year 8 status ^a				
In treatment	15	6	5	1*
Incarcerated	28	21	14	5*
Lifetime dependence ^{c,d}	88	94	89	94
Symptoms in past month	3	0	0	0*

(continued)

Table 1 (continued)

Characteristic at Baseline ^a	Length of Abstinence at Year 8			
	30 Days to 1 Year (<i>n</i> = 232)	1 to 3 Years (<i>n</i> = 127)	3 to 5 Years (<i>n</i> = 65)	5 or More Years (<i>n</i> = 77)
Symptoms 2 to 12 months, early remission	49	1	0	0
Symptoms 1 or more years, sustained remission	49	99	100	100

Note: Unless otherwise noted, all figures are percentages.

a. Statistical test: Pearson chi-square for percentage, Kruskal-Wallis for continuous measures; exact *p* value.

b. Five or more days of use in the past 30 days.

c. Comparison of lifetime dependence (three or more symptoms) versus abuse/other.

d. Within lifetime dependence, comparison by current course (most recent past-month abuse/dependence symptoms).

**p* < .05.

2.3 Measurement

2.3.1 Instruments. The assessment package included an augmented version (Scott et al. 1995) of the Addiction Severity Index (ASI; McLellan et al. 1992). This instrument spells out the items and response sets in the ASI (which is semistructured), increases the number of individual questions in each content area of the ASI (including questions on the age of first use, date of last use, treatment history, and current service use), and includes several scales from the Global Appraisal of Individual Needs (GAIN) related to substance use disorders, mental distress, and recovery environment (see Dennis 1999; Dennis, Titus et al. 2003). Psychometric evaluation of the A-ASI used in this sample demonstrated good internal consistency ($\alpha = .7$ or higher) and test-retest reliability ($r = .7$ or higher) for the ASI composite scores, GAIN, and other measures used in this analysis (see Scott, Foss, and Dennis 2003, 2005a). Past-year abstinence from illicit drug use and alcohol intoxication (the endpoint for the analyses presented here) demonstrated high test-retest reliability ($n = .92$) and was largely consistent with urine test results ($Kappa = .56$; Dennis et al. 2005).

To better understand the nature of long-term recovery, this battery was supplemented further in Year 8 with additional GAIN scales measuring substance use disorders, recovery environment, spirituality, personal strengths

Table 2
Definitions of Scales, Indices, and Created Measures

Scale Name	Source	Table in Source	Items	Year 8 alpha	Description
Psychological Composite Score	ASI	3	11	.87	The average of seven past-month types of psychological problems; whether they took prescribed medication in the past month; days experienced these problems divided by 30 days; a 0 to 4 rating of how bothered they were by these problems and how important treatment was for these problems, each divided by 4.
General Mental Distress Scale	GAIN	3	21	.94	Count of 21 past 90-day symptoms related to somatic complaints, depression, anxiety, and suicide.
Logical Analysis	CRI	3	6	.82	A cognitive, approach coping style that "attempts to understand and prepare mentally for a stressor and its consequences." All CRI items rated 0 = <i>not at all</i> , 1 = <i>one to two times</i> , 2 = <i>sometimes</i> , and 3 = <i>often</i> .
Seeking Guidance & Support	CRI	3	6	.79	A behavioral, approach coping style that "attempts to seek information, guidance, or support."
Cognitive Avoidance	CRI	3	6	.79	A cognitive, avoidance coping style that "attempts to avoid thinking realistically about a problem."
Emotional Discharge	CRI	3	6	.72	A behavioral, avoidance coping style that "attempts to reduce tension by expressing negative feelings."
Problem Solving	CRI	3	6	.86	A behavioral, approach coping style that "attempts to take action to deal directly with the problem."
Seeking Alternative Rewards	CRI	3	6	.81	A behavioral, avoidance coping style that "attempts to get involved in substitute activities and create new sources of satisfaction."
Positive Reappraisal	CRI	3	6	.87	A cognitive, approach coping style that "attempts to construe and restructure a problem in a positive way while still accepting the reality of the situation."
Acceptance or Resignation	CRI	3	6	.76	A cognitive, avoidance coping style that "attempts to react to the problem by accepting it."

Family Income as a Percentage of Poverty Line	http://aspe.hhs.gov/poverty/poverty.shtml	Table 4	Ratio estimate based on year of observation, family income and size at the time of the interview divided by the official Health and Human Services guidelines for the same year and family size. In 2006, the poverty line was \$9,800 for a single person and increased by \$3,400 for each additional person in the household. Dichotomized version of above, with less than 100% equal to 1 or higher equal to 0.		
Percentage of Families Below Poverty Line	http://aspe.hhs.gov/poverty/poverty.shtml	Table 4			
Environmental Risk Scale (0 to 84)	GAIN	Table 5	Sum of items rating (0 = none, 1 = a few, 2 = some, 3 = most, and 4 = all) indicating with how many people the respondent lives, works, goes to school or hangs out socially with, or were drinking, using drugs, involved in illegal activities, arguing, or fighting, as well as (reversed coded) how many were vocationally engaged, had been to treatment, or were in recovery.		
Perceived Family Support	Procidano and Heller 1983	Table 5	20	.93	A measure (count of yes answers) of the extent to which an individual perceives that his or her needs for support, information, and feedback are fulfilled by family.
Perceived Social Support	Procidano and Heller 1983	Table 5	20	.89	A measure of the extent to which an individual perceives that his or her needs for support, information, and feedback are fulfilled by friends.
Spiritual Social Support Index	GAIN	Table 5	7	.75	A count of endorsement of items related to spiritual development, including identification with an organized religious group, strength of spiritual beliefs, attendance, and praying.
Perceived Personal Strengths	GAIN	Table 5	10	.79	Count of areas the individual perceives as his or her strengths (e.g., doing well at home, work, with friends, art/performance, sports, computers, and people).
Self-Efficacy to Resist Relapse	GAIN	Table 5	5	.83	Self-rating 1 = strongly disagree, 2 = disagree, 3 = mixed, 4 = agree, 5 = strongly agree) of likelihood of avoiding relapse in different kinds of situations (e.g., at home, work, with friends, with others using in front of you).

Note: ASI = Addiction Severity Index; CRI = Coping Response Inventory; GAIN = Global Appraisal of Individual Needs.

and self-efficacy to resist relapse, the Perceived Family and Social Support Scales (Procidano and Heller 1983), and the Coping Response Inventory (CRI; Moos 1993). Table 2 provides short definition and internal consistency or reliability of each scale, index, or created measure used in the remaining tables. Because of inflation and changes in family size during the 8-year time frame, this includes two measures of the change in poverty using the U.S. Health and Human Services (HHS) guidelines (<http://aspe.hhs.gov/poverty/poverty.shtml>). The first is a percentage of the poverty line adjusting for family size and year, which ranges in this sample from 0% to 1046%. The second is the percentage below the poverty line (i.e., where the percentage of the poverty is dichotomized to less than 100% [1] vs. more [0]). Both are useful because the distribution is right skewed by a few people making a lot of money.

2.3.2 Urine screens. Interviews were supplemented with urine screens, and these data were used to identify who was not abstinent at Year 8 (dropped from this article) and for the other waves as one of several sources for estimating the recency of last use and hence the duration of use. Of the 1,162 study participants interviewed in Year 8, 782 participants were interviewed face to face and asked to provide a urine sample for testing. Ninety-seven percent ($n = 759$) agreed and 3% refused or were unable to provide an adequate sample. Samples were checked for color and temperature, frozen, and then shipped overnight to a Substance Abuse and Mental Health Services Administration (SAMHSA) National Laboratory Certification Program–certified laboratory (MedTox: <http://www.medtox.com>). The laboratory conducted screenings using kinetic interaction of microparticles in solution (KIMS) methodology at the SAMHSA standard cutoff levels for a panel of five drugs: amphetamines (1,000 ng/ml), cannabinoids (marijuana/THC; 50 ng/ml), cocaine (300 ng/ml), opiates (2,000 ng/ml), and phencyclidine (PCP; 25ng/ml). The laboratory also tested for adulteration by checking creatinine levels (less than 20 ng/ml suggests adulteration or high levels of kidney hydration) and if below the threshold, the specific gravity (less than 1.003 suggests dilution). None of the samples showed signs of adulteration. Of the 776 participants tested at Year 8, 77 (10%) denied past-month use but came up positive on the urine test. As noted earlier, this subset was excluded from these analyses.

2.4 Analytic Procedures

A number of variables were selected to assess various aspects of recovery that were expected to change as a function of the duration of abstinence. Given the baseline differences in the group, all variables were tested at baseline, Year 8, and for changes between baseline and Year 8 (i.e., within participants). The outcome variables were typically discreet, bounded (i.e., minimum or maximum score or both), and skewed; therefore, the Kruskal-Wallis (Wilcoxon) rank-order test was used to compare the groups. Exact estimates of the p value for the Kruskal-Wallis test were computed using SAS 9.3 (2005). Cohen's f statistic (Cohen 1988) was computed as an effect size measure of group membership—where $f = 0.1$ is interpreted as a small effect, $f = 0.2$ as moderate, and $f = 0.4$ or more as large. Where the differences were statistically significant, trends were described as “increasing,” “decreasing,” or “having peak at [time period].” The first two terms are used when significant trends are increasing or decreasing monotonically or if any slight shift away from the trend was not statistically significant in pair-wise comparisons of the adjacent groups. Conversely, the term *peak* was only used when there was a change in trend and the peak was significantly different than the adjacent groups in pair-wise tests.

3. Results

3.1 Changes in Health, Mental Health, and Coping

Table 3 shows rows for the participants' status at baseline, Year 8, and changes in health, mental health, and coping between baseline and Year 8 and columns for the four duration of abstinence groups at Year 8, Cohen's effect size f , significance at $p < .05$ using a Kruskal-Wallis test, and a symbol describing the significant trends by duration as consistently increasing (\uparrow), decreasing (\downarrow), or a peaking (\wedge) pattern. As noted in the “Method” section, the first two symbols were used if the numbers were monotonically increasing or decreasing or if an observed peak in the trend was not significantly different from its surrounding values using pair-wise testing. Conversely, the symbol for peak is only used when there was a significant change in the trend such that the group at the peak was significantly higher than a preceding group and also higher than a following group in pair-wise tests at $p < .05$. For a peak, the maximum period is underlined. At baseline, there were no significant differences or effect sizes of $f \geq .1$ across the four duration groups.

Table 3
Changes in Health, Mental Health, and Coping by Abstinence and Duration of Abstinence at Year 8

Time (Range)	Length of Abstinence at Year 8 ^a				<i>f</i>	<i>p</i>	<i>t</i>
	1 to 12 Months (<i>n</i> = 232)	1 to 3 Years (<i>n</i> = 127)	3 to 5 Years (<i>n</i> = 65)	5 or More Years (<i>n</i> = 77)			
Health							
Self-rating of health ^b							
Baseline (1 to 4)	2.1	2.2	2.2	2.0	.04		
Year 8 (1 to 4)	1.8	2.0	1.8	2.0	.15		
Change score (-3 to 3)	-0.3	-0.2	-0.4	-0.1	.13		
Days with health problems / past 30 days							
Baseline (0 to 30)	3.4	3.5	3.6	3.2	.02		
Year 8 (0 to 30)	2.1	3.2	1.7	2.2	.11		
Change score (-30 to 30)	-1.3	-0.3	-2.0	-1.0	.08		
ER visits / past 6 months							
Baseline (0 to 17)	0.3	0.5	0.6	0.4	.05		
Year 8 (0 to 12)	0.3	0.2	0.1	0.1	.06		
Change score (-17 to 12)	-0.1	-0.4	-0.5	-0.3	.07		
Mental Health							
ASI Psychological Composite Score / past 30 days							
Baseline (0 to 1)	.17	.20	.22	.17	.07		
Year 8 (0 to 1)	.07	<u>.13</u>	.08	.04	.11 *	∧ Peak	
Change score (-1 to 1)	-.09	-.07	-.14	-.13	.10		
Days of psychological problems / past 30 days							
Baseline (0 to 30)	5.7	7.1	6.0	6.9	.07		
Year 8 (0 to 30)	2.5	4.8	3.6	1.5	.10 *	∧ Peak	
Change score (-30 to 30)	-3.1	-2.3	-2.5	-5.4	.07		
General mental distress / past 90 days							
Baseline (0 to 21)	5.4	6.3	6.2	6.0	.07		
Year 8 (0 to 21)	2.1	2.8	1.7	0.8	.15 * ↓	Decrease	
Change score (-21 to 21)	-3.4	-3.5	-4.5	-5.2	.16		
Coping response^c							
Logical analysis	10.4	9.9	8.3	8.7	.13 * ↓	Decrease	
Seeking guidance and support	10.8	11.4	9.3	8.9	.19 * ↓	Decrease	
Cognitive avoidance	9.5	8.6	7.4	6.3	.17 * ↓	Decrease	
Emotional discharge	7.3	7.3	6.3	5.0	.14 * ↓	Decrease	

Table 3 (continued)

Time (Range)	Length of Abstinence at Year 8 ^a				<i>f</i>	<i>p</i>	<i>t</i>
	1 to 12 Months (<i>n</i> = 232)	1 to 3 Years (<i>n</i> = 127)	3 to 5 Years (<i>n</i> = 65)	5 or More Years (<i>n</i> = 77)			
Problem solving	12.4	12.5	11.3	11.2	.15	—	
Seeking alternative rewards	9.6	10.0	9.2	8.6	.14	—	
Positive reappraisal	12.3	12.1	11.2	10.3	.14	—	
Acceptance and resignation	8.2	8.1	7.4	6.5	.09	—	

Note: ASI = Addiction Severity Index.

a. Summarized with Cohen's *f*; * exact *p* value for $\alpha < .05$ using Kruskal-Wallis Test, and trend as described as increasing (\uparrow), decreasing (\downarrow), or has a peak (\wedge) based on pair-wise testing ($p < .05$)—with the maximum period underlined.

b. Self-reported health: 1 = *excellent*, 2 = *good*, 3 = *fair*, and 4 = *poor*.

c. Measured only at Year 8, each scale goes from 0 to 18.

At Year 8, there were no significant differences in the trends for physical health by duration of abstinence. Mental health problems, however, peaked between 1 and 3 years of abstinence, followed by decreases, suggesting improvements in ASI psychological composite scores and days of psychological problems. Although the GAIN General Mental Distress scale had a significant downward trend, the slight peak in Years 1 through 3 was not statistically significant. Use of the first four coping mechanisms (logical analysis, seeking guidance and support, cognitive avoidance, and emotional discharge) was more common during early abstinence and generally decreased with time. Thus, it appears that 1 to 3 years of abstinence was characterized by a slight increase in mental distress and reliance on several classic coping mechanisms but that as the duration of abstinence increased (and the number of mental health problems eventually decreased), use of these coping mechanisms also decreased.

3.2 Changes in Legal and Vocational Activity

Table 4 is organized like Table 3 but shows the baseline, Year 8, and changes in legal and vocational activity. At baseline, there were no significant differences across these eight legal and vocational measures. As the duration of abstinence increased, the days of illegal activity for money and illegal income decreased significantly. Illegal income actually dropped to 0 after

a year of abstinence. The small number of days of incarceration in the past 6 months (182 days) decreased significantly from 9.3 days for those abstinent 1 to 12 months to 1.6 days for those abstinent 5 or more years. The increasing duration of abstinence was associated with significantly more days of work, individual income from employment, and fewer days of financial problems. To control for inflation and family size during the 8-year period, the last two sets of rows were determined by dividing the participant's family income by the HHS poverty line for the year and their family size (see "Method" section for more details). The first row shows the change in the raw ratio (family income to year-family-size-based poverty line), and the second shows the percentage of families below the poverty line (i.e., ratio less than 100%). As the duration of abstinence increased, family income as the percentage of the HHS poverty line also increased ($f = 0.17, p < .05$) and a smaller percentage of families were living below the poverty line ($f = 0.14, p < .05$).

3.3 Changes in Recovery Environment

Table 5 is organized like Tables 3 and 4 but shows the baseline, Year 8, and changes in housing, friends, and other aspects of the recovery environment. At baseline, there were no significant differences by duration of abstinence for days housed or the number of clean and sober friends. At Year 8, the number of days housed in the community was the lowest in the first 12 months of abstinence and then consistently rose with the duration of abstinence. The change in the number of clean and sober friends rose consistently with the duration of abstinence. At Year 8, the duration of abstinence was associated with decreased environmental risks and increased social support, spiritual support, and self-efficacy to resist relapse.

3.4 Sustaining Abstinence

To address the fourth research question (How does the likelihood of sustaining abstinence another year vary by the duration of abstinence?), the data were subsetting to the 482 people abstinent at least a month at the Year 7 interview and categorized into the same four duration of abstinence groups based on all data available before then. A 0/1 variable was then created to indicate if they were able to maintain continuous abstinence from Year 7 to Year 8 (based on self-reported recency of use, days of use, and urine test results). No one died in the period and all were re-interviewed at Year 8, however, 32 people (6.6%) spent more than 11 of the next 12 months incarcerated and were dropped from this analysis. Figure 1 shows how well the duration of abstinence at Year 7 predicted who sustained

Table 4
Changes in Legal and Vocational Activity by Abstinence
and Duration of Abstinence at Year 8

Time (Range)	Length of Abstinence at Year 8 ^a				<i>f</i>	<i>p</i>	<i>t</i>
	1 to 12 Months (<i>n</i> = 232)	1 to 3 Years (<i>n</i> = 127)	3 to 5 Years (<i>n</i> = 65)	5 or More Years (<i>n</i> = 77)			
<u>Legal</u>							
Days of illegal activity for money / past 6 months							
Baseline (0 to 180)	11.7	12.6	6.5	6.0	.05		
Year 8 (0 to 180)	5.4	0.0	0.0	0.0	.10	*	↓ Decrease
Change score (-180 to 180)	-6.3	-12.6	-6.5	-6.0	.05		
Illegal income / past 6 months							
Baseline (\$0 to \$30,000)	\$779	\$1,174	\$450	\$434	.04		
Year 8 (\$0 to \$60,000)	\$555	\$0	\$0	\$0	.07	*	↓ Decrease
Change score (-\$30,000 to \$60,000)	-\$224	-\$1,174	-\$540	-\$434	.05	*	↓ Decrease
Days of incarceration / past 6 months							
Baseline (0 to 182)	1.0	0.7	0.4	0.3	.07		
Year 8 (0 to 182)	9.3	6.7	4.2	1.6	.43	*	↓ Decrease
Change score (-182 to 182)	8.3	5.9	3.8	1.3	.41	*	↓ Decrease
<u>Vocational</u>							
Days worked for pay / past 30 days							
Baseline (0 to 30)	2.7	1.8	2.5	3.4	.05		
Year 8 (0 to 30)	6.5	8.8	13.3	13.7	.20	*	^ Increase
Change score (-30 to 30)	3.8	6.9	10.7	10.3	.17	*	^ Increase
Individual employment income / past 6 months							
Baseline (\$0 to \$30,000)	\$1,211	\$948	\$1,068	\$1,339	.04		
Year 8 (\$0 to \$72,000)	\$2,919	\$3,128	\$5,154	\$8,311	.24	*	↑ Increase
Change score (-\$18,000 to \$72,000)	\$1,708	\$2,180	\$4,087	\$6,972	.23	*	↑ Increase
Days without financial probation / past 30 days							
Baseline (0 to 30)	19.7	19.2	21.9	21.1	.06		
Year 8 (0 to 30)	9.2	7.4	4.1	4.8	.15	*	↓ Decrease
Change score (-30 to 30)	-10.6	-11.8	-17.8	-16.4	.15	*	↓ Decrease
Family income as a percentage of poverty line ^b							
Baseline (0% to 590%)	97.4	89.8	100.3	86.0	.09		
Year 8 (0% to 1046%)	75.8	73.2	110.2	134.3	.17	*	↑ Increase

(continued)

Table 4 (continued)

Time (Range)	Length of Abstinence at Year 8a				f	p	t
	1 to 12 Months (n = 232)	1 to 3 Years (n = 127)	3 to 5 Years (n = 65)	5 or More Years (n = 77)			
Change score (-246% to 892%)	-21.6	-16.6	9.9	48.3	.18	*	↑
<u>Increase</u>							
Percentage of families below poverty line ^c							
Baseline (0% to 100%)	65.0	67.7	59.7	68.5	.04		
Year 8 (0% to 100%)	74.0	73.4	53.2	50.7	.14	*↓	Decrease
Change score (-100% to 100%)	9.0	5.7	-6.5	-17.8	.10		

- a. Summarized with Cohen’s *f*; * exact *p* value below criterion $\alpha < .05$ using a Kruskal-Wallis Test and trend described as increasing (↑), decreasing (↓), or has a peak (∧) based on a pair-wise testing ($p < .05$)—with the maximum period underlined.
- b. Based on year of interview, family income and size at the time of the interview per the official Health and Human Services guidelines (<http://aspe.hhs.gov/poverty/poverty.shtml>). In 2006, the poverty line was \$9,800 for a single person and increased by \$3,400 for each additional person in the household.
- c. Dichotomized as less than 100% (1) or higher (0).

abstinence during the subsequent year. Only 36% of the people with 1 to 12 months of abstinence sustained it, whereas 64% relapsed. Of the individuals with 1 to 3 years of abstinence, more than 66% sustained it (Odds Ratio [OR] = 3.4, $p < .05$). Of those with 3 or more years of abstinence, 86% sustained it (OR = 11.2, $p < .05$). Thus, the odds of sustaining abstinence improved through the first 3 years and then stabilized.

Next, a logistic regression was used to evaluate how the duration of abstinence would do with other variables in the model. The years of abstinence in Year 7 were entered (OR = 1.54 per year of abstinence; 95% confidence interval [CI] = 1.37 to 1.74), followed by all baseline variables from Table 1, and the Year 7 version of the variables from Tables 3 to 5 were then entered using a step-wise selection ($p < .10$ in, $p > .15$ out). With duration in the model, only “gender” predicted additional variance in who was able to sustain abstinence (OR = 1.76 for being female; 95% CI = 1.15 to 2.69). Females were significantly more likely than males to sustain abstinence following 1 to 12 months of abstinence (40% vs. 31%), 1 to 3 years (75% vs. 54%), and 3 to 5 years (93% vs. 71%) and were similar at 5 or more years (85% vs. 88%).

Table 5
Changes in Housing, Friends, and Recovery Environment by
Abstinence and Duration of Abstinence at Year 8

Time (Range)	Length at Abstinence at Year 8 ^a				<i>f</i>	<i>p</i>	<i>t</i>
	1 to 12 Months (<i>n</i> = 232)	1 to 3 Years (<i>n</i> = 127)	3 to 5 Years (<i>n</i> = 65)	5 or More Years (<i>n</i> = 77)			
Days housed / past 30 days ^b							
Baseline (0 to 30)	18.6	19.8	21.5	20.2	.09		
Year 8 (0 to 30)	16.9	20.7	25.6	27.1	.45 *	↑	Increase
Change score (-30 to 30)	-1.7	1.0	4.0	7.0	.24 *	↑	Increase
Friends who are clean and sober ^c	-126%	-85%	-38%	7%			
Baseline (1 to 4)	2.6	2.5	2.4	2.2	.08		
Year 8 (1 to 4)	3.3	3.5	3.5	3.5	.32		
Change score (-3 to 3)	0.7	1.0	1.1	1.4	.23 *	↑	Increase
Other (Year 8 only)							
Environmental risk (0 to 84)	33.3	30.1	29.5	27.7	.26 *	↓	Decrease
Perceived family support (0 to 20)	15.7	16.2	14.6	16.5	.10		
Perceived social support (0 to 20)	13.6	14.6	14.6	16.2	.18 *	↑	Increase
Spiritual Social Support Index (1 to 7)	5.4	5.7	6.1	5.9	.19 *	↑	Increase
Perceived personal strength (1 to 10)	6.2	6.3	6.4	7.1	.12		—
Self-efficacy to resist relapse (1 to 5)	3.9	4.0	4.0	4.3	.18 *	↑	Increase

a. Summarized with Cohen's *f*; * exact *p* value below criterion $\alpha < .05$ using a Kruskal-Wallis Test, and trend described as increasing (↑), decreasing (↓), and peak (∧) based on pair-wise testing ($p < .05$)—with the maximum period underlined.

b. Days living in own house, apartment, with friend; that is, not on the street, incarcerated, or in treatment.

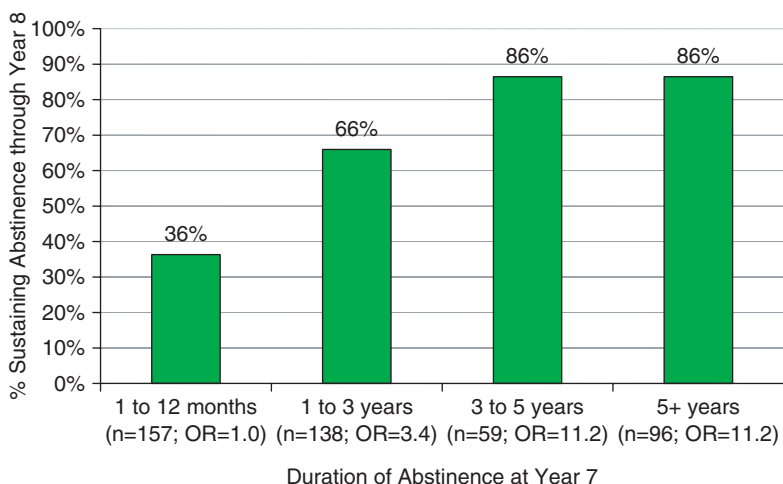
c. Response rate: 0 = none, 1 = a few, 2 = some, 3 = most, and 4 = all.

4. Discussion

4.1 Reprise of Findings

This study demonstrates that duration of abstinence is related to changes in other aspects of recovery but at different rates and times. With regard to physical health, it was slightly counterintuitive that health did not improve with longer periods of abstinence. It may be that a more comprehensive

Figure 1
Percent Sustaining Abstinence Through Year 8
by Duration of Abstinence at Year 7



measure of health is needed to identify differences. Use of coping mechanisms started out high and decreased as the number of years of abstinence increased, suggesting that the high rates of these coping strategies previously reported by others (see Moos and Moos 2007) may actually be a characteristic of early abstinence. Mental health problems peaked during 1 to 3 years of abstinence and decreased thereafter, suggesting the potential need for both early and ongoing mental health treatment. This also shows the potential value of changing the perspective of the analysis from treatment outcomes (e.g., Chi and Weisner [in press]) to the duration of abstinence (this article). Because people go through multiple episodes of care “when” they start abstinence, this peak is averaged out and not evident from the “treatment outcome perspective.” It is not that either is wrong but rather that they represent different perspectives of a complex problem.

The rapid decrease in illegal activity and illegal income sustained across varying lengths of abstinence was consistent with the literature given that many of the crimes were drug related. Following 1 year of abstinence, the number of days worked and legal income generated significantly increased and days with financial problems decreased. After 3 years of abstinence, there were also significant reductions in the percentage of families living below the poverty line, which indicates continued gains in financial status.

These findings are consistent with the life course theories about desistance from crime (Laub and Sampson 2001) that suggest people need to both stop deviant behaviors and engage in vocational activities. They are also consistent with Laub and Sampson's warning both to clients and funders about unrealistic expectations regarding the speed with which people who have become abstinent will be able to be vocationally engaged and improve their financial position. Although many expect this to happen almost immediately, in practice, it is more likely to take several years.

Consistent with the literature, the duration of abstinence was associated with reduced environmental risks and increased number of clean and sober friends, level of social support, spiritual support, and self-efficacy to resist relapse. This is again consistent with both life course work on other sociological changes associated with desistance from crime (e.g., Laub and Sampson 2001) as well as on the development of "recovery capital" with time (Laudet et al. [in press]; White 2005).

The odds of sustaining abstinence increased dramatically (OR = 11.2) during the first 3 years and then leveled off. Among people with 5 or more years of abstinence, there was still some risk of relapse (14%). There was also evidence of gender differences, with women improving their odds of staying abstinent faster than men. This is consistent with earlier findings by Grella et al. (Grella, Scott, and Foss 2005; Grella et al. 2003; Grella et al. [in press]) that women were more likely to enter and stay in recovery.

4.2 Strengths and Limitations

This study had several strengths, including a large sample size, long-term follow-up, high follow-up rates, and a wide range of standardized measures. It is also one of the first to look at how the duration of abstinence predicts other aspects of recovery. It is, however, important to acknowledge some of the article's limitations. The analyses are fundamentally observational, comparing a retrospective classification of the duration of abstinence at Year 8 with other aspects of recovery at Year 8. It is possible that 2 years of abstinence at the beginning of the study has a different kind of effect than 2 years of abstinence at the end of 8 years. It would be useful to see if the findings can be replicated by allowing the start date of abstinences to vary and/or when the duration of recovery is experimentally increased, such as has been done in the Early Re-Intervention (ERI) experiments (Dennis, Scott et al. 2003; Scott et al. 2005b). Using a change score only partially controls for the observed differences at baseline. In the future, it would be useful to reorganize the data based on the initial year of abstinence and examine change within individuals (as their own control) over time. The

data here primarily rely on multiple types of self-reports (recency, 6-month frequency, and 30-day frequency) and annual urine screening. Ideally, it would be useful to replicate the analyses with more frequent urine monitoring and/or other sources of data (e.g., criminal justice system or employment records). Finally, the sample is from one location (the west side of Chicago), and all were adults and disproportionately female and African American relative to the U.S. treatment system. Ideally, it should be replicated in other locations with a more diverse sample.

It is also worth noting that in our previous work, we often broke out people who were in substance abuse treatment or incarcerated when predicting 3- to 12-month transition patterns (e.g., Grella et al. [in press]; Scott et al. 2005a, 2005b). We did not do so here because these groups are usually small (5% to 10% at any given time) and much more transitory (typically less than 90 days), they are interventions primarily associated with attempts to “initiate” abstinence, and they did not predict who “sustained” abstinence. We did rerun the analysis, dropping from all groups anyone who had been incarcerated in the past 6 months (about 13% of the sample; 21% of abstinent subsample). This tended to increase the size of the difference (in the same direction with some additional variables now reaching significance) in the using versus abstinent analysis but did not change the substantive finding that those in abstinence were functioning at a higher level than those still using. For the duration of abstinence variable, it had little or no impact on anything except the days of incarceration (where the contrast was reduced). Although it may not affect the findings from this article, this is probably still an area worthy of further investigation.

4.3 Implications for Practice, Policy, and Research

Consistent with earlier findings that the average person requires three to four treatment admissions for 8 to 9 years to achieve a year of abstinence (Dennis et al. 2005), these findings suggest the need for a shift from focusing on acute episodes of treatment to the management of recovery during longer periods of time. This includes evaluating the impact of improving our approaches to continuing care, monitoring and ERI, and linkage to mental health and wraparound services and other sober activities (Dennis and Scott [in press]).

Although they are only observational, these findings are consistent with federal policies to increase the integration of mental health services (SAMHSA 2002) and divert people from the criminal justice system to substance abuse treatment to reduce long-term crime (National Institute on

Drug Abuse 2006). These findings also suggest caution in welfare reforms designed to get people back into the workforce. Although this evidence supports the goal, it suggests that the process may face an initial lag and take several years. This is also consistent with vocational experiments with clients in long-term methadone maintenance where some people may be employed, others work ready, others in training or training ready, and some people who first need help with motivation to prepare them for work (Dennis et al. 1993; Karuntzos 2002).

Most of the drug abuse treatment research to date has focused on reducing days of use or abstinence in the first 6 to 12 months after treatment (Dennis and Scott [in press]; Prendergast et al. 2002). More health services research is needed on managing long-term recovery, both in terms of how to deliver it in ways that are both effective and cost effective for multiple years. This includes research on ways to integrate these other kinds of services, minimize some of the negative trends (e.g., the early peak in mental health problems), and accelerate the positive trends (e.g., more positive recovery environment and vocational activity).

4.4 Conclusion

Although much of the research on substance abuse treatment outcomes has focused on abstinence in the first 6 to 12 months after treatment, this article suggests that initial abstinence and the initial time period do not fully represent the changes associated with long-term recovery. This research shows that risk of relapse is particularly problematic in the first 3 years of abstinence and never completely goes away, suggesting the need for promoting strategies and programs that support the long-term management of recovery.

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