

AN ANALYSIS OF CHARACTERISTICS ASSOCIATED
WITH CHOOSING EDUCATION AS A RECOVERY GOAL AND
BEGINNING AN EDUCATIONAL PROGRAM IN FULL SERVICE PARTNERSHIPS

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Table of Contents
(Petris Report # 2010-6)

Acknowledgements 3

Summary 4

Chapter 1: Introduction 5

Chapter 2: Data and Methods 9

Chapter 3: Results..... 11

Chapter 4: Discussion 13

Tables and Figures 14

Technical Appendix..... 20

References..... 26

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Summary

In this report, we evaluate the educational outcomes of participants in the Full Service Partnership (FSP) programs. Specifically, we answer the following questions:

- 1) What factors are associated with FSP participants choosing education as a recovery goal?
- 2) What factors are associated with FSP participants entering educational programs?

We assessed the following factors in this study: demographics (age, gender, educational background), psychiatric diagnoses, residential status, employment status, financial support, legal system involvement, substance abuse status and emergency interventions (physical health related, mental health/substance abuse related). We find that the longer a consumer is enrolled in the FSP program, the more likely it is that the consumer will begin an educational program. Consumer characteristics that positively correlate with choosing education as a recovery goal *and* entering an educational program include: having bipolar disorder, and having an associate or vocational degree. In addition, there is a negative relationship between age and either educational outcome. The likelihood of choosing education as a recovery as a goal and likelihood of entry into an educational program goes down as age increases.

The key policy finding of this analysis is that a current substance abuse problem is associated with decreased odds of choosing education as a recovery goal and decreased likelihood of starting an educational program. On the other hand, substance abuse treatment is associated with increased odds of choosing education as a recovery goal and increased likelihood of starting an educational program. This suggests that treatment for current substance abuse problems can increase the importance of education for consumers as well as the odds of actually entering an educational program.

Lastly, while being employed does not effect choosing education as a recovery goal, it does have a strong effect on how soon consumers begin an educational program. In summary, increasing substance abuse treatment and employment can positively influence consumer's entry into educational programs.

Chapter 1: Introduction

In November 2004, Californians approved the ballot measure Proposition 63 (which became the Mental Health Services Act) to expand public mental health funding and services. This report focuses on one subcomponent of MHSA, the Full Service Partnership (FSP), which is part of Community Services and Supports (CSS) component of MHSA. The CSS component provides funding for direct services and supports to people with a serious mental illness (SMI) or a serious emotional disturbance (SED).

Full Service Partnerships, according to the California Code of Regulations (Title 9, § 3620, 2010), may include the following services for adults:

Full Service Partnership Service Category.

(a) The County shall develop and operate programs to provide services under the Full Service Partnership Service Category. The services to be provided for each client with whom the County has a full service partnership agreement may include the Full Spectrum of Community Services necessary to attain the goals identified in the Individual Services and Supports Plan (ISSP). The services to be provided may also include services the County, in collaboration with the client, and when appropriate the client's family, believe are necessary to address unforeseen circumstances in the client's life that could be, but have not yet been included in the ISSP.

(1) The Full Spectrum of Community Services consists of the following:

(A) Mental health services and supports including, but not limited to:

- (i) Mental health treatment, including alternative and culturally specific treatments.*
- (ii) Peer support.*
- (iii) Supportive services to assist the client, and when appropriate the client's family, in obtaining and maintaining employment, housing, and/or education.*
- (iv) Wellness centers.*
- (v) Alternative treatment and culturally specific treatment approaches.*
- (vi) Personal service coordination/case management to assist the client, and when appropriate the client's family, to access needed medical, educational, social, vocational rehabilitative and/or other community services.*
- (vii) Needs assessment.*
- (viii) ISSP development.*
- (ix) Crisis intervention/stabilization services.*
- (x) Family education services.*

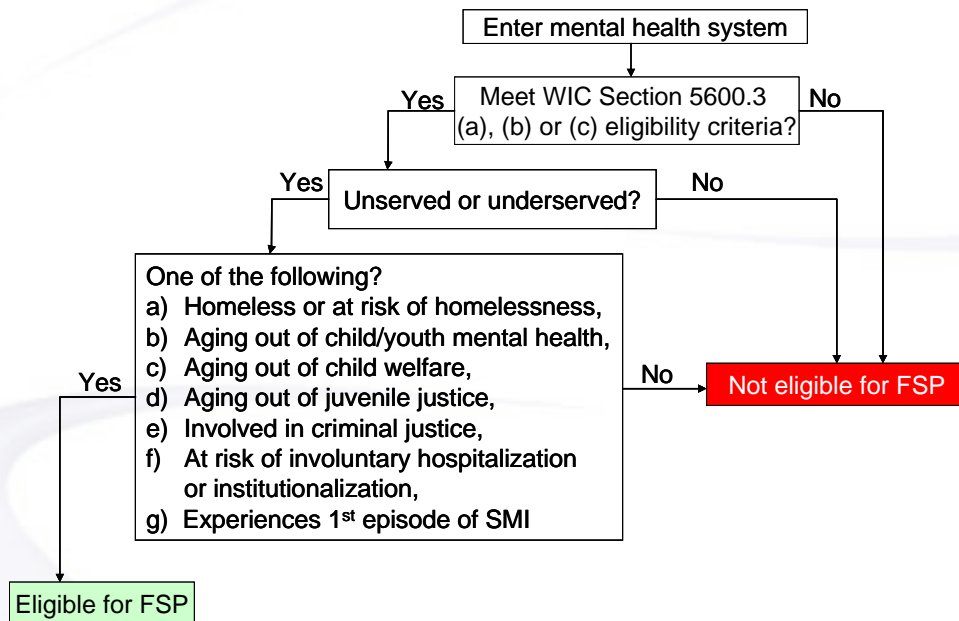
(B) Non-mental health services and supports including, but not limited to:

- (i) Food.*
- (ii) Clothing.*
- (iii) Housing, including, but not limited to, rent subsidies, housing vouchers, house payments, residence in a drug/alcohol rehabilitation program, and transitional and temporary housing.*
- (iv) Cost of health care treatment.*
- (v) Cost of treatment of co-occurring conditions, such as substance abuse.*
- (vi) Respite care.*

(C) Wrap-around services to children in accordance with WIC Section 18250 et. seq.

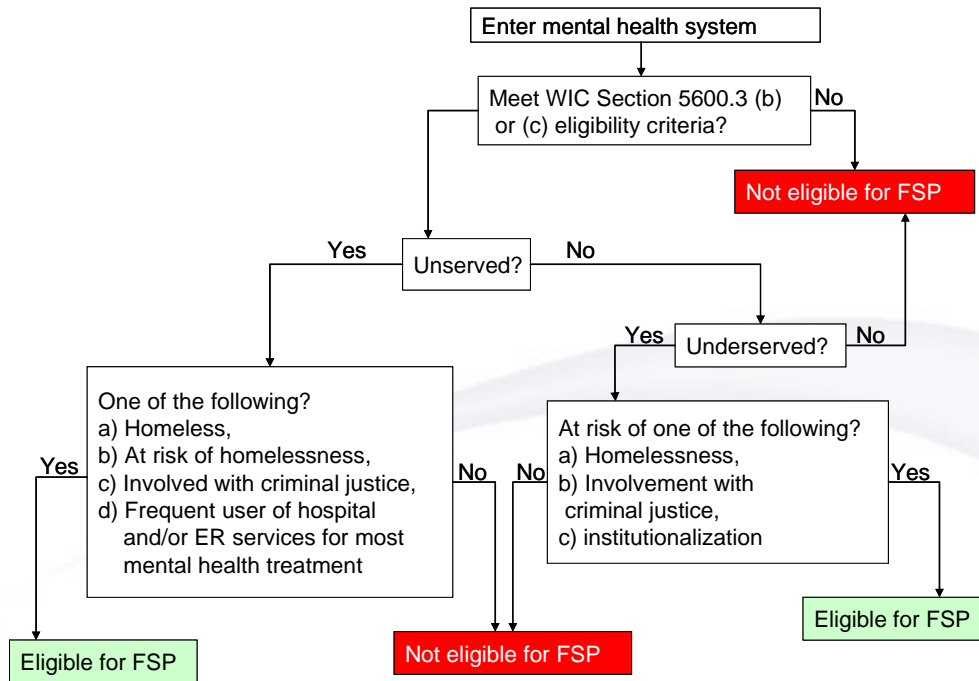
Figures 1.1, 1.2 and 1.3 show the criteria for admission into FSPs for transition age youth, adults and older adults respectively. First, a person must meet the eligibility criteria for mental health services as defined in WIC Section 5600.3 (a), (b) or (c). Next, an individual must be unserved or underserved. Unserved is defined as someone with an SMI or SED who is not receiving mental health services. People who have only had emergency or crisis-oriented contact and/or services are considered unserved. The definition of underserved is extremely broad, including anyone with an SMI or SED who does not receive services to support their wellness, recovery or resilience (California code of regulations, Title 9, § 3200.300, 2010). The last criteria that participants must meet varies by age group but can include: homelessness, at risk of homelessness, involvement or at risk of involvement with the criminal legal system, at risk of institutionalization, frequent users hospitals and/or emergency room treatment for mental health care, or for transition age youth, aging out of the child and youth mental health system, child welfare system or juvenile legal system (California code of regulations, Title 9, § 3620.05, 2010).

Figure 1.1: FSP Criteria for Transition Age Youth



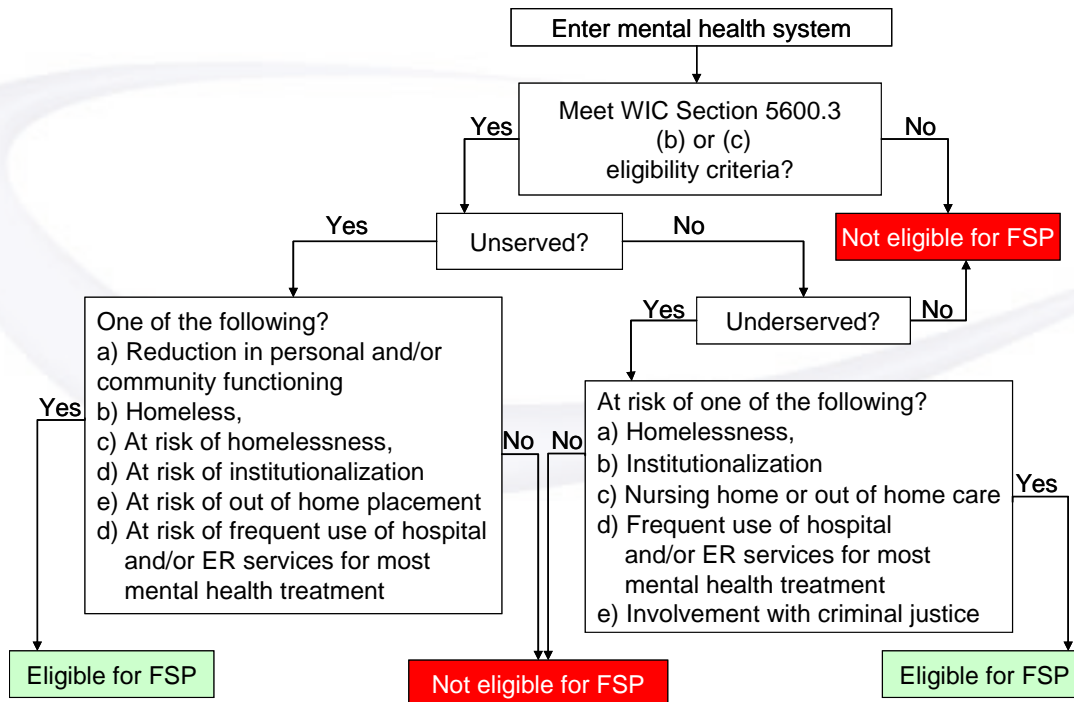
Notes: Petris Center Analysis of the California Code of Regulations, Title 9, Section 3620.05. FSP: Full Service Partnership.

Figure 1.2: FSP Criteria for Adults



Notes: Petris Center Analysis of the California Code of Regulations, Title 9, Section 3620.05. FSP: Full Service Partnership.

Figure 1.3: FSP Criteria for Older Adults



Notes: Petris Center Analysis of the California Code of Regulations, Title 9, Section 3620.05. FSP: Full Service Partnership.

Educational Outcomes

The emergence of serious mental illness (SMI) during a person's teens or early twenties can interrupt education and hamper progression to higher education (Isohanni *et al.*, 2001). Education level has been shown to be highly correlated with income and economic independence for people with a SMI (Baron & Salzer, 2002; Mowbray & Megivern, 1999; Nordt *et al.*, 2007). In addition, people with a SMI are more likely to have lower educational levels (Isohanni *et al.*, 2001; Megivern *et al.*, 2003). Since one of the goals of the FSP programs is to move clients towards independence and self-sufficiency, we examine the factors associated with movement toward increased education. This study looks at two related questions:

- 1) What factors are associated with FSP participants choosing education as a recovery goal?
- 2) What factors are associated with FSP participants entering educational programs?

The results of this study will enable policymakers and other stakeholders determine the effectiveness of the FSP program with respect to education outcomes.

Chapter 2: Data and Methods

The data for this analysis come from several sources. The main source of information is the Data Collection and Reporting System (DCR). Supplementary data are from the Client and Service Information (CSI) System. All systems are maintained by the California Department of Mental Health. All results are for transition age youth (TAY), adults and older adults in the Full Service Partnerships (FSP) program.

Data

Data from the DCR are collected using three forms: the Partnership Assessment Form (PAF), the Key Event Tracking Form (KET), and the Quarterly Assessment Form (3M) (California Department of Mental Health, 2007). The PAF records a consumer's history and baseline information for the following categories: residential status, education status, employment status, sources of financial support, legal designations, emergency interventions, health status, and substance abuse status. The KET is used whenever a consumer changes his or her status with regard to the following categories: discontinuation or reestablishment in the program, residential setting, education, employment, financial support, legal status, and emergency intervention. The 3M is filled out every quarter and assesses sources of financial support, legal issues, health status, and substance abuse regardless of whether there have been any changes. In other words, the PAF consists of baseline information, while the KET and the 3M provide follow-up information for each consumer (California Department of Mental Health, 2008). Age, gender, and educational background are also available from the DCR.

Other data used in our analysis included the consumer's psychiatric diagnosis which was obtained from CSI. Psychiatric diagnoses are determined when an individual seeks services at a county mental health facility. The diagnostic codes use the formats from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association, 2000). All psychiatric diagnoses were collapsed into the following categories: (schizophrenia, substance abuse including alcohol abuse, attention deficit hyperactivity disorders (ADHD) or conduct disorders, personality disorders, anxiety and anxiety related disorders, bipolar disorder, depression, and other or unable to diagnose. These categories were determined in consultation with Dr. Neal Adams, the collaborating psychiatrist for this project. All past psychiatric diagnoses were included in the analysis. This approach attempts to capture comorbid psychiatric conditions (Ciapparelli et al., 2007; Pulay et al., 2009; Tamam, Karakus, & Ozpoyraz, 2008; Uwakwe & Gureje, 2010).

Sampling

Our analysis included TAY, adults and older adults per their PAF on record. TAY range from ages 16-25, adults range from ages 26-59, and older adults are age 60 years or older. We used DCR data from 2005-2008. At the time of this analysis, data was only available for 43 of 58 California counties: Butte, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Lake, Los Angeles, Madera, Mariposa, Merced, Mono, Napa, Nevada, Orange, Plumas, Sacramento, San Benito, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Stanislaus, Trinity, Tulare, Tuolumne, Ventura, Yolo, and Sutter/Yuba. The results of this study are generalizable to consumers residing in the remaining 15 counties to the extent that the consumers and FSP programs in the excluded counties are similar to the average consumer and average FSP programs in the included counties.

Variables

The primary outcomes of interest in our analyses are (1) choosing education as a recovery goal and (2) involvement in an educational program during the first 12 months of participation in the FSP program. We predict these two outcomes using the following information (independent variables): demographics (age, gender, education), psychiatric diagnoses (schizophrenia, substance abuse including alcohol abuse, attention-deficit hyperactivity disorder (ADHD) and conduct disorders, personality disorders, anxiety and anxiety-related disorders, bipolar disorder, depression, other or unable to diagnoses), residential status (independent living, emergency shelter, homeless, supervised residential, medical hospital, psychiatric hospital, licensed residential, justice placement, other setting), employment status, financial support, legal justice involvement (probation, conservatorship, payee), emergency intervention (number of emergency interventions related to physical health, number of emergency interventions related to mental health/substance abuse), and substance abuse (currently has a substance abuse problem, receiving substance abuse treatment). Variables that can change over time (time-dependent covariates) include residential status, employment status, financial support, legal system involvement, emergency intervention, and substance abuse information. The reference group is made of consumers ages 16 to 25, male, with no high school diploma or unknown degree, where time is at baseline. All variables were coded as dummy variables (either 0 or 1), with the exception of emergency interventions which were coded as count variables. For example, during each of the 12 months of follow-up, homeless status was coded as 1 if a consumer was homeless in any given month; otherwise the dummy variable was 0. Employment status and financial support were coded as binary variables rather than as multilevel categorical variables. Consumer employment was in two categories: unemployment and any type of employment, (including supported employment and volunteer work). Similarly, consumers were coded as either having any kind of financial support or none. Finally, race/ethnicity and parole status were excluded from the model due to a large number of missing values.¹

Statistical Methods

The goal of this project was to determine factors that are predictive of 1) consumers choosing education as part of their recovery goals, and 2) consumers beginning an educational program. We used a logistic regression model to see which factors were predictive of clients choosing education as part of their recovery goals. We evaluated whether measures including age, gender, psychiatric diagnoses, education level, residential status, education involvement, employment, financial support, legal status, emergency intervention and substance abuse status (all measured at the time a client entered the FSP program) significantly predicted whether a client chose education as a recovery goal.

We used Cox non-proportional hazards models with time-dependent covariates to determine the factors that predict time to a consumer's entry into an educational program. Socio-demographic measures (age, gender, educational background, residential setting, employment status, financial support status), psychiatric diagnoses, as well as legal issues, emergency interventions, substance abuse and treatment were all included in the Cox model. We decided on the Cox non-proportional hazards model because it allows us to consider the time it takes to begin an educational program. In addition, it also allows flexibility in including variables in the model that could vary with time, such as residential setting or substance abuse treatment. We controlled for all of these factors in order to determine the impact that each of these measures has on the likelihood a client enters an educational program.

¹ 40.96% of observations were missing values for race/ethnicity and 73.64% of observations were missing values for parole status.

Chapter 3: Results

Table 3.1 lists the population characteristics at baseline. Approximately 5.88% of the population was already in an educational program when they entered the FSP program, and about 30.82% chose education as their recovery goal. Among consumers with a current substance abuse problem (40.19%), about 61.56% were receiving substance abuse treatment.

Table 3.2 shows that the characteristics that were found to be statistically related to choosing education as a recovery goal. These include age, gender, educational background, psychiatric diagnosis, residential status, current educational program involvement, financial support, probation status, payee status, having a current substance abuse problem, receiving substance abuse treatment, and the number of emergency interventions related with physical health. All findings assume that all else is held constant.

Age had the expected relationship with choosing education as a recovery goal: as age increases, the odds of choosing education as a recovery goal decrease. The odds of choosing education as a recovery goal for those ages 26 to 39 were 49% lower than the odds for consumers ages 16-25. The odds of choosing education as a recovery goal for those ages 40 to 59 were 70% lower than the odds for consumers ages 16-25. Lastly the odds of choosing education as a recovery goal for those ages 60 or older were 91% lower than the odds for those ages 16 to 25.

The odds of choosing education as a recovery goal for women were 21% higher than for men. Having a high school diploma/GED or having a bachelor's degree or higher did not have any effect on choosing education as a recovery goal. The odds for those who had an associate degree were 67% higher than the odds for consumers who had no high school degree or had an educational background that was unknown.

Having an anxiety disorder or bipolar disorder were the only two psychiatric diagnoses that significantly change the odds of choosing education as a recovery goal. Consumers with an anxiety disorder had 27% higher odds of choosing education as a recovery goal, while consumers with bipolar disorder had 25% higher odds of choosing education as a recovery goal, compared to consumers who did not have the corresponding disorders respectively.

Two categories of residential status significantly change the odds of choosing education as a recovery goal. The odds for choosing education as a recovery goal increased by 33% for consumers in an emergency shelter compared to consumers who were in supervised residential placements. The odds for choosing education as a recovery goal decreased by 49% for consumers in psychiatric hospitals compared to consumers in supervised residential placements.

The odds of choosing education as a recovery goal was 687% higher for people who are currently involved in education relative to those who were not involved in any kind of educational program. The odds of choosing education as a recovery goal for consumers receiving financial support were 17% lower than consumers who did not receive any kind of financial support.

For consumers who are involved with the legal system, being on probation resulted in a 52% increase in choosing education as a recovery goal compared to consumers who were not on probation. Having a payee resulted in a 20% decrease in choosing education as a recovery goal, compared to those who did not have a payee. The odds for those who had physical health related emergency interventions resulted in a 57% increase in choosing education as a recovery goal compared to who did not have physical health related emergency interventions.

Currently having substance abuse problem resulted in a 16% decrease in choosing education as a recovery goal compared to consumers who did not currently have substance abuse problem. In contrast, consumers who received substance abuse treatment had 23% higher odds of choosing education as a recovery goal compared to consumers who did not receive substance abuse treatment.

Table 3.3 shows the results from the Cox non-proportional hazards model which shows the association between consumer characteristics and time to entering an educational program. Age, educational background, psychiatric diagnoses, residential status, employment status, current substance abuse problem, and receiving substance abuse treatment were all associated with entry into an educational program. The probability² of entry into an educational program for consumers ages 26 to 39 decreased by 68% compared to consumers ages 16-25, while the probability of entry into an educational program for consumers ages 40 to 59 decreased by 77% compared to consumers ages 16-25. Lastly, the probability of starting an educational program for ages 60 and older decreased by 83% compared to those ages 16 to 25. The probability of entering an educational program increased 63% for those who had an associate degree compared to those who had no high school degree or had an unknown educational background.

With regard to psychiatric diagnoses, having a substance abuse diagnosis decreased the probability of entering an educational program by 25% compared to consumers without a substance abuse diagnosis. Having a personality disorder decreased the probability of starting an educational program by 29%, compared to consumers who did not have a personality disorder. Having bipolar disorder increased the probability of entry into an educational program by 41%, while having depression increased the probability of starting an educational program by 41% compared to consumers who did not have bipolar or depression respectively. Lastly, having any other psychiatric disorder or an undiagnosable disorder increased the probability of beginning an educational program by 41% compared to consumers who did not have any other diagnosis or an undiagnosable disorder.

Certain residential placements had a significant effect on entry into an educational program. Independent living is associated with a 207% increase in starting an educational program compared to consumers who were not in independent living status. Supervised placement is associated with a 231% increase in initial education involvement compared to those who were not in supervised placement status.

Employment, a current substance abuse problem and receiving substance abuse treatment all had a significant effect on initial entry into an educational program. Consumers who were employed were 226% more likely to start an educational program compared to unemployed consumers. A current substance abuse problem (this is not the same as having a substance abuse psychiatric diagnosis – it is possible to have a substance abuse diagnosis and not currently be abusing drugs or alcohol) decreased the likelihood of starting an educational program by 24% compared to those who did not currently have substance abuse problem, while consumers who received substance abuse treatment increased the likelihood of starting an educational program by 49% compared to consumers who did not receive substance abuse treatment.

Figure 3.1 shows that the cumulative hazard rate (with a 95% confidence bands) of entering an educational program is increasing. This illustrates that the odds of involvement in education increase as time spent in the FSP programs increases. Estimates from other models support these findings (see the Technical Appendix for details).

² Since the terminology could be a bit awkward in the context, *probability* was used instead of the correct term *hazard*.

Chapter 4: Discussion

There are a number of factors that were associated with both choosing education as a recovery goal and starting an educational program. As age increased the likelihood of choosing education as a recovery goal and beginning an educational program decreased. Factors that increased the likelihood of choosing education as a recovery goal and starting an educational program include a diagnosis of bipolar disorder, and having an associate degree, vocational degree or some college education.

The living situation of a consumer does not have a consistent effect on choosing education as a recovery goal and starting an educational program. While independent living was not associated with choosing education as a recovery goal, it is positively associated with starting an educational program. Similarly, supervised placement is positively associated with starting an educational program but does not effect choosing education as a recovery goal. Being in a shelter increased the likelihood of choosing education as a recovery goal but did not affect entry into an educational program while being in a psychiatric hospital decreases the likelihood of choosing education as a recovery goal but does not affect entry into educational programs. Employment has a positive effect on starting an educational program.

A current substance abuse problem decreased the likelihood of choosing education as a recovery goal and starting an educational program while receiving substance abuse treatment increased the likelihood of choosing education as a recovery goal and starting an educational program. This suggests that the negative effect of substance abuse can be reversed and can increase educational outcomes if programs place a strong emphasis on substance abuse treatment. Lastly, evidence shows that the longer consumers participated in a FSP program, the higher the probability of their involvement in education.

Tables and Figures

Figure 3.1. Cumulative Hazard Rate with Confidence Bands for Involvement of Education

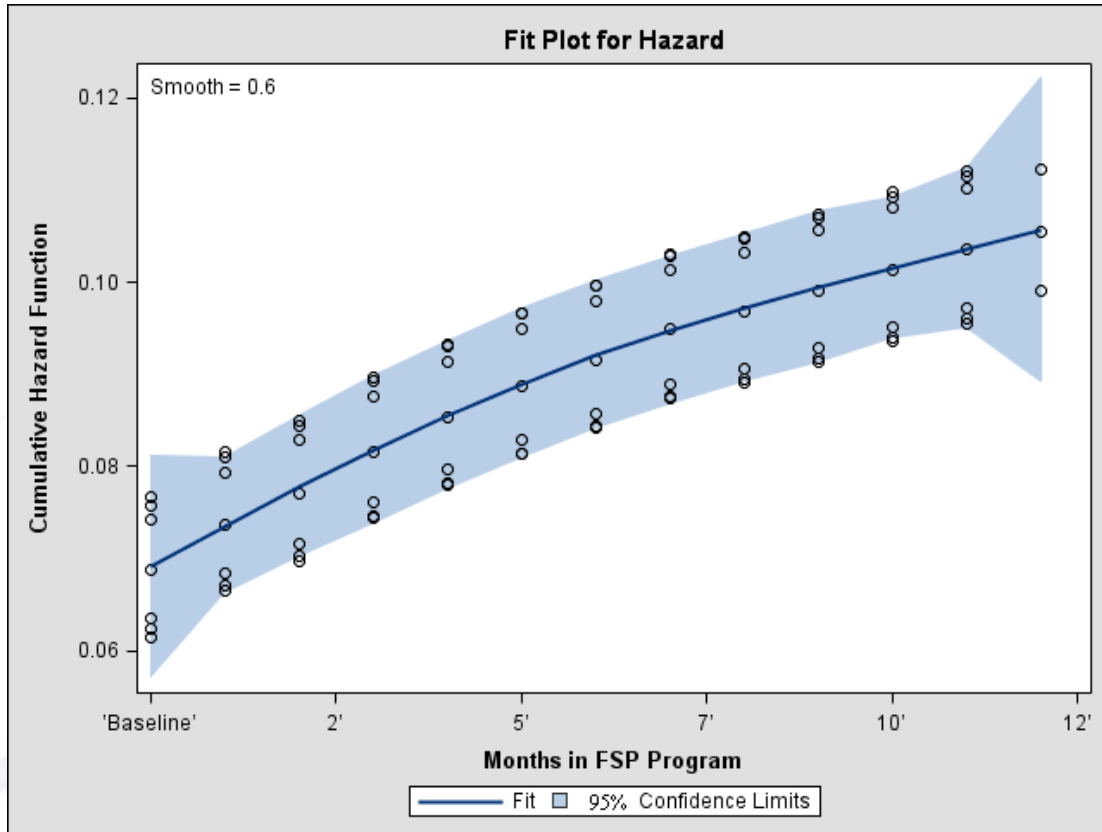


Table 3.1. Summary Statistics at Baseline (N = 9888)

Variable	% of FSP	% of Missing data				
Age						
Age 16 - 25	27.31	0.00				
Age 26 - 39	22.62	0.00				
Age 40 - 59	37.02	0.00				
Age 60 - Older	11.87	0.00				
Gender						
Male	51.17	7.47				
Female	41.35	7.47				
Educational Background						
No High/Unknown	36.29	9.74				
High School/GED	27.97	9.74				
College/Associate/Vocational Degree	21.40	9.74				
Bachelor/Master/Doctoral Degree	4.60	9.74				
Psychiatric Diagnosis						
Schizophrenia	50.84	19.57				
Substance/Alcohol Abuse	42.84	19.57				
ADHD/ODD/Conduct Disorder	2.69	19.57				
Personality Disorder	9.02	19.57				
Anxiety Disorder	17.29	19.57				
Bipolar Disorder	38.37	19.57				
Depression Disorder	39.02	19.57				
Other/Undiagnosable	19.27	19.57				
Residential Information						
Independent Living	41.63	5.37				
Shelter	12.54	5.37				
Homeless	8.99	5.37				
Supervised Residential Living	15.77	5.37				
Medical Hospital	0.34	5.37				
Psychiatric Hospital	2.86	5.37				
Licensed Residential	7.55	5.37				
Jail	2.61	5.37				
Other/Unknown	2.34	5.37				
Education	5.88	13.06				
Education as Recovery Goal	30.82	11.45				
Employment	5.99	1.91				
Employment as Recovery Goal	43.69	2.47				
Financial Support	79.74	2.96				
Legal System Involvement						
Probation	24.23	1.98				
Conservatorship	7.30	1.81				
Payee	25.15	1.59				
Substance Abuse						
Current Substance Abuse Problem	40.19	5.30				
Receiving Substance Abuse Treatment	24.74	5.14				
Emergency Intervention (by Month)						
Physical Related Emergency Intervention	0.06	(0.25)	0	8.25	15.23	0.02
Mental Related Emergency Intervention	0.11	(0.28)	0	7	8.81	0.16

Table 3.2 Variables That May Affect Choosing Education as Recovery Goal

Parameter	Parameter Estimate	Std. Error	Odds Ratio	Odds Ratio Confidence Interval
Intercept	-0.33	(0.14)		*
Age				
Age 26 - 39	-0.67	(0.09)	0.51	(0.43 , 0.61) ***
Age 40 - 59	-1.22	(0.08)	0.30	(0.25 , 0.35) ***
Age 60 - Older	-2.37	(0.14)	0.09	(0.07 , 0.12) ***
Gender				
Female	0.19	(0.06)	1.21	(1.07 , 1.38) **
Educational Background				
High School Diploma/GED	-0.05	(0.08)	0.95	(0.82 , 1.10)
College/Associate/Vocational Degree	0.51	(0.08)	1.67	(1.43 , 1.96) ***
Bachelor/Master/Doctoral Degree	0.28	(0.15)	1.33	(0.99 , 1.77)
Psychiatric Diagnosis				
Schizophrenia	0.02	(0.07)	1.02	(0.89 , 1.18)
Substance/Alcohol Abuse	-0.02	(0.07)	0.98	(0.85 , 1.12)
ADHD/ODD/Conduct Disorder	0.31	(0.16)	1.36	(0.99 , 1.86)
Personality Disorder	-0.14	(0.10)	0.87	(0.72 , 1.05)
Anxiety Disorder	0.24	(0.07)	1.27	(1.10 , 1.46) **
Bipolar Disorder	0.22	(0.06)	1.25	(1.11 , 1.42) **
Depression	0.08	(0.07)	1.08	(0.95 , 1.23)
Other/Undiagnosable	0.06	(0.07)	1.06	(0.92 , 1.22)
Residential Information				
Independent Living	0.09	(0.09)	1.09	(0.92 , 1.30)
Shelter	0.28	(0.11)	1.33	(1.07 , 1.65) **
Homeless	-0.02	(0.13)	0.98	(0.76 , 1.25)
Medical Hospital	-0.66	(0.59)	0.52	(0.16 , 1.63)
Psychiatric Hospital	-0.67	(0.21)	0.51	(0.34 , 0.77) **
Licensed Residential	-0.03	(0.13)	0.97	(0.75 , 1.27)
Jail	0.05	(0.20)	1.05	(0.71 , 1.56)
Other/Unknown	-0.07	(0.20)	0.93	(0.63 , 1.37)
Education Involvement				
	1.93	(0.15)	6.87	(5.15 , 9.15) ***
Employment				
	0.22	(0.12)	1.25	(0.98 , 1.59)
Financial Support				
	-0.19	(0.08)	0.83	(0.71 , 0.97) *
Legal System Involvement				
Probation	0.42	(0.07)	1.52	(1.32 , 1.75) ***
Conservatorship	0.21	(0.14)	1.23	(0.94 , 1.60)
Payee	-0.22	(0.08)	0.80	(0.69 , 0.94) **
Substance Abuse				
Substance Abuse Problem	-0.18	(0.07)	0.84	(0.73 , 0.97) *
Receiving Substance Abuse Treatment	0.20	(0.08)	1.23	(1.05 , 1.43) **
Emergency Intervention				
Physical Related Emergency Intervention	0.45	(0.12)	1.57	(1.25 , 1.98) **
Mental Related Emergency Intervention	-0.15	(0.12)	0.86	(0.68 , 1.08)

*** <.0001 **<.01 *<.05

Table 3.3. Predictors of Initial Education Involvement for FSP Consumers Estimates using Cox Hazards Model

Parameter	Estimate	Std. Error	Hazard Ratio	Hazard Ratio Confidence Interval
Age				
Age 26 - 39	-1.13	(0.12)	0.32	(0.25 , 0.41) ***
Age 40 - 59	-1.47	(0.11)	0.23	(0.19 , 0.29) ***
Age 60 - Older	-1.79	(0.18)	0.17	(0.12 , 0.24) ***
Gender				
Female	-0.04	(0.09)	0.96	(0.81 , 1.14)
Educational Background				
High School/GED	-0.04	(0.10)	0.96	(0.78 , 1.18)
College/Associate/Technical/Vocational Degree	0.49	(0.11)	1.63	(1.32 , 2.00) ***
Bachelor/Master/Doctoral Degree	0.20	(0.22)	1.22	(0.80 , 1.87)
Psychiatric Diagnosis				
Schizophrenia	-0.04	(0.09)	0.96	(0.80 , 1.15)
Substance/Alcohol Abuse	-0.29	(0.10)	0.75	(0.62 , 0.90) **
ADHD/ODD/Conduct Disorder	0.18	(0.15)	1.20	(0.89 , 1.63)
Personality Disorder	-0.35	(0.16)	0.71	(0.52 , 0.96) *
Anxiety Disorder	0.07	(0.09)	1.07	(0.89 , 1.29)
Bipolar Disorder	0.34	(0.09)	1.41	(1.19 , 1.67) ***
Depression Disorder	0.34	(0.09)	1.41	(1.18 , 1.68) **
Other/Undiagnosable	0.34	(0.09)	1.41	(1.18 , 1.68) **
Residential Information				
Independent Living	0.73	(0.37)	2.07	(1.00 , 4.28) *
Shelter	0.49	(0.38)	1.63	(0.77 , 3.46)
Homeless	0.04	(0.41)	1.04	(0.46 , 2.35)
Supervised Residential	0.84	(0.37)	2.31	(1.12 , 4.77) *
Medical Hospital	-0.50	(1.05)	0.61	(0.08 , 4.72)
Psychiatric Hospital	-0.64	(0.55)	0.53	(0.18 , 1.56)
Licensed Residential	0.50	(0.39)	1.65	(0.77 , 3.57)
Jail	0.24	(0.48)	1.28	(0.50 , 3.27)
Other/Unknown	0.36	(0.42)	1.43	(0.62 , 3.26)
Employment				
Employment	0.81	(0.11)	2.26	(1.82 , 2.79) ***
Financial Support				
Financial Support	0.11	(0.12)	1.11	(0.88 , 1.40)
Legal System Involvement				
Probation	-0.09	(0.10)	0.92	(0.75 , 1.12)
Conservatorship	-0.22	(0.22)	0.81	(0.52 , 1.25)
Payee	-0.17	(0.11)	0.84	(0.67 , 1.05)
Substance Abuse				
Current Substance Abuse Problem	-0.28	(0.11)	0.76	(0.61 , 0.93) **
Receiving Substance Abuse Treatment	0.40	(0.11)	1.49	(1.20 , 1.86) **
Emergency Intervention				
Physical Related Emergency Intervention	-0.16	(0.25)	0.85	(0.52 , 1.40)
Mental Related Emergency Intervention	-0.23	(0.25)	0.79	(0.48 , 1.31)

*** <.0001 **<.001 *<.05

Figure 5.1 ROC Curve from Logistic Regression Model for Education as Recovery Goal

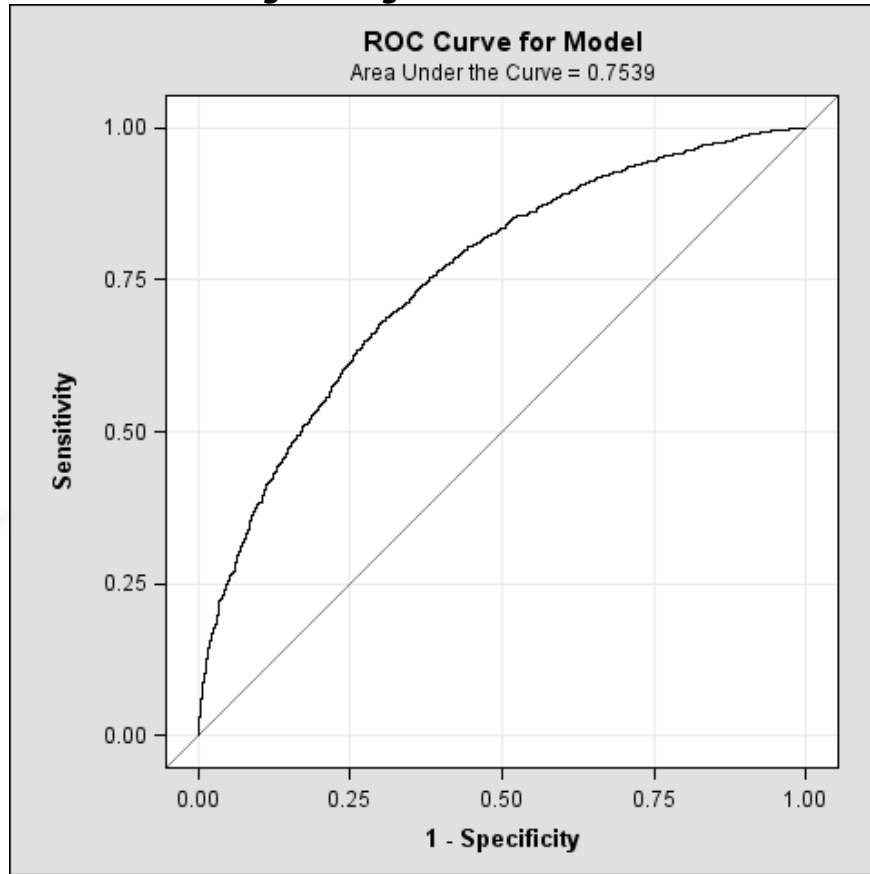


Table 5.1 Estimates from Gamma Accelerated Failure Time Model for Left-Censored Cases

Parameter	Estimates†	Std. Error	95% Confidence Interval	
Intercept	3.78	(0.18)	(3.42 , 4.14)	***
Age				
Age 26 - 39	0.93	(0.12)	(0.69 , 1.16)	***
Age 40 - 59	1.22	(0.13)	(0.98 , 1.47)	***
Age 60 - Older	1.48	(0.17)	(1.14 , 1.81)	***
Gender				
Female	0.00	(0.07)	-(0.15 , 0.14)	
Educational Background				
High School Diploma/GED	-0.01	(0.09)	-(0.18 , 0.16)	
College/Associate/Vocational Degree	-0.44	(0.10)	-(0.63 , -0.25)	***
Bachelor/Master/Doctoral Degree	-0.21	(0.18)	-(0.57 , 0.15)	
Psychiatric Diagnosis				
Schizophrenia	0.01	(0.08)	-(0.14 , 0.17)	
Substance/Alcohol Abuse	0.22	(0.08)	(0.06 , 0.39)	**
ADHD/ODD/Conduct Disorder	-0.16	(0.14)	-(0.43 , 0.11)	
Personality Disorder	0.30	(0.13)	(0.05 , 0.56)	*
Anxiety Disorder	-0.06	(0.08)	-(0.22 , 0.10)	
Bipolar Disorder	-0.30	(0.08)	-(0.45 , -0.15)	***
Depression Disorder	-0.31	(0.08)	-(0.47 , -0.16)	***
Other/Undiagnosable	-0.31	(0.08)	-(0.46 , -0.16)	***
Residential Information‡				
Independent Living	-0.02	(0.10)	-(0.22 , 0.17)	
Shelter	0.19	(0.13)	-(0.08 , 0.45)	
Homeless	0.20	(0.16)	-(0.11 , 0.50)	
Medical Hospital	0.55	(0.82)	-(1.06 , 2.15)	
Psychiatric Hospital	0.78	(0.33)	(0.13 , 1.43)	*
Licensed Residential	0.04	(0.16)	-(0.27 , 0.35)	
Jail	0.38	(0.31)	-(0.23 , 0.99)	
Other/Unknown	0.29	(0.22)	-(0.13 , 0.72)	
Employment	-0.61	(0.12)	-(0.84 , -0.37)	***
Financial Support	0.01	(0.10)	-(0.18 , 0.20)	
Legal System Involvement				
Probation	0.05	(0.09)	-(0.12 , 0.22)	
Conservatorship	0.21	(0.19)	-(0.16 , 0.58)	
Payee	0.09	(0.09)	-(0.09 , 0.28)	
Substance Abuse				
Current Substance Abuse Problem	0.26	(0.09)	(0.09 , 0.44)	**
Receiving Substance Abuse Treatment	-0.33	(0.10)	-(0.52 , -0.14)	**
Emergency Intervention				
Physical Related Emergency Intervention	0.47	(0.27)	-(0.06 , 0.99)	
Mental Related Emergency Intervention	0.62	(0.22)	(0.18 , 1.06)	**
Scale	1.02	(0.17)	(0.74 , 1.41)	
Shape	0.67	(0.20)	(0.29 , 1.05)	

† Positive coefficient indicates a longer time to enter an educational program, while negative implies a shorter time.

‡ Since residential status was mutually exclusive at baseline, Supervised Residential was used as the reference group.

*** <.0001 **<.001 *<.05

Technical Appendix

Data

The data was analyzed with following assumptions:

1. Any observations with missing identifiers (ID) were deleted³.
2. Any duplicate records with regards to ID in the Partnership Assessment Form (PAF) were deleted, and only the last record was kept.
3. For the survival model, the discontinuation and reestablishment of participation in the Full Service Partnership (FSP) program were not taken into account, since it is assumed that the consumer's status at any given month would not be changed during the time of discontinuation of the program.
4. For the generalized estimating equations (GEE) and generalized linear mixed model (GLMM), the discontinuation and reestablishment of participation in a FSP program were taken into account and coded as missing during the period of discontinuation.
5. Any records with incorrect or inconsistent entry/exit sequences were excluded.
6. When a Key Event Tracking Form (KET) for either an entry into or exit from an education program was duplicated consecutively with different dates, the observation from only the first instance was kept and all subsequent multiple entries or exits were deleted (*e.g.*, if a KET for entry was followed by another KET for entry without a KET for exit, or if a KET for exit is followed by another KET for exit without a KET for entry, the second duplicated record was deleted).
7. If a KET was filed on the same day a consumer started the FSP program, the record was included.
8. Consumers under 16 years of age at the time of entry into the FSP program were excluded from the analysis.
9. Since the total number of emergency interventions recorded in a PAF is the total number of such interventions occurring during the 12 month period before a consumer participated in a FSP program, this number was divided by 12 (which yields an average monthly value) in order to make it consistent with data that was recorded by month.
10. If a participant was in a FSP program for less than 12 months, the last values were coded as missing. For instance, if a consumer participated in a FSP program for only 8 months, the values for the months 9 to 12 would be considered missing. The data were also estimated with the missing values imputed with the last observed value for the consumer, known as the last value carried forward (LVCF) (Fitzmaurice et al., 2004).
11. The PAF, KET and Quartely Assessment Form (3M) were merged by ID to calculate the duration of any specific status, and also to calculate the status at any given month for each consumer.
12. The FSP dataset was merged with CSI dataset, which records the consumers' psychiatric diagnoses, by ID.⁴

³ All identifiers were encrypted.

13. The status for the month was determined by whether or not a client meets the criteria for employment status, residential status, *etc.* for at least 15 days. For instance, if a client changed their employment status from unemployed to employed and remained employed for at least 15 days, then the employment status was assigned a value of 1, otherwise 0. Consequently, if the consumer changed his/her employment status several times within a given month, a random value was assigned.
14. A person-level data set, in which there is one record per participant, including the time-dependent covariates, was constructed for the study of education as a recovery goal (logistic regression). The analysis of participation in educational programs (survival analysis) accounted for the left-censored⁵ and/or right-censored⁶ cases in determining entry into an educational program. The data was reconfigured into a person-period dataset, in which there is one record per observation, for the longitudinal analyses using the GEE and GLMM (Singer et al., 2003).
15. Missing at random (MAR) was assumed to handle the issues of missing values for the GEE model.
16. The various residential settings were collapsed in the following manner:
 - 1) Independent Living:
 - a. In an apartment/house alone/with spouse/partner/minor children/other dependents/roommate-must hold lease or share in rent /mortgage.
 - b. With one or both biological/adoptive parents
 - c. With adult family member(s) other than parents
 - d. Single room occupancy (must hold lease)
 - e. Foster home (with relatives)
 - f. Foster home (with non-relatives)
 - 2) Shelter:
 - a. Emergency shelter/temporary housing (includes people living with friends but pay no rent)
 - 3) Homeless:
 - a. Homeless (includes people living in their cars)
 - 4) Supervised Residential:
 - a. Unlicensed but supervised individual placement (includes paid caretakers, personal care attendants)
 - b. Assisted living facility
 - c. Unlicensed but supervised congregate (includes group living homes, sober living homes)
 - d. Licensed community care facility (Board and Care)
 - 5) Medical Hospital
 - 6) Psychiatric Hospital:
 - a. Acute psychiatric hospital/psychiatric health facility (PHF)
 - b. State psychiatric hospital
 - 7) Residential Program:
 - a. Licensed residential treatment (includes crisis, short-term, long-term, substance abuse, dual diagnosis residential programs)
 - b. Skilled nursing facility (physical)

⁴ About 20% of the population in FSPs did not have matching information in the CSI dataset.

⁵ The event occurred some time before a client participated in a FSP program, but we do not know the exact time.

⁶ The consumer started a FSP without being in an education program and did not begin an education program throughout the period of the study.

- c. Skilled nursing facility (psychiatric)
 - d. Long-term institutional care [Institution for Mental Disease (IMD), Mental Health Rehabilitation Center (MHRC)]
 - e. Group home (level 0-11)
 - f. Group home (level 12-14)
 - g. Community treatment facility
- 8) Jail:
- a. Jail
 - b. Prison
 - c. Juvenile hall/camp/ranch
 - d. Division of juvenile justice
- 9) Other:
- a. Other
 - b. Unknown

Statistical analysis

The variance inflation factor (VIF) was used to check for multicollinearity which occurs when two or more independent variables are highly correlated with one another (Allison, 1999). If a high VIF or prior knowledge indicated that the variables were imparting similar information to the models, dropping one of the variables was explored. There was a correlation between residential status and who referred the client to a FSP program so the variable “referral” was dropped from the analysis. The variable “currently has a substance abuse problem” from the DCR and the variable “substance abuse diagnosis” from CSI were both included because the “currently has a substance abuse problem” variable from the DCR provided the information on current substance abuse problems, while the substance abuse diagnosis from the CSI only gives a history of substance abuse rather than the current status. The low VIF⁷ also indicated that two variables could be in the model because they were not correlated. Variables in the Cox Non-proportional Hazards model such as gender, financial support, legal system involvement, and emergency intervention were included in the model although they are not statistically significant because of their importance for making policy decisions.

To determine what factors were associated with choosing education as a recovery goal, we used logistic regression to predict the probability of a consumer choosing education as the part of their recovery goals. The Hosmer and Lemeshow goodness of fit test was assessed for fitting a model (Hosmer et al., 2000). To visualize how well the logistic regression predicted the outcome variable, the receiver operating characteristic (ROC) curve was used (Afifi et al., 2004) as shown in Figure 5.1. The model is the following:

$\log it \{Pr(y_i = 1 | x_i)\} = \beta_1 + \beta_2 x_i$, where β_1 is the intercept, β_2 is the vector of coefficients, and x_i represents the vector of covariates.

Several methods were investigated to predict time to a consumer’s involvement in an educational program. Since each method provides different perspectives to the policy makers, a variety of methods were investigated and compared. Based on our investigation, we chose the Cox non-proportional hazards model as the main model from which we make inferences (Cox et al., 1984; Cox et al., 1989).

To produce crude estimates and plots of the survivor functions, the LIFETEST procedure with the Kaplan-Meier method and the life-table method (also known as the actuarial method) were used⁸ in the

⁷ The value was 1.14.

⁸ For the survival analyses using the LIFETEST, LIFEREG and PHREG procedures, a consumer’s first involvement in an educational program was the dependent variable of interest.

preliminary examinations (SAS Institute Inc., 2009). In order to visualize the hazards function and confidence bands, the LOESS (locally weighted scatter plot smoothing) procedure was used as graphical method (SAS Institute Inc., 2009).

Since our dataset was heavily left-censored, ignoring the left-censored cases could cause biased results (Allison, 1995). To accommodate this left-censored data, the LIFEREG procedure was used to produce estimates of parametric regression models, which are also known as the accelerated failure time (AFT) model (SAS Institute Inc., 2009) shown in Table 5.1. After testing the distribution for the time to event using the maximum likelihood fit statistics, the gamma model was applied conditioning on the covariates. The survivor function of the gamma AFT model is the following: $\log(T) = \alpha + \beta Z + \sigma \varepsilon$, where T notes the survival time, β is a vector of regression coefficients, Z is a vector of covariates, σ is the coefficient of the disturbance term, and ε is a random independent disturbance term. If ε has a gamma distribution,

$s_i(t | z) = s_j(t \phi_{ij}) = \int_t^\infty \frac{\lambda (\lambda z)^{k-1} e^{-\lambda z}}{\Gamma(K)} dz$, where ϕ_{ij} is a constant for each i and any other j, $K = 1/\delta^2$ (δ is the shape parameter), $\lambda = \exp\{-[\alpha + \beta Z]\}$, and $\Gamma(K) = (K-1)!$ ($\Gamma(\cdot)$ is the gamma function) (Klein et al, 2003).

Following-up consumers' status using the Cox's non-proportional hazards model, it was essential to take into account the time-dependant covariates. Ignoring the time-varying information could lead to imprecise results (Allison, 1995). For instance, if a consumer was in jail in any given month, the continuation of education would be harder than if a consumer was in an independent living status. The Cox non-proportional hazards model was used to deal with the time-dependant variables collected from the KET and 3M. For this purpose, PHREG procedure was used to estimate the survivor functions with the exact method in order to handle ties (SAS Institute Inc., 2009). The model is written as $h_i(t | X_1, X_2) = h_0(t) \exp(\beta_1 X_{i1} + \beta_{i2} X_{i2}(t))$, where $h_0(t)$ is the hazard function at baseline, β_1 and β_2 are vectors of coefficients, X_{i1} is a vector of constant variables, and X_{i2} is a vector of time-dependent variables at time t.

To reduce the problem of causal ordering for the survival analysis, the lagged covariates, which were the covariate values one month prior to a change in education status, were also analyzed (Allison, 1995). For instance, it would be possible to check whether the change of residential status from homeless to independent living affects a consumer's education or vice versa.

Since our dataset showed about 27% of events⁹ were repeated during a one-year period with up to four changes in the education status, the GEE model was investigated. The GEE model estimates the probability of population-averages (or marginal) effects considering the dependence by the repeated measures among the consumers for longitudinal data with dichotomous responses (Zeger and Liang 1986). The GEE model provides direct estimates of the effect of FSP duration on educational program involvement. The covariance structures were tested using the GENMOD procedure (SAS Institute Inc., 2009). The estimates of odd ratios derived from the population average model were obtained using the unstructured covariance structure with the logit link function and robust standard errors calculated using the sandwich variance estimator. We assume that the marginal probability of involvement in an educational program at a given month is:

$\logit\{\Pr(y_{ij} = 1 | x_{ij})\} = \beta_1 + \beta_2 x_{ij}$, where β_1 is intercept, β_2 is a vector of coefficients, x_{ij} represents time for the consumer j at a given month i.¹⁰

Since we expect variation among consumers with regard to involvement of education, the GLMM was explored to determine the existence of unmeasured heterogeneity (Fitzmaurice et al., 2004). The GLMM

⁹ The meaning of events is different between the survival model and the GEE and GLMM. In the survival model, the meaning is the first occurrence of educational program involvement. For the GEE and GLMM, events are educational program involvement status changes.

¹⁰ Covariates not included in the model due to the convergence error with unstructured covariance structure.

estimated the probability of subject-specific effects as a function of covariates. The covariance structures were tested using the GLIMMIX procedure that provides model fit statistics (SAS Institute Inc., 2009). The adaptive quadrature maximum likelihood estimation method was used with 100 quadrature points for the approximation. The estimates of odd ratios derived from the random-intercept logistic regression model were obtained assuming the unstructured correlation structure with the logit link function. The model can be written as: $\log it \{Pr(y_{ij} = 1 | x_{ij}, \zeta_j)\} = \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \zeta_j$, where $\zeta_j | x_{ij} \sim N(0, \psi)$ and ζ_j independent across consumer j , giving a random intercept logistic regression model. β_1 is intercept, β_2 and β_3 are the vector of coefficients, x_{2ij} represents time at a given month i , and x_{3ij} represents the vector of covariates (Rabe-Hesketh et al., 2008).

Likewise, using the latent response formulation, the model is:

$y_{ij}^* = \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \zeta_j + \varepsilon_{ij}$, where $\zeta_j | x_{ij} \sim N(0, \psi)$ and $\varepsilon_{ij} | x_{ij}, \zeta_j$ have a logistic distribution and are independent across consumer j . ε_{ij} is independent across both time and consumers, and independent of ζ_j . β_1 is intercept, β_2 and β_3 are the vector of coefficients, x_{2ij} represents time and x_{3ij} represents the vector of covariates. The conditional intra-class correlation (ρ) of the latent responses y_{ij}^* , given the covariates for the heterogeneity among consumers, was calculated based on $\rho \equiv cor(y_{ij}^*, y_{i'j}^* | x_{ij}, x_{i'j}) = cor(\varepsilon_{ij}, \varepsilon_{i'j}) = \frac{\psi}{\psi + \pi^2 / 3}$ (Rabe-Hesketh et al., 2008).

Assuming MAR for the missing or dropout data, the estimates using the maximum likelihood estimation are close to the true parameters in the large sample and less susceptible to bias (Rabe-Hesketh et al., 2008). So the estimates were obtained with the assumption of MAR and also LVCF imputations, and compared.

All SAS procedures for data management and analyses were performed with SAS 9.2 (SAS Institute Inc., 2007; SAS Institute Inc., 2009). Statistical significance throughout was defined $\alpha < 0.05$.

Results

Table 3.2 shows the estimates of variables associated with choosing recovery as an education goal. The data from the 6,009 participants who had no missing values for the response or explanatory variables were utilized. Of these participants, 1,987 partners responded that education was one of their recovery goals. The testing global null hypothesis was highly significant ($p < .0001$). The p -value of Hosmer and Lemeshow goodness of fit test is 0.58, indicating the model fit well. The ROC curve in Figure 5.1 showed the value of the area under the curve was 0.75.

Table 3.3 shows the results from the Cox non-proportional hazards model which shows the association between consumer characteristics and entering an educational program for the first time. At baseline 8.96% of consumers were involved in educational programs (involvement in educational program: 591, censored: 6,006). The testing global null hypothesis is highly significantly ($p < .0001$).

A check for the problem of causal ordering for the survival analysis, the lagged covariates, which were the covariate values one month prior to a change in education status, were analyzed. The results from the lagged time-dependant covariates model showed that age, educational background, psychiatric diagnosis, residential status, being employed, and receiving substance abuse treatment were still statistically significant (table not included in the report).

Figure 3.1 shows the cumulative hazard rate with 95% confidence band is increasing. This shows that involvement in education increases as time in FSPs increases. The shape using gamma accelerated failure time model in Table 5.1 also shows a result consistent with the Figure 5.1.

The results from the Cox non-proportional hazards model, which took into account time-dependant covariates, were similar to those based on the gamma accelerated failure time (AFT) model except for the residential status and mental health related emergency intervention. The ATF model which took into account left-censored cases is shown in Table 5.1. Variables that were significant in relation to educational involvement include age, educational background, psychiatric diagnosis, residential status, employment, current substance abuse problem, receiving substance abuse treatment, and mental health related emergency intervention. A positive coefficient indicates a longer time to enter an educational program, while a negative coefficient indicates a shorter time to enter an educational program. For instance, the positive coefficient of current substance abuse problem indicates that those who had the current substance abuse problems took a longer time to enter an educational program than those who did not. The negative coefficient of the receiving substance abuse treatment variable was associated with a shorter time to enter an educational program. The expected time to involvement in an educational program for those who had the substance abuse was 30% longer than for those who did not have substance abuse (95% Confidence Interval: 1.09, 1.55), controlling for the other covariates. Likewise, receiving substance abuse treatment was associated with a 28% decrease in expected time to enter into educational program as compared to those who did not receive substance abuse treatment, holding other covariates constant (95% Confidence Interval : 0.59, 0.87).¹¹

In fitting the GEE model, involvement of education (i.e. events) was about 7.96% (events: 7,275, observations: 91,408). The time in a FSP substantially increased education involvement. Consumers who participated in a FSP program for six months had the odds of starting an educational program increase by 16.84% (95% Confidence Interval: 1.12, 1.22). Consumers who participated in a FSP for one year had the odds of starting an educational program increase by 30.34% (95% Confidence Interval: 1.23, 1.38), compared to the baseline respectively (table not included in the report).

From the random-intercept logistic regression model the estimated conditional intra-class correlation is 0.92, given the subject-specific random intercept and the covariates, which implies that the heterogeneity among consumers is considerable. Thus, there is substantial consumer-to-consumer variability in terms of baseline of involvement in education (table not included in the report). The results from the analysis under the assumption of MAR for the missing or dropout values are similar to those based on the LVCF imputations (table not included in the report).

Limitations

There are a number of limitations in this study. First, one county did not report any changes for educational status among FSP participants, which seems unlikely. Thus, issues of data accuracy and data reporting problems could exist. Second, 15 days were used as a threshold to determine the monthly status of some of the variables, so if a consumer changed status several times in a month, a random value was assigned. Finally, the dataset showed a wide range of characteristics among the consumers, indicating that there were a number of outliers which can bias the results. Also, since the estimated intra-subject correlation was considerably large, indicating substantial heterogeneity among consumers and that caution be exercise when making inferences (Rabe-Hesketh et al., 2008).

¹¹ These numbers were calculated from the data in Table 5.1

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