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Disengagement in Immigrant Groups Receiving Services for a First Episode of Psychosis

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Abstract

Objective: Although early intervention (EI) programs for psychosis invest in keeping clients engaged in treatment, disengagement remains a concern. It is not entirely clear whether immigrants are likelier to disengage. The rates and predictors of disengagement for immigrant vis-à-vis non-immigrant clients in a Canadian EI setting were analyzed. ***Method***: 297 clients were included in a time-to-event analysis with Cox Proportional Hazards regression models. Immigrant status (first- or second-generation immigrant or non-immigrant), age, gender, education, substance abuse, family contact, social and material deprivation and medication non-adherence were tested as predictors of service disengagement. ***Results***: 24.2% (n = 72) of the clients disengaged from services before completing two years. Disengagement rates did not differ between first-generation immigrants (23.3%), second-generation immigrants (22.7%) and non-immigrants (25.3%). For all clients, only medication non-adherence predicted disengagement (HR = 3.81, 95% CI 2.37-6.14). For first-generation immigrants, age (HR = 1.17, 95% CI 1.02-1.34) and medication non-adherence (HR = 2.92, 95% CI 1.09-7.85) were significant predictors. For second-generation immigrants, material deprivation (HR = 1.03, 95% CI 1.00-1.05) and medication non-adherence (HR = 11.07, 95% CI 3.20-38.22) were significant. ***Conclusion***: Disengagement rates may be similar between immigrants and non-immigrants, but their reasons for disengagement may differ. Medication adherence was an important predictor for all, but the role of various sociodemographic factors differed by group. Sustaining all clients' engagement in EI programs may therefore require multi-pronged approaches.

Key Words: early intervention, psychosis, immigrant, disengagement

1.0 Introduction

Early intervention (EI) service paradigms (Malla et al., 2007; Nordentoft et al., 2014) have contributed to improving the clinical and functional outcomes (Malla et al., 2007; Iyer et al., 2015; Lal and Malla, 2015; Anderson et al., 2015) of psychosis. A key strength of EI is the priority it places on keeping clients engaged, which is reflected in its service design and goals (Birchwood, 2014; Iyer et al., 2015). Despite these advances, disengagement from EI programs remains a concern, with typically reported rates of disengagement being 20-40% (Turner et al., 2007; Conus et al., 2010; Doyle et al., 2014; Malla et al., 2007; Stowkowy et al., 2012). Certain characteristics, such as low socioeconomic status, substance misuse or poor family support have been associated with increased risk of disengagement. Reasons for disengagement include dissatisfaction with services, feeling that services do not meet their needs, lack of trust, poor insight, and stigma (Lal and Malla, 2015). Although time to disengagement from EI services is less frequently reported, there may be periods of higher risk for disengagement such as early in and/or towards the end of treatment (Conus et al., 2010). Thus, time-to-disengagement is an important factor to examine (Lal and Malla, 2015; Turner et al., 2007; Conus et al., 2010; Doyle et al., 2014; Malla et al., 2007; Stowkowy et al., 2012). Variables such as family involvement and substance use may also differ between individuals who disengage early versus later in the course of receiving EI (Stowkowy et al., 2012).

Immigrant populations have a higher risk of developing a psychotic disorder as compared to non-immigrants (Bourque et al., 2011; Cantor-Graae and Selten, 2005), yet immigrants are less likely to access mental health care (Kirmayer et al., 2007; Whitley et al., 2006; Edge and Newbold, 2013; Thomson et al., 2015). Immigrants face extensive challenges

in accessing care (Thomson et al., 2015), and two recent studies suggest that they are at a greater risk for disengaging from EI services (Ouellet-Plamondon et al., 2015; Abdel-Baki et al., 2015). It is therefore important to establish if indeed immigrants are at greater risk of disengagement from EI services, and to examine potential drivers of service disengagement among immigrants.

Many EI services make significant efforts to keep clients engaged in treatment. It is unclear whether current engagement efforts are effective or if they differentially impact certain client groups. This makes understanding the reasons for disengagement and how they vary across different client sub-groups crucial (Nordentoft et al., 2014).

1.1 Aims and Objectives

We aimed to evaluate the rates and early predictors of service disengagement among non-immigrant and immigrant clients at an EI for psychosis service in Montréal, Canada. We sought to examine similarities and differences in these factors across non-immigrants, first-generation and second-generation immigrants. Additionally, given the important intersection of immigrant and visible minority status, we also sought to investigate these issues across visible minority groups.

2.0 Methods

2.1 Study Population

This is a prospective study that included all clients who entered PEPP-Montréal between

January 2003 and July 2012; met program eligibility criteria (aged 14-35 years; and were diagnosed with affective or non-affective psychosis with less than 1 month of previous antipsychotic treatment); consented to assessments and had complete data for the variables of interest. Exclusion criteria were not having organic brain damage, pervasive developmental disorder, an IQ below 70, epilepsy or substance-induced psychosis (Iyer et al., 2015). PEPP-Montréal is publicly funded and the sole program in its catchment for youth with first-episode psychosis, making its patient sample representative of the surrounding population. Treatment is provided for two years, and comprises intensive case management and psychosocial (e.g., family psychoeducation) and medical management (Iyer et al., 2015). This is part of a larger study approved by the Research Ethics Board at the Douglas Mental Health University Institute. Rigorously trained research staff were responsible for all data collection, with repeated checks and other means to ensure high-quality data.

2.2 Service Disengagement

Service disengagement was defined as having no clinical contact for at least three consecutive months (Anderson et al., 2013) (i.e., no clinic or community appointments with the psychiatrist and/or case manager and not responding to phone calls). Time to disengagement was recorded as the time from program entry to the first month (of the three consecutive months) of no contact. Clients who moved or were transferred were censored as of that time and were not considered to have disengaged. Clients who completed the two-year program were censored at 24 months.

2.3 Sociodemographic and Baseline Data

Sociodemographic variables that were previously shown to be important for predicting disengagement were recorded, including age, gender (female/male), education level (completed/did not complete high school), substance use diagnosis based on the Structured Clinical Interview for DSM-IV (yes/no), and family contact with the treatment team (yes/no). Social Deprivation Index (SDI; combines 3 indicators from the Canadian census: the proportion of the population aged 15 and over living alone, the proportion of the population aged 15 and over who are separated, divorced or widowed, and the proportion of single-parent families) and Material Deprivation Index (MDI; combines 3 indicators from the Canadian census: the proportion of the population 15 years and over without a high school diploma (or equivalent), the employment to population ratio for the population 15 years and over, and the average income of the population aged 15 years and over) (Gamache et al., 2010) were used as a proxies for socioeconomic status (SES) and were included as continuous variables based on centiles ranging from 0 to 100, with higher scores indicating higher levels of deprivation. Medication adherence during months one to three of treatment was included as a putative early predictor of disengagement. It was reported as a dichotomous variable with "adherent" being adherent for 75% or more during all three months and "non-adherent" being less than 75% at any time within the first three months (Jordan et al., 2014; Cassidy et al., 2010).

2.4 Immigration and Visible Minority Status

Individuals born outside Canada were coded as first-generation immigrants. Those born in Canada with at least one parent born outside Canada were coded as second-generation

immigrants. Those born in Canada with both parents born in Canada were coded as non-immigrants (Anderson et al., 2015; Statistics Canada, 2013a). Visible minority status was self-reported; options were based on Statistics Canada's classification (Statistics Canada, 2013b) of Caucasian, Black, Asian (includes Chinese, South Asian, Filipino, South-East Asian, West Asian, Korean, Japanese), Aboriginal or Other (Latin America, Arab, multiple). The small number of individuals who identified as Aboriginal (n=4) were excluded given their unique historical contexts and internal migration patterns.

2.5 Data Analysis

Descriptive statistics are presented as proportions for count data and as means with standard deviations (SD) for continuous data. Independent sample t-tests (for continuous variables) and Pearson Chi-squared tests (for dichotomous variables) were used to assess group differences between clients who completed treatment and clients who disengaged before the two year timepoint. Pearson Chi-squared tests with post-hoc adjusted residual calculations (for dichotomous variables) and one-way ANOVAs with Tukey post-hoc tests (for continuous variables) were used to assess group differences between non-immigrants, first-generation and second-generation immigrants.

Kaplan-Meier time-to-event curves were plotted for each immigrant group to demonstrate the rate and pattern of disengagement. Log-rank test assessed differences between groups. Cox Proportional Hazards regression analysis was used to determine the predictive value of the selected sociodemographic and baseline variables on disengagement for all clients and for each immigrant sub-group. A post-hoc time-to-event

and Cox Proportional Hazards regression analyses were carried out with visible minority status replacing immigration status. Results are presented as hazard ratios (HR) with 95% confidence intervals (CI). All analyses were performed using SPSS software, version 20.

3.0 Results

Table 1 presents key clinical and sociodemographic characteristics for the sample (N=297) of PEPP clients included in this study. 208 (70.0%) had non-affective psychosis, 88 (29.6%) had affective psychosis, and 1 (.3%) was missing a main diagnosis. The median duration of untreated psychosis was 15.1 weeks (range 0 – 1011.6).

3.1 Completers vs. Disengagers

Of the 297 included clients, 72 (24.2%) disengaged with an average time to disengagement of 13.3 (SD=5.7) months. Compared to those who remained engaged, a higher proportion of those who disengaged were non-adherent to medication [χ^2 (1, N=297) = 27.4, $p < .01$], had completed high school [χ^2 (1, N=297) = 4.16, $p < .05$], and were older [$t(295)=-2.0$, $p < .05$] (Table 1).

3.2 Immigration Status and Disengagement

There were 73 (24.6%) first-generation immigrants, 66 (22.2%) second-generation immigrants, and 158 (53.2%) non-immigrants. Most first-generation immigrants were born in Africa (28.8%), Europe (28.8%) or Asia (27.4%). A smaller proportion were born in the Caribbean, Central or South America (13.7%) or the USA (0.01%). The majority of first-generation immigrants were naturalized Canadian citizens (n=41); other statuses

included permanent resident (n=7), landed immigrant (n=3), citizen by birth (n=2), refugee claimant (n=1), other (n=7) or missing (n=14).

For second-generation immigrants, father's (n=55) and mother's (n=46) place of birth demonstrated similar patterns with the majority being born in Asia (n=18, n=13), Caribbean, Central or South America (n=17, n=22) or Europe (n=13, n=8). A smaller number were born in Africa (n=3, n=1), USA (n=2, n=2), Oceania (n=1, n=0).

17 (23.3%) first-generation immigrants disengaged, 15 (22.7%) second-generation immigrants disengaged and 40 (25.3%) non-immigrants disengaged. The total disengagement rate for immigrants (first- and second-generation) was 23.0%. There were no statistical differences between these groups in terms of their disengagement rates [χ^2 (2, N= 297) =0.23, p>.05] or their time-to-disengagement [F(2,69) = 0.489, p>.05] (Figure 1).

Comparisons between immigrant sub-groups demonstrated that, on average, second-generation immigrants were younger than non-immigrants [21.8 years SD 4.1 vs. 23.7 years SD 4.1; F(2,294)= 4.851, p<.01 Tukey's post-hoc p< .01] (Table 2). A higher proportion of non-immigrants had a substance use disorder [65.8% vs. 45.2% of first-generation immigrants and 50.0% of second-generation immigrants; χ^2 (2,N=297) = 10.49, p<.01]. A higher proportion of non-immigrants (23.4%) had no family contact compared to both first- (16.4%) and second-generation (6.1%) immigrants [χ^2 (2, N=297) = 9.70, p<.01]. More non-immigrants came from materially deprived areas than second-

generation immigrants [51.5 SD 31.8 vs. 64.8 SD 27.8; $F(2,294)= 4.846$, $p<.01$, Tukey's post-hoc $p<.01$].

3.3 Predictors of Disengagement

The Cox Proportional Hazards regression found that clients who were medication non-adherent within the first three months had a significantly higher likelihood of disengagement (HR = 3.81, 95% CI 2.37-6.14). There were no statistically significant effects for age, sex, immigration status, education level, substance use, family contact, or social or material deprivation indices (Table 3). When only first-generation immigrants were analyzed, age (HR = 1.17, 95% CI 1.02 – 1.34) and medication adherence (HR = 2.92, 95% CI 1.09 – 7.85) were significant predictors. For second-generation immigrants only, material deprivation index (HR = 1.03, 95% CI 1.00 – 1.05) and medication adherence (HR = 11.07, 95% CI 3.20 – 38.22) were found to be significant predictors of disengagement. For non-immigrants alone, medication adherence was the only significant predictor (HR = 3.23, 95% CI 1.70 – 6.11).

3.4 Post-Hoc Analyses - Visible Minority Status

Post-hoc analyses were conducted by replacing immigration status with visible minority status (n=332; Caucasian=232, Black=35, Asian=23 and Other=42). Fifty-six (24.1%) Caucasian clients disengaged, 10 (28.6%) Black clients disengaged, 5 (21.7%) Asian clients disengaged, and 10 (23.8%) clients categorized as "Other" disengaged. Visible minority status was found to be non-significant in the model. Early medication non-adherence remained significant (HR = 3.44, 95% CI 2.19 – 5.39) while material

deprivation became a significant predictor (HR=1.01, 95% CI 1.00 – 1.02). When separate Cox Proportional Hazards regressions were run for each visible minority group, early medication non-adherence was significant for all groups except for Asians (Caucasian: HR= 2.71, 95% CI 1.58 – 4.64; Black: HR = 9.38, 95% CI 1.60 – 54.88; Asian: HR = 0.82, 95% CI 0.03 – 25.16; Other: HR = 12.95, 95% CI 2.54 – 65.93). No other predictors were statistically significant in any of the visible minority groups. Time-to-disengagement was similar between all visible minority groups.

3.5 Sensitivity Analysis

The sample utilized in the primary analysis consisted of the 297 clients that met our inclusion criteria, including having complete data for our variables of interest. There were an additional 112 clients who consented to participate in the same time frame but did not have complete data so were excluded from the primary analysis (characteristics of those included and excluded are provided in an online supplement Table 1).

Importantly, amongst those who were excluded, the proportion of disengagers to completers was similar overall and for each immigrant sub-group. Compared to those included, a higher proportion of those excluded were male [χ^2 (1, N= 409) = 4.65, p < .04], first- generation immigrants [χ^2 (1, N=352) = 8.82, p < .02], diagnosed with substance use disorders [χ^2 (1, N= 394) = 4.27, p < .04], less likely to have completed high school [χ^2 (1, N= 399) = 9.52, p < .01] and likelier to disengage [χ^2 (1, N= 409) = 7.11, p < .01] (Table 1). The mean time to disengagement amongst those excluded was 8.5 months (SD=6.2).

To assess the validity of our primary results, we conducted a sensitivity analysis using all PEPP-Montreal non-Aboriginal clients who consented in the same time frame but had complete data for immigration status, age, medication non-adherence, SDI and MDI (n=309). Kaplan-Meier time-to-event and Cox Proportional Hazards regression analysis demonstrated no statistically significant differences in rates of disengagement between immigrant groups. Predictors of disengagement were the same as those reported for the primary analysis.

4.0 Discussion

We found that rates of disengagement were similar between immigrants and non-immigrants in our EI service for psychosis. Over 20% of clients disengaged from the 2-year program, a rate that was similar across first- and second-generation immigrants and non-immigrants. Early medication non-adherence was a predictor of disengagement for all immigrant sub-groups. Age and MDI were significant predictors of disengagement amongst first and second-generation immigrants, respectively.

Our overall disengagement rate is within the 20-40% range previously reported for EI programs internationally (Conus et al., 2010; Doyle et al., 2014; Malla et al., 2007; Menezes et al., 2009). Among immigrants, disengagement rates were similar to or slightly lower than those previously reported by other EI programs (Ouellet-Plamondon et al., 2015; Abdel-Baki et al., 2015). This, along with the rate of disengagement for *non*-immigrants being higher than in these previous studies, should be seen in light of the

wide variety of definitions of disengagement used in the literature (Malla et al., 2007; Doyle et al., 2014). Some studies have defined disengagement as loss to follow-up at 24 months (Abdel-Baki et al., 2015; Ouellet-Plamondon et al., 2015) and others at 12 months (Menezes et al., 2009; Malla et al., 2007). In contrast, the more sensitive definition used in the present study would count clients who leave the service temporarily but return before the 24 month time point as having disengaged (n=13). These differences make it challenging to directly compare disengagement rates across studies.

We found that neither rates nor time to disengagement differed based on immigrant or visible minority status. The average time to disengagement was approximately halfway through the treatment program. However, there appear to be times when the probability of continued service engagement drops dramatically (Figure 1), suggesting that clients may be at increased risk of disengaging during particular time periods in treatment. Given that previous work has suggested that the risk of disengagement is especially high during the initiation of treatment and when transferring care (Olfson et al., 2009; Boyer et al., 2000), further research is warranted to investigate any differences in drivers of disengagement across the entire duration of treatment at an EI service.

We found that early medication non-adherence was a predictor of disengagement regardless of immigration status. The link between early medication non-adherence and service disengagement is complex. Early non-adherence may reflect low trust in the clinical service or a lack of belief in the model of illness articulated by service providers (Tranulis et al., 2011). Alternately, clients may perceive the EI service as being

medication-centric; thus, if medication is discontinued, they may feel that the remainder of services offered are no longer necessary. If these issues are not addressed adequately, especially early on in the course of treatment, disengagement may follow.

Sub-group specific predictors suggest a differential impact of factors driving disengagement between groups. Some studies report younger age as a risk factor for non-adherence (Nose et al., 2003); others find older age to be a risk factor (Anderson et al., 2013), and yet more identified no association between age and disengagement (Stowkowy et al., 2012; Conus et al., 2010). For first-generation immigrants, age of entry into an EI program may be close to the age of immigration. Older first-generation immigrants may hold stronger beliefs in alternative illness explanatory models and health practices that are more predominant in their countries of origin. Additionally, there may be a real or perceived incompatibility with service providers in regards to language and culture. These factors have been shown to hinder access to mental health care, and can be implicated in one's comfort with and willingness to engage with the health care system (Thomson et al., 2015). In contrast, this was not significant for second-generation immigrants, who being born in Canada may have been likelier to identify with Western culture and beliefs.

Material deprivation index scores are one facet of SES. Lower SES has been associated with disengagement from both EI and mental health services in general (Conus et al., 2010; O'Brien et al., 2009). Our results demonstrate that second-generation immigrants with greater material deprivation are more likely to disengage. Such clients may face

financial or other barriers to accessing or engaging in services. If they are indeed more susceptible to negative impacts of material deprivation, one explanation may lie in the concept of 'thwarted aspirations' (Bagley, 1971; Sellers and Neighbors, 2008; Parker, 1966), the notion that second-generation immigrants (being born and raised in a country different from that of their parents) expect to have the same opportunities as non-immigrants, yet encounter societal barriers that prevent them from fully integrating and accessing resources. In contrast, first-generation immigrants may be somewhat protected by their expectations of needing to face obstacles in their integration into a new land.

Post-hoc analysis using visible minority status demonstrated that rates of disengagement were similar between visible minority groups and that early medication non-adherence remained a predictor for all such groups except Asians. However, due to the small sample size it is unclear if the lack of significant finding for Asians is simply due to lack of power or a true finding. Furthermore, while our sample size was not large enough to investigate interactions between immigration and visible minority status, the post-hoc analysis confirmed that our findings extend to this different but overlapping classification. In line with the primary analysis, it suggests that although rates of disengagement are similar between minority groups, the driving forces for each may vary.

Viewed from the perspective of service provision, it could be inferred that at least some of the specific needs of immigrant clients are being met well enough to keep them engaged in the service as much as non-immigrant clients. However, since drivers of

disengagement differ across sub-groups, different approaches may be required to reduce the still-substantial rates of disengagement among non-immigrants and immigrants in EI services. More research is needed before we can confidently design and implement such strategies.

Strengths of our study include a large, well-characterized sample, the use of SDI and MDI to assess SES and the examination of both immigration and visible minority status. Limitations include the significant heterogeneity both within and between immigrant groups (e.g., arriving in Canada as a refugee, cultural and ethnic identity, linguistic preferences, etc.) that is relevant to service engagement but not captured in this data. Additionally, we used the definition of second-generation immigrants provided by Statistics Canada; however, this may not adequately reflect individuals' self-identity, which may be important in understanding their needs and how best to adapt services. The significant number of clients excluded due to missing data is also a limitation. Those excluded were likelier to be male, first-generation immigrants, substance users and to disengage. This indicates that data are missing not at random, making imputation techniques less valid. Future work should attempt to discern the robustness of these findings through additional data gathering and advanced statistical techniques.

While the present study is an important addition to existing literature about disengagement from EI services, further work is needed to elaborate on what motivates

immigrant and non-immigrant clients to remain in treatment, their reasons and drivers for disengagement, and longer-term outcomes in these groups.

5.0 Conclusions

Ensuring that all clients, including first and second-generation immigrants, have access to high quality care, including at EI for psychosis programs, is important. However, it is evident that disengagement from EI services is itself influenced by a number of factors, and potentially in different ways across subgroups. Further work is needed to ensure that first- and second-generation immigrant clients are benefitting in an equitable way from EI services.

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Figure 1. Time-to-Event Curve (n=297)

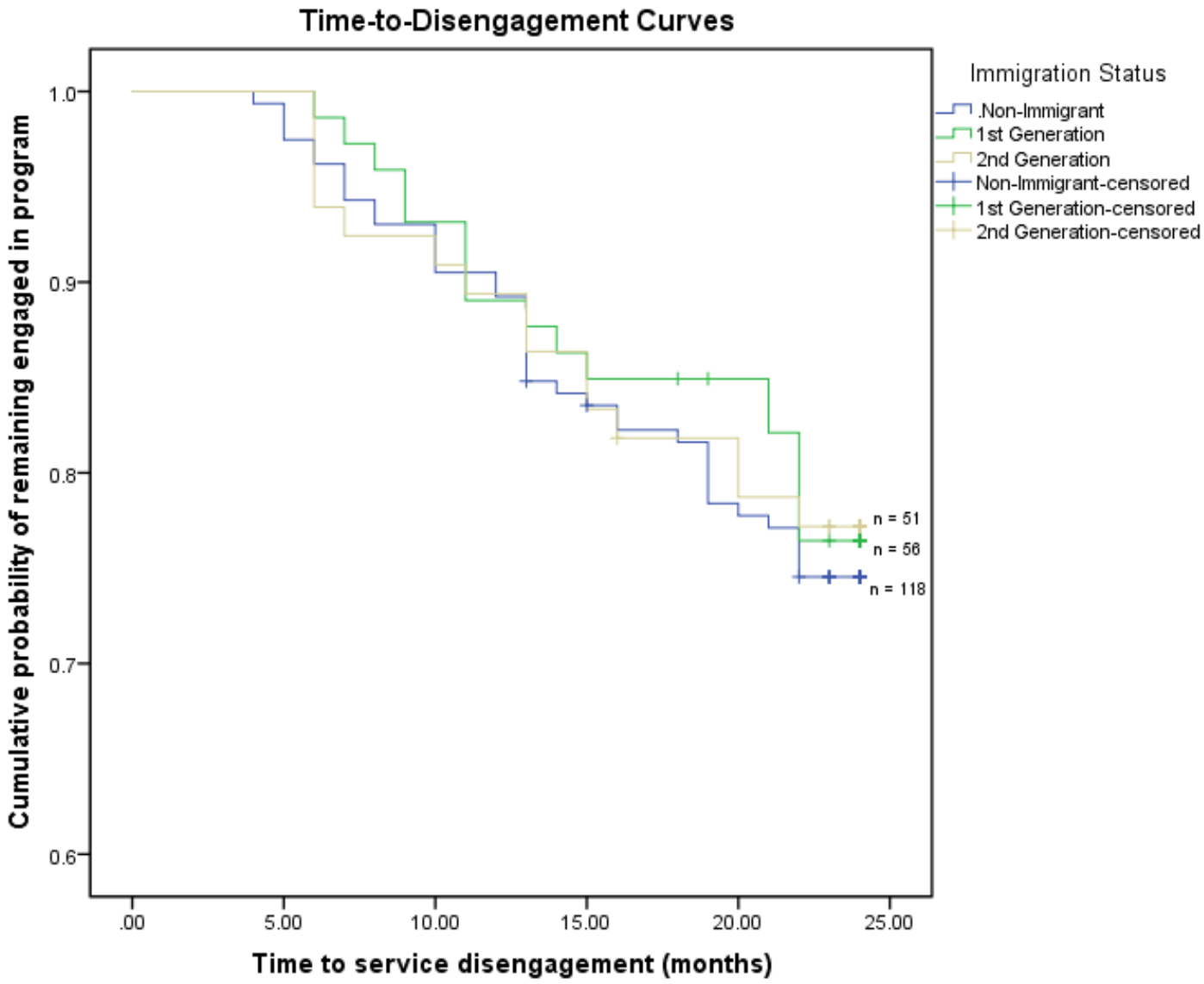

Table 1. Demographics Table

	Completed (N=225)[a]		Disengaged (N=72)[b]		Analysis[c]
Variable	**N**	**%**	**N**	**%**	
Age[d]	22.8	4.2	23.9	4.0	.044*
Sex					.873
Female	71	31.6	22	30.6	
Male	154	68.4	50	69.4	
Immigration status					.897
Non-immigrant	118	52.4	40	55.6	
1st generation	56	24.9	17	23.6	
2nd generation	51	22.7	15	20.8	
Visible minority					.876
Caucasian	147	66.5	47	66.2	
Black	24	10.8	10	14.1	
Asian	18	8.1	5	7.0	
Other	32	14.5	9	12.7	
Substance use disorder					.445
No	99	44.0	28	38.9	
Yes	126	56.0	44	61.1	
Education level					.041*
Completed HS	146	64.9	56	77.8	
Did not complete HS	79	35.1	16	22.2	
Family contact					.684
Yes	186	82.7	58	80.6	
No	39	17.3	14	19.4	
Medication non-adherence					.000*
>75% in first 3 months	176	78.2	33	45.8	
<75% in first 3 months	49	21.8	39	54.2	
Social Deprivation Index[d, e]	74.0	22.6	73.9	20.1	.986
Material Deprivation Index[d, f]	59.8	29.6	63.2	29.6	.398
Disengagement					
No					
Yes					

Footnotes:

a. Numbers may not add up to 225 due to missing values.
b. Numbers may not add up to 72 due to missing values.
c. Significance values reported for independent samples t-tests for continuous variables and Chi-squared tests for categorical values.
d. Continuous variables: mean and SD presented.
e. SDI: reflects fragilities of social networks, combines indicators related to marital status and family structure. The higher the centile, the greater the deprivation.
f. MDI: reflects lack of access to everyday goods and amenities, combines indicators of education, employment and income. The higher the centile, the greater the deprivation.

*$p<0.05$

Table 2. Comparisons Between Immigrant Sub-Groups

	Non-immigrant (N=158)		**1st generation immigrant (N=73)**		**2nd generation immigrant (N=66)**		**Analysis[a]**
Variable	**N**	**%**	**N**	**%**	**N**	**%**	
Age[b]	23.7	4.1	22.9	4.1	21.8	4.1	.008*
Sex							.941
Female	49	31.0	24	32.9	20	30.3	
Male	109	69.0	49	67.1	46	69.7	
Substance use disorder							.005*
No	54	34.2	40	54.8	33	50.0	
Yes	104	65.8	33	45.2	33	50.0	
Education level							.769
Completed HS	105	66.5	52	71.2	45	68.2	
Did not complete HS	53	33.5	21	28.8	21	31.8	
Family contact							.008*
Yes	121	76.6	61	83.6	62	93.9	
No	37	23.4	12	16.4	4	6.1	
Medication non-adherence							.675
>75% in first 3 months	108	68.4	54	74.0	47	71.2	
<75% in first 3 months	50	31.6	19	26.0	19	28.8	
Social Deprivation Index[b]	74.6	22.5	75.9	18.2	70.5	24.3	.312
Material Deprivation Index[b]	64.8	27.8	60.1	29.8	51.5	31.8	.009*
Disengagement							.822[c]
No	118	74.7	56	76.7	51	77.3	
Yes	40	25.3	17	23.3	15	22.7	
Time-to-disengagement[b,d]	13.2	5.6	14.4	6.0	12.4	5.6	.615

Footnotes:

a. Significance values reported for one-way ANOVAs for continuous variables and Chi-squared tests for categorical values.
b. Continuous variables: mean and SD presented.
c. Significance value reported for Log rank comparison.
d. Only individuals who disengaged included in analysis (n=72).

*$p<0.05$

Table 3. Cox Proportional Hazards Regression Model for All Participants and Immigrant Sub-groups

Predictor variables	**Value**	**All participants outcome**		**Non-immigrant outcome**		**1st gen. immigrant outcome**		**2nd gen. immigrant outcome**	
		HR	**95% CI**	**HR**	**95% CI**	**HR**	**95% CI**	**HR**	**95% CI**
Age	NA	1.04	.98-1.11	1.01	.92-1.09	1.17	1.02-1.34*	1.08	.90-1.30
Sex	Female Male	Ref. 1.15	.68-1.94	Ref. 1.26	.62-2.55	Ref. .36	.11-1.24	Ref. .82	.15-4.48
Immigration status	3rd generation 1st generation 2nd generation	Ref. .94 .92	.50-1.75 .45-1.88	--	--	--	--	--	--
Education level	Completed high school Did not complete high school	Ref. .63	.35-1.13	Ref. .76	.36-1.56	Ref. .56	.10-3.00	Ref. 0.80	.17-3.79
Substance use disorder	No Yes	Ref. 1.11	.67-1.84	Ref. 1.08	.55-2.15	Ref. .64	.18-2.34	Ref. 2.66	.72-9.89
Family contact	Yes No	Ref. .78	.42-1.44	Ref. .73	.32-1.62	Ref. 1.40	.43-4.60	Ref. .85	.10-7.59
Medication non-adherence	>75% in first 3 months <75% in first 3 months	Ref. 3.81	2.37-6.14*	Ref. 3.23	1.70-6.11*	Ref. 2.92	1.09-7.85*	Ref. 11.07	3.20-38.22*
Social Deprivation Index	NA	1.00	.99-1.01	1.00	.99-1.02	.99	.96-1.02	.99	.96-1.02
Material Deprivation Index	NA	1.01	1.00-1.02	1.00	.99-1.01	1.00	.98-1.02	1.03	1.00-1.05*

Footnote:

*p<0.05