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In and Out and In Again: An Analysis of Length of Time Between Successful Treatment Program Completion and Relapse and Subsequent Reentry

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NORTHERN ILLINOIS UNIVERSITY

In and Out and In Again: An Analysis of Length of Time Between Successful Treatment Program Completion and Relapse and Subsequent Reentry

A Thesis Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

With Upper Division Honors

Department Of

Statistics

By

Jennifer Heermance

DeKalb, Illinois

December, 2017

University Honors Program

Capstone Approval Page

Capstone Title (print or type)

In and Out and In Again: An Analysis of Length of Time Between Successful Treatment Program Completion and Subsequent Reentry

Student Name (print or type) Jennifer Heermance

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ABSTRACT

While there is a plethora of information on addiction relapse, research is lacking on whether or not there is a measurable effect on relapse rates by clients completing a residential treatment stay. Additionally, there is a dearth of research about whether a previous residential stay could impact the length of time before an addict seeks additional inpatient treatment. My objectives were to determine the correlations between various factors and relapse and program readmittance times. The experiment was done via a confidential survey taken voluntarily by a total of 46 individuals, including 24 women and 22 men in residential drug rehabilitation programs for the second or more time. Linear analysis was done using SAS.

Only two variables were found to be significant to the relapse model: religious background and how long the respondent had been employed at the time of their relapse. For the readmittance model, if the respondent took depressants, they were more likely to be readmitted to a rehabilitation program. Lastly, there is some ambiguity surrounding the significance of unemployment time and time until relapse as they relate to the readmittance model, but those are possibly also significant.

Key Words: Addiction, Relapse, Analysis, Residential Treatment Program

HONORS THESIS ABSTRACT

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Forster, S. E., Finn, P. R., & Brown, J. W. (2017). Neural responses to negative outcomes predict success in community-based substance use treatment. *Addiction, 112*(5), 884-896. doi: 10.1111/add.13734

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ABSTRACT (100-200 WORDS):

While there is a plethora of information on addiction relapse, research is lacking on whether or not there is a measurable effect on relapse rates by clients completing a residential treatment stay. Additionally, there is a dearth of research about whether a previous residential stay could impact the length of time before an addict seeks additional inpatient treatment. My objectives were to determine the correlations between various factors and relapse and program readmittance times. The experiment was done via a confidential survey taken voluntarily by a total of 46 individuals, including 24 women and 22 men in residential drug rehabilitation programs for the second or more time. Linear analysis was done using SAS.

Only two variables were found to be significant to the relapse model: religious background and how long the respondent had been employed at the time of their relapse. For the readmittance model, if the respondent took depressants, they were more likely to be readmitted to a rehabilitation program. Lastly, there is some ambiguity surrounding the significance of unemployment time and time until relapse as they relate to the readmittance model, but those are possibly also significant.

In and Out and In Again: An Analysis of Length of Time Between Successful Treatment Program Completion and Relapse and Subsequent Reentry

One area of research that is lacking is whether there is a measurable effect on relapse rates by clients completing a residential treatment stay. Additionally, there is a dearth of research about whether a previous residential stay could impact the length of time before an addict seeks additional inpatient treatment. Measuring relapse times after completing treatment while controlling for other factors could provide incredible insight into what is needed for an addict to heal and recover as successfully as possible. This research could also have implications for future treatment program development and client outreach.

There is quite a bit of research surrounding addiction and relapse. When looking at how prevalent relapse is among users of different drugs, Hunt, Barnett, and Branch (1971) concluded that within 12 months of program completion, approximately 80% of heroin addicts and smokers will have relapsed, and approximately 70% of alcoholics will have relapsed. Additionally, tracking this information forms an asymptotic graph, so it is likely that relapse rates with these drugs will not have significantly increased after a longer time period. Additionally, Staiger, et al. (2012) looked at the difference between legal addictions, such as alcoholism, and illegal addictions, such as harder drugs. They found that alcohol consumption and relapse are definitely correlated, and it may be a contributing factor. Use of alcohol may contribute to drug use relapse, as those who have relapsed are more likely to test positively for alcohol than those who have not, and starting drinking within a month is positively associated with relapse within 2-3 months. Drug users have altered dopamine pathways, so they may be more susceptible to dependency to other drugs via cross-tolerance and cross-sensitization. Therefore, abstention from all drugs,

including alcohol, may be necessary. This is why I asked about tobacco use. Forster, Finn, and Brown (2017) looked at biological indicators of addiction disorders, and found that neural indicators, especially emotional reactivity, can be predictive of addictive disorders. Finally, Snow and Anderson (2000) looked at demographic factors that influenced relapse in women addicted to drugs and alcohol. They found that age, marital status, education, and their career were factors into relapse.

METHODS

Study Population

This dataset is composed of 46 adults in a residential addiction treatment program in the Midwest who have previously completed a residential program. These 46 individuals consist of 23 women and 23 men with only one person identifying as transgender. 10 of the respondents were between 18 and 27 years of age, 26 were between 28 and 37, 9 were between 38 and 47, and one was 58 or older. 89% of the respondents were white. 50% of the respondents were single, while 26% were either married or in a committed relationship, and 24% were separated, divorced, or in unstable relationships. 70% of respondents had finished high school, and an additional 13% got their GED. 56% of respondents have some form of additional education. 67% of respondents have a religious background. 52% of respondents were employed at their time of relapse. 72% of respondents lived with two or fewer people, but 80% were regularly with at least one person who used drugs. These figures can be found in Appendix C.

Data Information

I collected my data using an anonymous and voluntary survey distributed by an employee of the treatment facility to maintain confidentiality. However, since anyone who works with the participants would be able to tell from the responses which participants completed a survey if

they saw the completed surveys, this is technically confidential data, and not truly anonymous. Since my time frame to collect the data was limited, and I could only record responses from one location, this is a convenience sample. This also means that my sample is very small. I only received 48 eligible surveys, and I needed to eliminate two pieces of data, as they were either incomplete, or their eligibility was in question due to a misunderstanding of the directions. The survey, found in Appendix A, asked for information on demographic data, education, religion, drug use, tobacco use, referral status, employment, and residential and social situations and drug use, as well as the response variables.

The survey was designed to collect almost exclusively qualitative data. While it is possible to analyze qualitative data in SAS, it is much easier to transform the qualitative data into quantitative data. Therefore, for many variables, I assigned "truth values." For ranges, I picked a representative value of the range. For age, I simply took the first digit of the range, as shown below. However, for the time interval ranges, I used the midpoints of the ranges described in months. Additionally, I used the Primary Drug of Choice variable to create four new variables: D_Poly, which has a truth value based on whether or not the individual took more than one drug; D_Stim, which has a truth value based on whether or not the individual took stimulants; D_Dep, which has a truth value based on whether or not the individual took depressants; and D_Psych, which has a truth value based on whether or not the individual took psychotics. Indicated drugs classified as stimulants include Meth and other Amphetamines, Cocaine, and Bath Salts. Indicated drugs that are classified as Depressants are Alcohol, Heroin, other Opiates, and other Sedatives. Indicated drugs that are classified as Psychedelics are Marijuana, Shrooms, and other Psychedelics (Inaba, et al. 2011). The complete variable coding can be found in Appendix B. I had four different hypotheses going into this study:

1) There will be a difference in lengths of time until initial relapse as they correlate to different drug classifications.

2) Using more than one drug will result in shorter lengths of time until initial relapse.

3) Certain demographics and stressful life situations, such as gender identity, racial identity, religious backgrounds, employment status, and the exposure to drugs through friends or family are indicative of relapse and readmittance times.

4) The length of time until initial relapse is strongly correlated with the length of time until readmittance.

Analysis

To analyze this data, I looked at the populations statistics and then found which variables were significant to the model using both stepwise and backward elimination in SAS. Since there are two response variables, I found significance for two models; the first model I will investigate measures lengths of time until initial relapse, and the second model I will investigate measures lengths of time between initial relapse and readmittance into a residential program.

All variables excluding relapse time and readmittance time were entered as explanatory variables for the relapse model. Figure 1 in Appendix D shows that, when using backward elimination, only four variables were found to be significant: whether the participant has a GED or a high school diploma, whether the participant has additional education, whether the participant has a religious background, and how long the participant had been employed at the time of their relapse. However, using stepwise elimination, only religious background and employment time were found to be significant. Employment time was found to be the most significant variable to explain relapse time, as compared to religion. Figures 5 and 6 show that,

despite what the results from backwards elimination suggested, the GED and additional schooling variables do not significantly impact relapse time at all. I also investigated stimulants, depressants, psychedelics, and whether or not the participant took more than one drug in regard to the relapse model, and I confirmed that none of them were significant. When examining several different measures of fit, I determined that the best model for relapse times was the same as the backward elimination model.

For the readmittance model, relapse time was entered as an explanatory variable in addition to the same variables for the relapse model. When conducting backward elimination as shown in Figure 11 of Appendix E, only two variables were found to be significant: whether the participant used depressants and how long they had been unemployed at the time of their relapse. After conducting Stepwise elimination, I found the results between the two elimination methods are identical. When looking at which variable was the most significant to the model, I found some anomalies. The most significant variable to this model was relapse time, but that was not included in the model at all. Similarly, Figure 14 shows that unemployment time is insignificant, even though it was included in the model. I did confirm that the use of depressants was significant. Since I had expected the use of more than one drug, stimulants, and psychedelics to also be significant, I investigated their individual significance, and confirmed that they were not significant to the model at all. As religion was significant to the relapse model, I looked at its significance to the readmittance model, and also confirmed that it was not significant. Overall, when checking for several different factors and measures, the best model for readmittance times included whether the participant took depressants and unemployment time.

RESULTS

It appears that hypotheses 1 and 2 are not supported, as only employment time and religious background significantly impact the relapse model. Each variable has a positive coefficient as found in Appendix D, so participants that had a religious background tended to have longer sobriety times, and, for those who had been employed, the longer they had been employed, the longer they remained sober. Surprisingly, drug classifications and how many different drugs were taken made no significant impact on the relapse model. However, since I identified religious background and employment status in my third hypothesis, there is evidence supporting this hypothesis.

The anomaly in my findings on the readmittance model does not allow me to accurately evaluate hypothesis 4. On its own, relapse times significantly impact times until readmittance, and Figure 19 shows a positive coefficient, which indicates that longer times until relapse correlate with longer times between relapse and readmittance. However, when using elimination methods, it was found to be well over the .05 significance value. Therefore, there appears to be both evidence for and against hypothesis 4. There was a similar anomaly when it came to the amount of time the participant had been unemployed at the time of relapse. When using elimination methods, it was found to be significant to the model, but on its own, there was no significance. In an attempt to explain the anomalies, I looked for collinearity and multicollinearity among the variables, but I found no conclusive indicators of either. Figures in Appendix E show that unemployment time has a negative coefficient, so, if this variable is actually significant to the model, then we can conclude that the shorter the time the participant had been unemployed at the time of their relapse, the longer the time was before they were readmitted to a residential program. The one variable that was consistent across analysis of the

readmittance model was whether the participant used depressants. Appendix E shows it has a large, negative coefficient, which indicates that once users of depressants relapse, they are more likely to be readmitted to a program sooner rather than later.

DISCUSSION

There are several parts of this study that I would do differently, if given the chance. First, I would want to revise the survey and give clearer instructions. Dozens of respondents circled "Yes," indicating that they were not eligible to complete the survey and proceeded to turn it in, so the paper was wasted, although I suppose that did help preserve confidentiality in terms of who actually completed the survey. Some people circled "Yes" and filled out the entire survey except for the response variables, so I could not use this data. One person circled "Yes" and filled out the entire survey correctly, so there was confusion on whether this person was truly eligible, and to err on the side of caution, I did not use this piece of data. Additionally, there was some confusion from several people about how to answer some questions. This was seen primarily in two areas: when answering questions 17 and 18, many respondents answered both questions, leading to ambiguity, and when answering question 21, many respondents answered identically to question 11. While it is quite possible that the respondents' friends did exactly the same drugs as the respondent, I am skeptical of the accuracy of some of the respondents' answers.

Additionally, I knew that with my time constraints, I could only conduct the surveys to three rounds of clients, so I knew my sample size would be limited, but I did not expect the sample size to be less than 50. If I were to do this again, I would not only collect data for a longer period of time, but I would also go to more than one facility to expand the population of

my samples. The implication of this is that since my sample size is so small, it is very unlikely that the conclusions and analysis are accurate, and this analysis must be taken critically.

The other main limitation to this analysis is that this data is interval sensitive data, and when analyzing that, using the midpoint is usually not very accurate, especially when the last midpoint is open ended. A better analysis technique would have been to do an interval censored data analysis, instead, or survival analysis. However, I have not yet learned how to do that, so the biggest limitation to this study is I bit off more than I could chew.

CONCLUSION

While my sample size is too small to guarantee accuracy, it appears that clients are likely to remain sober longer if they are employed and can remain employed longer and have a religious background. Additionally, clients who take depressants such as alcohol or heroin are more likely to either seek or be referred to help quickly, and both length of unemployed time and length of time until initial relapse may also be significant factors.

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APPENDIX A

Survey

1. Is this your first time in a residential treatment program for substance abuse?
    a. Yes—Thank you for your time; you do not need to complete this survey.
    b. No—Please proceed.

Demographic Information

2. Current Age
    a. 18-27
    b. 28-37
    c. 38-47
    d. 48-57
    e. 58+
3. Gender
    a. Male
    b. Female
    c. Other _____
4. Sex
    a. Male
    b. Female
    c. Other _____
5. Identified Race/Ethnicity (choose all that apply)
    a. White
    b. Black/African
    c. LatinX
    d. Asian
    e. Pacific Islander
    f. Other _____
6. Marital Status
    a. Single
    b. In a Long-Term Relationship
    c. Married
    d. Divorced
    e. Other _____
7. Highest Grade Level completed (Up to Grade 12)
    _____
8. Do you have a High School Diploma or G.E.D.?
    a. Yes
    b. No

9. Do you have any additional schooling? If so, please specify.
    a. Yes _____
    b. No
10. Any religious/spiritual background/upbringing? If so, please specify.
    a. Yes _____
    b. No

Relapse

11. Primary Drug(s) of Choice (Select all that apply)
    a. Alcohol
    b. Other Sedatives (including Klonopin, Xanax, any Barbituates)
    c. Marijuana/Hash/Spice/K2
    d. Other Psychedelics (including LSD, Shrooms, Peyote, Ketamine, PCP)
    e. Heroin
    f. Other Opiates (including Hydrocodone, Oxy, Dilaudid, Codeine)
    g. Cocaine/crack
    h. Methamphetamines (including Meth, Adderall, Ecstasy, Crystal, Ice)
    i. Other _____
12. Did you smoke tobacco before relapse?
    a. Yes
    b. No
13. Time Between Program Completion and Initial Relapse
    a. Less than 1 month
    b. 1-3 months
    c. 3-6 months
    d. 6-9 months
    e. 9-12 months
    f. 1-2 years
    g. More than 2 years
14. Time Between Initial Relapse and Admittance to New Program
    a. Less than 1 month
    b. 1-3 months
    c. 3-6 months
    d. 6-9 months
    e. 9-12 months
    f. 1-2 years
    g. More than 2 years
15. Referral to New Program
    a. Self-Referred
    b. Legally Referred

Employment

16. Were you employed at the time of your relapse?
    a. Yes
    b. No
17. If so, how long had you been employed at the time?
    a. Less than 1 month
    b. 1-3 months
    c. 3-6 months
    d. 6-9 months
    e. 9-12 months
    f. 1-2 years
    g. More than 2 years
    h. N/A
18. If not, how long had it been since you were employed?
    a. Less than 1 month
    b. 1-3 months
    c. 3-6 months
    d. 6-9 months
    e. 9-12 months
    f. 1-2 years
    g. More than 2 years
    h. N/A

Residential/Social Situations

19. How many people did you live with between program completion and relapse?
    a. None
    b. 1
    c. 2
    d. 3
    e. 4
    f. 5
    g. 6+
20. How many people were you with regularly who used drugs/alcohol?
    a. None
    b. 1
    c. 2
    d. 3
    e. 4
    f. 5
    g. 6+

21. What were their primary drug(s) of choice? (Select all that apply)
    a. Alcohol
    b. Other Sedatives (including Klonopin, Xanax, any Barbituates)
    c. Marijuana/Hash/Spice/K2
    d. Other Psychedelics (including LSD, Shrooms, Peyote, Ketamine, PCP)
    e. Heroin
    f. Other Opiates (including Hydrocodone, Oxy, Dilaudid, Codeine)
    g. Cocaine/crack
    h. Methamphetamines (including Meth, Adderall, Ecstasy, Crystal, Ice)
    i. Other _____
22. How many of them smoke tobacco?
    a. None
    b. 1
    c. 2
    d. 3
    e. 4
    f. 5
    g. 6+

Thank you! You are officially done with this survey!
Please seal this survey in a provided envelope and return it to a staff member.

APPENDIX B

Variable Consolidation

Age:

1: 18-27

2: 28-37

3: 38-47

4: 48-57

5: 58+

Gender:

0: M

1: F

Sex:

0: Cis-gendered

1: Trans-gendered

Race/Ethnicity:

0: White

1: Other

Marital Status:

0: Single

1: Long-Term, Married

2: Divorced, Separated, It's Complicated

Highest Grade:

0: <12

1: 12

HS Diploma/GED

0: N

1: Y

Add. Schooling:

0: N

1: Anything Else

Religion:

0: N

1: Anything Else

Primary Drugs: (Classified thanks to Inaba et al.)

New Variable: D_Poly

0: only used one drug

1: used more than 1 drug

New Variable: D_Stim

0: Did not use stimulants

1: Used Stimulants

New Variable: D_Dep

0: Did not use depressants

1: Used Depressants

New Variable: D_Psych

0: Did not use psychedelics

1: Used psychedelics

Smoke:

0: N

1: Y

Time before Relapse:

Find Midpoints in months

<1 mo=.5

1-3 mos=2

3-6 mos=4.5

6-9 mos=7.5

9-12 mos=10.5

1-2 ys=18

2+ ys=36

Time before Readmittance:

<1 mo=.5

1-3 mos=2

3-6 mos=4.5

6-9 mos=7.5

9-12 mos=10.5

1-2 ys=18

2+ ys=36

Referral:

0: Self-referred

1: legally-referred

Employed:

0: N

1: Y

Employed Time:

N/A=0

<1 mo=.5

1-3 mos=2

3-6 mos=4.5

6-9 mos=7.5

9-12 mos=10.5

1-2 ys=18

2+ ys=36

Time Since Employment:

N/A=0

<1 mo=.5

1-3 mos=2

3-6 mos=4.5

6-9 mos=7.5

9-12 mos=10.5

1-2 ys=18

2+ ys=36

People lived With:

No change

People_Drugs:

Eliminated; answered in Their Drugs

Their Drugs:

0: no one did drugs

1: they did drugs

Their Smoke:

0: no one smoked

1: 1+ smoked

APPENDIX C

Frequency Statistics

Age	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	10	21.74	10	21.74
2	26	56.52	36	78.26
3	9	19.57	45	97.83
5	1	2.17	46	100.00

Gender	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	23	50.00	23	50.00
1	23	50.00	46	100.00

Trans	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	45	97.83	45	97.83
1	1	2.17	46	100.00

Race	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	41	89.13	41	89.13
1	5	10.87	46	100.00

M_Stat	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	23	50.00	23	50.00
1	12	26.09	35	76.09
2	11	23.91	46	100.00

Grade	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	13	29.55	13	29.55
1	31	70.45	44	100.00
Frequency Missing = 2				

GED	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	8	17.39	8	17.39
1	38	82.61	46	100.00

Add_Schooling	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	20	43.48	20	43.48
1	26	56.52	46	100.00

Religion	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	15	32.61	15	32.61
1	31	67.39	46	100.00

D_Poly	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	14	30.43	14	30.43
1	32	69.57	46	100.00

D_Stim	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	17	36.96	17	36.96
1	29	63.04	46	100.00

D_Dep	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	5	10.87	5	10.87
1	41	89.13	46	100.00

D_Psych	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	29	63.04	29	63.04
1	17	36.96	46	100.00

Smoke	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	7	15.22	7	15.22
1	39	84.78	46	100.00

Time_Relapse	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0.5	13	28.26	13	28.26
2	7	15.22	20	43.48
4.5	6	13.04	26	56.52
7.5	2	4.35	28	60.87
10.5	3	6.52	31	67.39
18	8	17.39	39	84.78
36	7	15.22	46	100.00

Time_Readmittance	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0.5	7	15.22	7	15.22
2	9	19.57	16	34.78
4.5	4	8.70	20	43.48
7.5	6	13.04	26	56.52
10.5	2	4.35	28	60.87
18	9	19.57	37	80.43
36	9	19.57	46	100.00

Referral	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	26	56.52	26	56.52
1	20	43.48	46	100.00

Employment	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	22	47.83	22	47.83
1	24	52.17	46	100.00

Time_Employed	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	22	48.89	22	48.89
0.5	1	2.22	23	51.11
2	7	15.56	30	66.67
4.5	4	8.89	34	75.56
7.5	1	2.22	35	77.78
10.5	1	2.22	36	80.00
18	4	8.89	40	88.89
36	5	11.11	45	100.00
Frequency Missing = 1				

Time_Since	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	19	41.30	19	41.30
0.5	2	4.35	21	45.65
2	3	6.52	24	52.17
4.5	4	8.70	28	60.87
7.5	5	10.87	33	71.74
10.5	3	6.52	36	78.26
18	3	6.52	39	84.78
36	7	15.22	46	100.00

People_Lived	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	4.35	2	4.35
1	17	36.96	19	41.30
2	14	30.43	33	71.74
3	7	15.22	40	86.96
4	1	2.17	41	89.13
5	2	4.35	43	93.48
6	3	6.52	46	100.00

D_Them	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	9	19.57	9	19.57
1	37	80.43	46	100.00

Smoke_Them	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	8	17.39	8	17.39
1	38	82.61	46	100.00

APPENDIX D

Relapse Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	3106.92221	776.73055	9.27	<.0001
Error	38	3182.77547	83.75725		
Corrected Total	42	6289.69767			

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	-2.45726	3.65053	37.95015	0.45	0.5049
GED	8.90385	4.25584	366.61296	4.38	0.0432
Add_Schooling	-8.14086	3.41892	474.88144	5.67	0.0224
Religion	8.88994	3.12313	678.63978	8.10	0.0071
Time_Employed	0.54640	0.11916	1761.06736	21.03	<.0001

Bounds on condition number: 1.48, 20

All variables left in the model are significant at the 0.1000 level.

Figure 1: Results for Backward Elimination on Relapse Model; Best Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2546.92483	1273.46241	13.61	<.0001
Error	40	3742.77285	93.56932		
Corrected Total	42	6289.69767			

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	1.01561	2.66403	13.59919	0.15	0.7050
Religion	7.79045	3.16661	566.33142	6.05	0.0183
Time_Employed	0.54240	0.12591	1736.25671	18.56	0.0001

Bounds on condition number: 1.0118, 4.0474

All variables left in the model are significant at the 0.1000 level.

No other variable met the 0.1500 significance level for entry into the model.

Figure 2: Results for Stepwise Elimination on Relapse Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	779.75951	779.75951	5.48	0.0238
Error	44	6260.67527	142.28807		
Corrected Total	45	7040.43478			

Root MSE	11.92846	R-Square	0.1108
Dependent Mean	10.65217	Adj R-Sq	0.0905
Coeff Var	111.98143		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	4.73333	3.07991	1.54	0.1315
Religion	1	8.78280	3.75177	2.34	0.0238

Figure 3: Results for Just Religion on Relapse Model

Number of Observations Read	46
Number of Observations Used	45
Number of Observations with Missing Values	1

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	1856.51933	1856.51933	15.57	0.0003
Error	43	5128.72511	119.27268		
Corrected Total	44	6985.24444			

Root MSE	10.92120	R-Square	0.2658
Dependent Mean	10.48889	Adj R-Sq	0.2487
Coeff Var	104.12164		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	6.75530	1.88310	3.59	0.0008
Time_Employed	1	0.55541	0.14078	3.95	0.0003

Figure 4: Results for Just Employment Time on Relapse Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	226.82787	226.82787	1.46	0.2326
Error	44	6813.60691	154.85470		
Corrected Total	45	7040.43478			

Root MSE	12.44406	R-Square	0.0322
Dependent Mean	10.65217	Adj R-Sq	0.0102
Coeff Var	116.82182		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	5.81250	4.39964	1.32	0.1933
GED	1	5.85855	4.84066	1.21	0.2326

Figure 5: Results for Just GED on Relapse Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	17.23094	17.23094	0.11	0.7440
Error	44	7023.20385	159.61827		
Corrected Total	45	7040.43478			

Root MSE	12.63401	R-Square	0.0024
Dependent Mean	10.65217	Adj R-Sq	-0.0202
Coeff Var	118.60501		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	11.35000	2.82505	4.02	0.0002
Add_Schooling	1	-1.23462	3.75767	-0.33	0.7440

Figure 6: Results for Just Additional Schooling on Relapse Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	117.78746	117.78746	0.75	0.3916
Error	44	6922.64732	157.33289		
Corrected Total	45	7040.43478			

Root MSE	12.54324	R-Square	0.0167
Dependent Mean	10.65217	Adj R-Sq	-0.0056
Coeff Var	117.75287		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	13.07143	3.35232	3.90	0.0003
D_Poly	1	-3.47768	4.01929	-0.87	0.3916

Figure 7: Results for Just Number of Drugs on Relapse Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	9.16906	9.16906	0.06	0.8118
Error	44	7031.26572	159.80149		
Corrected Total	45	7040.43478			

Root MSE	12.64126	R-Square	0.0013
Dependent Mean	10.65217	Adj R-Sq	-0.0214
Coeff Var	118.67307		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	11.23529	3.06596	3.66	0.0007
D_Stim	1	-0.92495	3.86141	-0.24	0.8118

Figure 8: Results for Just Stimulants on Relapse Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	286.61039	286.61039	1.87	0.1787
Error	44	6753.82439	153.49601		
Corrected Total	45	7040.43478			

Root MSE	12.38935	R-Square	0.0407
Dependent Mean	10.65217	Adj R-Sq	0.0189
Coeff Var	116.30819		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	17.80000	5.54069	3.21	0.0025
D_Dep	1	-8.01951	5.86882	-1.37	0.1787

Figure 9: Results for Just Depressants on Relapse Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	47.60213	47.60213	0.30	0.5869
Error	44	6992.83266	158.92801		
Corrected Total	45	7040.43478			

Root MSE	12.60667	R-Square	0.0068
Dependent Mean	10.65217	Adj R-Sq	-0.0158
Coeff Var	118.34829		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	11.43103	2.34100	4.88	<.0001
D_Psych	1	-2.10751	3.85084	-0.55	0.5869

Figure 10: Results for Just Psychedelics on Relapse Model

APPENDIX E

Readmittance Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1365.57618	682.78809	4.81	0.0135
Error	40	5682.36568	142.05914		
Corrected Total	42	7047.94186			

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	29.17704	5.80210	3592.36732	25.29	<.0001
D_Dep	-16.46545	5.77454	1154.99846	8.13	0.0069
Time_Since	-0.25013	0.14414	427.77643	3.01	0.0904

Bounds on condition number: 1.0372, 4.1487

All variables left in the model are significant at the 0.1000 level.

Figure 11: Results of Backward Elimination on Readmittance Model; Best Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1365.57618	682.78809	4.81	0.0135
Error	40	5682.36568	142.05914		
Corrected Total	42	7047.94186			

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	29.17704	5.80210	3592.36732	25.29	<.0001
D_Dep	-16.46545	5.77454	1154.99846	8.13	0.0069
Time_Since	-0.25013	0.14414	427.77643	3.01	0.0904

Bounds on condition number: 1.0372, 4.1487

All variables left in the model are significant at the 0.1000 level.

Figure 12: Summary of Stepwise Elimination on Readmittance Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	854.40957	854.40957	5.53	0.0232
Error	44	6796.42195	154.46414		
Corrected Total	45	7650.83152			

Root MSE	12.42836	R-Square	0.1117
Dependent Mean	12.85870	Adj R-Sq	0.0915
Coeff Var	96.65335		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	25.20000	5.55813	4.53	<.0001
D_Dep	1	-13.84634	5.88730	-2.35	0.0232

Figure 13: Results for Just Depressants on Readmittance Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	273.31432	273.31432	1.63	0.2084
Error	44	7377.51720	167.67085		
Corrected Total	45	7650.83152			

Root MSE	12.94878	R-Square	0.0357
Dependent Mean	12.85870	Adj R-Sq	0.0138
Coeff Var	100.70055		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	14.54459	2.32135	6.27	<.0001
Time_Since	1	-0.19388	0.15185	-1.28	0.2084

Figure 14: Results for Just Time Unemployed on Readmittance Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	277.41076	277.41076	1.66	0.2050
Error	44	7373.42076	167.57774		
Corrected Total	45	7650.83152			

Root MSE	12.94518	R-Square	0.0363
Dependent Mean	12.85870	Adj R-Sq	0.0144
Coeff Var	100.67259		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	16.57143	3.45975	4.79	<.0001
D_Poly	1	-5.33705	4.14809	-1.29	0.2050

Figure 15: Results of Just Number of Drugs on Readmittance Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	51.10028	51.10028	0.30	0.5892
Error	44	7599.73124	172.72116		
Corrected Total	45	7650.83152			

Root MSE	13.14234	R-Square	0.0067
Dependent Mean	12.85870	Adj R-Sq	-0.0159
Coeff Var	102.20588		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	14.23529	3.18749	4.47	<.0001
D_Stim	1	-2.18357	4.01447	-0.54	0.5892

Figure 16: Results of Just Stimulants on Readmittance Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	17.25241	17.25241	0.10	0.7540
Error	44	7633.57911	173.49043		
Corrected Total	45	7650.83152			

Root MSE	13.17158	R-Square	0.0023
Dependent Mean	12.85870	Adj R-Sq	-0.0204
Coeff Var	102.43323		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	13.32759	2.44590	5.45	<.0001
D_Psych	1	-1.26876	4.02340	-0.32	0.7540

Figure 17: Results of Just Psychedelics on Readmittance Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	276.62722	276.62722	1.65	0.2056
Error	44	7374.20430	167.59555		
Corrected Total	45	7650.83152			

Root MSE	12.94587	R-Square	0.0362
Dependent Mean	12.85870	Adj R-Sq	0.0143
Coeff Var	100.67794		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	9.33333	3.34261	2.79	0.0077
Religion	1	5.23118	4.07177	1.28	0.2056

Figure 18: Results of Just Religion on Readmittance Model

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	984.68802	984.68802	6.50	0.0144
Error	44	6666.14351	151.50326		
Corrected Total	45	7650.83152			

Root MSE	12.30867	R-Square	0.1287
Dependent Mean	12.85870	Adj R-Sq	0.1089
Coeff Var	95.72251		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	8.87498	2.39485	3.71	0.0006
Time_Relapse	1	0.37398	0.14669	2.55	0.0144

Figure 19: Results of Just Relapse Times on Readmittance Model