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Submitted To: Social Psychiatry and Psychiatric Epidemiology - SPPE-D-12-00079.R1

Determinants of Negative Pathways to Care and their Impact on Service Disengagement in First-Episode Psychosis

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Word Count: 4438 Words, 5 Tables

Running Head: Determinants of the Pathway to Care

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ABSTRACT

Purpose: Although there have been numerous studies on pathways to care in first-episode psychosis (FEP), few have examined the determinants of the pathway to care and its impact on subsequent engagement with mental health services.

Methods: Using a sample of 324 FEP patients from a catchment area based early intervention (EI) program in Montréal, we estimated the association of several socio-demographic, clinical, and service-level factors with negative pathways to care and treatment delay. We also assessed the impact of the pathway to care on time to disengagement from EI services.

Results: Few socio-demographic or clinical factors were predictive of negative pathways to care. Rather, service-level factors, such as contact with primary care providers, have a stronger impact on patterns of health service use across multiple indicators. Patients who were in contact with primary care had a reduced likelihood of negative pathways to care, but also had longer referral delays to EI services. Socio-demographic and clinical factors were more relevant for predicting subsequent engagement with EI services, and indicators of negative pathways to care were not associated with service disengagement.

Conclusions: Primary care providers may be an efficacious target for interventions aimed at reducing overall treatment delay. Increasing the uptake of primary care services may also reduce the likelihood of negative pathways to care. Our findings draw attention to the need for further investigations of the role that the primary care system plays in early intervention for FEP, and strategies for supporting service providers in this role.

Keywords: First-Episode Psychosis; Pathways to Care; Service Engagement; Mental Health Services; Primary Care

Introduction

The divergence between the high burden of mental illness and the comparatively low likelihood of obtaining treatment [1] has led to an interest in the modes by which patients with mental health problems access help, known as the pathways to care. These pathways include the help-seeking behaviour of the patient and family, the accessibility of mental health services, and the identification of and response to symptoms by each contact on the pathway to care [2]. The concept of pathways to care is of particular importance in first-episode psychosis (FEP), as it is well established that an extended period between the onset of psychotic symptoms and the initiation of antipsychotic treatment, known as the duration of untreated psychosis (DUP), is associated with poor clinical and functional outcomes [3-6]. The DUP can be conceptualized as consisting of both help-seeking and referral delays [7], and there is evidence that referral delays are responsible for a substantial portion of the overall DUP in some jurisdictions [7-9].

Our findings from a recent systematic review on the pathways to care of patients with FEP suggest that there is insufficient evidence on the determinants of service utilization in FEP [10], with the notable exception of ethnicity [11-16], and on whether these patterns have implications for treatment delay and subsequent engagement with mental health services. The objectives of the present study were: (i) To estimate the extent to which socio-demographic, clinical, and service-level factors are associated with negative pathways to care and referral delay among patients presenting to a specialized early intervention (EI) program for FEP; (ii) To evaluate the impact of negative pathways to care on subsequent engagement with services.

Methods

Study Population

This study was conducted at the Prevention and Early Intervention for Psychoses Program (PEPP) in Montréal, Canada. PEPP is the only specialized service for new cases of psychotic disorders within a defined catchment area of close to 400,000 inhabitants. All mental health care is publicly funded in Canada, and there are no competing private facilities in the region. Patients are eligible for the program if they meet the following inclusion criteria:

- (a.) Aged 14 to 30 years
- (b.) Diagnosed with an affective or non-affective psychotic disorder
- (c.) ≤ 30 consecutive days of antipsychotic drug therapy
- (d.) No history of organic mental disorder, epilepsy, pervasive developmental disorders, or intellectual disability ($IQ \leq 70$)
- (e.) No outstanding charges with the criminal justice system for a serious offence for which sentencing is likely.

Patients admitted between January 2003 and October 2010 with complete data on the outcomes of interest were included.

All PEPP patients were asked to provide informed consent for the use of their data for research purposes. We obtained approval to access these data for the current project from the Research Ethics Board at the Douglas Mental Health University Institute, a health care facility within the McGill Academic Health Network.

Data Collection

Data were collected from patients, family members, clinical staff, and medical records using the *Course of Onset and Relapse Schedule* (CORS). The CORS is a standardized semi-structured interview developed by PEPP investigators in London (Ontario) and Montréal, and has been described in detail previously [8]. Briefly, the interview seeks to construct a timeline of the patient's life to gather information on symptom onset, duration of untreated psychosis, help seeking and referral delay, and the pathways into mental health care. All measures from CORS are derived via consensus between the research staff and a senior clinical research psychiatrist.

Baseline Measures

We obtained information on sex and age at program entry, and age was used as a continuous variable. Patients' living circumstances at onset was used as a proxy for social support, and was dichotomized as 'living with others' versus 'living alone'.

We used the material and social deprivation index as an ecological measure of socioeconomic disparities [17]. It was developed in Québec using census data, and individuals are assigned to one of five strata by residential postal code. Material deprivation includes the proportion of the population without a high school diploma, the employment to population ratio, and average income. Social deprivation includes the proportion of the population who live alone, are separated/divorced/widowed, and are in a single-parent family [17]. Given the limited sample size within each of the five strata, we dichotomized the indices, and individuals falling into the worst stratum of material or social deprivation were classified as materially deprived or socially deprived, respectively.

All individuals were assigned to an ethnic group based on their self-reported region of

origin using the categories from the Statistics Canada definitions of population group [18]. We further categorized these as White, Black, Asian, or other population groups to allow sufficient numbers for analysis.

Diagnoses are based on the Structured Clinical Interview for the DSM-IV (SCID), [19] conducted by trained research personnel followed by consensus with a senior research psychiatrist. We were particularly interested in whether the patient had a substance abuse disorder, which has been found to impact pathways to care [14;16;20].

Severity of psychotic symptoms was measured with the expanded *Brief Psychiatric Rating Scale* (BPRS-E) [21] by trained research staff who had achieved a high level of inter-rater reliability (ICC=0.88 for PEPP). The BPRS-E has been shown to have good internal consistency [22], high inter-rater reliability [23], and demonstrated predictive validity [23]. We divided the scores into quartiles to aid the interpretability of the findings.

The patient's level of functioning prior to psychosis onset was assessed using the Premorbid Adjustment Scale (PAS) [24]. This instrument evaluates the achievement of social, developmental and educational milestones across four developmental periods [24]. It has been shown to have good internal consistency and inter-rater reliability ($r = 0.74-0.85$), [24] and has demonstrated predictive and concurrent validity [25]. Scores were used to classify individuals into one of three trajectories: (A) Deteriorating - a progressive decline in scores (≥ 2 points) across developmental periods; (B) Stable Poor - scores fall below the group median; (C) Stable Good - scores fall above the group median [26].

DUP and Treatment Delay

The ‘duration of untreated illness’ (DUI) is the period from the onset of *psychiatric* symptoms to the initiation of antipsychotic treatment, and the ‘duration of untreated psychosis’ (DUP) is the period from the onset of *psychotic* symptoms to the initiation of antipsychotic treatment [27]. High levels of inter-rater reliability have been obtained for these measures (ICC=0.86-0.93 for PEPP). DUI was used as a proxy for mode of onset, with shorter DUIs suggesting acute onset. Of exception, in one model we replaced DUI with the length of the ‘prodrome’ (details below), which is the period of psychiatric symptoms that immediately precede and are continuous with the onset of psychotic symptoms. Both variables were used as a continuous measure with log-transformation due to the positively skewed distribution.

We also calculated the referral delay, defined as the time from first contact with mental health services to PEPP referral [7], which is of interest as a potentially efficacious target for reducing the overall DUP.

Pathways to Care

Information on pathways to care was obtained by identifying the type and sequence of contacts that the patient or family member sought help from. The prodromal contact was dichotomized based on whether there was any contact during the prodrome. The first contact and referral source were dichotomized based on whether the contact was with emergency services, defined as contact with an emergency department (ED), crisis team, or inpatient unit. Contact with these services has been suggested to have an impact on subsequent service engagement [28-30]. We calculated the total contacts between psychosis onset and entry into PEPP, which has good inter-rater reliability (ICC=0.86 for PEPP). This variable was dichotomized as ‘0-2

contacts' versus '>2 contacts' due to the restricted range of data which limited its utility as a continuous measure. We also constructed two binary variables based on whether the patient was in contact with primary care (general practitioner (GP) in private practice or clinic) and whether there was police or ambulance involvement.

Service Disengagement

Patients were considered to have disengaged from PEPP if there was no contact for a continuous period of three months. Time to disengagement was calculated as the number of months from program entry to the first month of no contact. Individuals who moved out of catchment area or were referred to alternate services were censored, as we did not have information on subsequent service engagement. Patients who completed the program were censored at 24 months, and current patients were censored at the end of the follow-up period (June 2011).

Multiple Imputation for Missing Data

The proportion of missing data for each variable ranged from 2% to 30%, and the case-wise proportion was 42%. Therefore, we used a multiple imputation procedure to replace missing data points by random selection from a set of plausible values, conditional on the observed data. This was done multiple times to create several datasets with complete observations, which were analyzed in parallel and synthesized to compute summary parameter estimates that account for uncertainty introduced by the imputation process [31]. The multiple imputation was done using the logistic regression method in PROC MI in SAS 9.2 (SAS Institute Inc., North Carolina, USA) [32]. We conducted ten imputations, analyzed the data using the

techniques described below, and synthesized the results using PROC MIANALYZE.

We imputed data for the following independent variables (% missing): diagnosis (1.5%), prodrome length (2.4%), DUI (4.0%), material deprivation (4.3%), social deprivation (4.3%), ethnic group (4.6%), substance abuse (5.9%), severity (7.4%), living arrangements (17.9%), and premorbid adjustment (27.2%). The relatively higher proportion of missing data for premorbid adjustment was likely due to the fact that this measure is based partly on interviews with family members [24]. We additionally included age, sex, and all pathways to care indicators in the imputation model. We did not impute data for missing outcome variables.

Data Analysis

Simple logistic regression was used to estimate unadjusted associations between each covariate and the following indicators: (i) prodromal contact; (ii) first contact; (iii) referral source; (iv) total contacts; and (v) contact with police/ambulance. For referral delay, we obtained unadjusted estimates using simple linear regression, with a log-transformed dependent variable due to the positively skewed distribution. We then used multivariable regression models to estimate independent associations of the covariates with each outcome. All models included sex, age, material deprivation, social deprivation, ethnic group, living arrangements, substance abuse, DUI, severity, pre-morbid adjustment, and primary care. Of exception, model i included the length of the prodrome rather than DUI.

We used Cox-proportional hazards (PH) models [33] to estimate the independent effects of negative pathways to care on disengagement from PEPP. We verified the PH assumption that the covariate effect remains constant during the follow-up period by testing the interaction of each covariate with time [34]. The covariate ‘age’ was found to violate the PH assumption,

therefore we used extended Cox regression models that allowed for time-dependent interactions between age and follow-up time [35]. The multivariate model included sex, age, material deprivation, social deprivation, ethnic group, living arrangements, substance abuse, DUI, severity, contact with police/ambulance, and total contacts.

Results are presented as odds ratios (OR) for logistic regression and hazard ratios (HR) for PH regression, with 95% confidence intervals (CI). The β -coefficients and 95% CIs of the analyses using a log-transformed outcome variable were converted to $\exp(\beta)$, which can be interpreted as the relative effects on the outcome of interest. We compared the results of the analyses of imputed data with the complete case analyses to assess the robustness of the findings to missing data. Although some associations failed to reach statistical significance due to the reduced sample size, the magnitude and direction of the associations were not substantially different. Therefore, we present the results of the fully adjusted models from the imputed dataset. All analyses were performed using PROC LOGISTIC and PROC PHREG in SAS 9.2.

Results

Between January 2003 and October 2010, 342 patients were admitted to PEPP. Seven refused participation and eleven were missing data on outcomes of interest, for a final sample of 324 (226 males; 98 females). The descriptive characteristics of the sample are presented in Table 1, and the proportion of patients making contact with each type of service provider is presented in Table 2. The results of all regression analyses are presented in Tables 3 to 5.

Determinants of Negative Pathways to Care

Twenty-six percent of patients (n=85) had contact with mental health services during the

prodrome. The likelihood of prodromal contact increased with increasing prodrome length (OR=1.61, 1.33-1.94). Individuals in contact with primary care prior to psychosis onset were more likely to have any contact during the prodrome (OR=2.70, 1.48-4.96).

The first contact after psychosis onset was emergency services for 62% of patients (n=202), and the referral source was emergency services for 74% (n=239). Individuals in contact with primary care were less likely to have first contact with emergency services (OR=0.07, 0.04-0.14) or to be referred by emergency services (OR=0.42, 0.24-0.74).

Between psychosis onset and contact with PEPP, the median number of contacts was 3 (IQR=2-4). Individuals in contact with primary care had an increased likelihood of having more than two contacts (OR=3.50, 1.95-6.30). Asian patients were less likely to have more than two contacts (OR=0.47, 0.22-0.98).

Over 45% of patients (n=149) had contact with police or ambulance at some point on the pathway to care. The likelihood of contact with these services increased with increasing DUI (OR=1.21, 1.02-1.43). Being in contact with primary care reduced the likelihood of police or ambulance involvement (OR=0.47, 0.27-0.82).

The median time between the first contact after onset and referral to PEPP was one week (IQR=0.3-9.5). Patients in contact with primary care had a referral delay that was more than twice as long as those who were not in contact with primary care ($\exp(\beta)=2.31$, 1.36-3.92).

Impact on Service Disengagement

Nearly 28% of patients (n=89) disengaged from PEPP prior to completing the 2-year program, and the median time to dropout was 5 months (IQR=1-11). Older age was associated with an increased risk of disengagement (HR=1.10, 1.02-1.19). Black patients also had an

increased risk of disengagement, as compared with white patients (HR=2.10, 1.19-3.70). Individuals living alone had a reduced likelihood of service disengagement (HR=0.46, 0.21-1.00).

Discussion

The findings from our analyses suggest that few socio-demographic or clinical factors are predictive of the pathway to care in FEP in the Montréal health services context. Rather, service-level factors, such as having contact with a primary care provider, may have a stronger impact on patterns of health services use across multiple indicators. In contrast, socio-demographic and clinical factors were more relevant for predicting service disengagement. Negative pathways to care did not have an effect on subsequent engagement with EI services in our sample.

Most of the socio-demographic factors we employed were not predictive of the pathway to care. Indeed, our systematic review of international studies on pathways to care in FEP found inconsistent results across studies [10], and it is likely that the impact of these determinants vary depending on the social, cultural, and health system context. Only one prior study has examined the socio-demographic predictors of the pathway to care in FEP in a different Canadian province [15]. In contrast to our study, Archie and colleagues found that males, as well as Asian and patients of other ethnic backgrounds, were more likely to make first contact with the ED [15]. This study was conducted at four sites in the province of Ontario and included a large metropolitan centre (Toronto) with a high proportion of South and East Asians. The discrepant findings may be reflective of subtle differences in provincial health care systems, regional availability of services, especially primary care, or social and cultural composition of the cities. Of exception, we did find that individuals of Asian ethnicity had fewer contacts on the pathway

to care. This is consistent with other Canadian studies, which have previously found that Asian immigrants have lower rates of mental health service use [36;37]. It is unlikely that the differential use of services that we observed was due to a more severe clinical presentation, as prior research from PEPP Montréal did not find evidence of ethnic differences in psychopathology [38]. Alternatively, qualitative research from Hong Kong has found that informal helpers within the social network of patients with early psychosis played a crucial role in recognizing the illness and encouraging the family to seek help, often expediting the help-seeking process [39;40]. The involvement of these informal contacts, such as relatives and friends, would not be captured in our measurement of pathways to care and may explain the lower number of contacts we observed among Asian patients.

Only one quarter of patients in our sample sought help during the prodromal phase of psychosis. This is lower than findings from other Canadian jurisdictions, which were in the range of 35% to 40% [8;41]. The use of emergency services during the prodrome was relatively rare, which has been reported previously [8]. Additionally, two studies have examined help-seeking by individuals identified as a high risk for psychosis, and these studies also report more frequent use of physician and non-physician services [42;43]. To our knowledge, only one study has investigated help-seeking during the prodrome specifically [44]. Characterizing the patterns and predictors of help-seeking during this phase of psychotic illness could be a worthwhile avenue for future research.

We found that contact with emergency services was frequent, which is consistent among FEP samples across most jurisdictions [10]. Ethnicity as a predictor of emergency service contact is the most extensively studied determinant of the pathway to care [10]; however, we did not find ethnic differences in our sample, as our study did not have sufficient numbers in each ethnic

group to detect such differences. As previously mentioned, ethnic differences have been reported in a Canadian context [15], and a study from Montréal found that patients of Afro-Canadian descent with psychotic disorders were more likely to be brought to the ED by police or ambulance [45]. The latter study examined psychotic disorders generally, rather than FEP specifically, and there is evidence to suggest that ethnic differences in negative pathways to care may occur only after the first contact [11;12]. This may be due to negative experiences with services, stigma from within ethnic communities, and a loss of social support due to such stigma [12]. We may also have missed ethnic differences as a result of the indicators employed, as others have found visible minorities to have an increased risk of compulsory admission [13;15;16] and contact with police [11;16;46], and a decreased likelihood of GP referral [11;14]. There is also evidence that social support may be a better predictor of negative pathways to care [11;12], and observed ethnic differences may be mediated by indicators of social support and isolation [11]. As such, we may have missed this association given that we did not use a specific measure of social support in our study.

Our findings suggest that negative pathways to care could potentially be avoided by increasing uptake of primary care services by patients with FEP and improving the detection of early psychosis by these service providers. A study from the United Kingdom also found that GP involvement is associated with a reduced likelihood of compulsory admission and contact with police [12]. However, we did find that patients in contact with primary care had a greater number of contacts and a longer referral delay, which is consistent with previous findings from the Netherlands [47]. This may indicate that primary care providers need additional training in the recognition of early psychosis and protocols for referral. Prior research has also found that patients who were receiving professional care at the onset of psychosis had a longer referral

delay [8;47]. Additionally, there is evidence that patients with insidious and non-specific symptoms are more likely to contact GPs [48], and family members of FEP patients report that GPs may misattribute symptoms to conditions other than a psychotic disorder or administer inappropriate treatment regimens [20]. This may also reflect the relatively low incidence of psychotic disorders, resulting in a very small number of new cases presenting to primary care each year. System-level factors are likely also implicated, such as local availability of specialized services, collaboration between different levels of care, and establishment of linkages to facilitate referral. We cannot rule out the possibility that the effects of contact with primary care on treatment delay are moderated by socio-demographic factors, such as gender, ethnicity, or socioeconomic status, as we did not have sufficient power to examine interaction terms in our analyses. Indeed, prior research has found evidence that psychosocial factors may be associated with an increased likelihood of primary care attendance among adolescents [49].

Nearly 30% of patients disengaged from PEPP prior to completing the two-year program, which is comparable with other estimates from EI services [50-53]. We found that patients of black ethnicity had more than twice the risk of disengagement. Ethnicity has been reported as a risk factor for disengagement from health services among psychiatric patients generally [54]. We also found that living away from family was associated with a reduced risk of service disengagement, which is in contrast to what has been reported previously [50;52;53]. It is possible that clinicians may use more assertive follow-up for patients who do not have a support system in place, thereby reducing the risk of disengagement. Alternatively, patients who have a strong network of social support may perceive that they are less in need of services. The complex mechanisms by which family involvement impacts on engagement warrants further examination as a potential target for improving adherence with EI programs.

A descriptive case series hypothesized that negative pathways to care may be associated with disengagement from services [28], however we were unable to find evidence of this in our analyses. This may be due to the nature of EI services, which focus on providing a positive treatment experience through the use of case management, a lack of exclusive emphasis on medication, and a strong orientation toward psychosocial recovery. An alternative explanation is that we used program drop-out as a proxy for service engagement, rather than measuring the quality of engagement. There may be important components of engagement that are associated with negative pathways to care, such as reported satisfaction [29] and propensity to seek help in the future [30]. We were also unable to discriminate between those who had contact with the police and those who had contact with an ambulance, and this distinction may be important for disengagement. Patients with involvement of the criminal justice system are ineligible for the PEPP program, and we are consequently missing those who have the most negative pathways to care. Contact with police may impact engagement if there is criminal justice involvement, such that pending legal charges or arrests may render medication compliance and outpatient appointments difficult to maintain [28]. Individuals with a forensic history are also twice as likely to disengage from services [52], suggesting that contact with police specifically may be more detrimental than contact with emergency services generally.

Strengths and Limitations

Few studies to date have examined the determinants of the pathway to care in FEP, and ours is the first to examine the impact of negative care pathways on engagement with services. Our findings are strengthened by the use of consensus measurements of different components of the pathway to care and treatment delay. We also use validated methods to minimize the

pernicious effects of missing data, thereby ensuring our study is adequately powered to achieve its objectives.

The patterns we observed may not be representative of all FEP patients, as our sample was obtained from EI services and is comprised of individuals who have been successful at obtaining specialized care. It is possible that patients in the EI context differ on important socio-demographic or clinical factors, such as socioeconomic status, ethnicity, or illness severity, which would have implications for our assessment of these determinants of the pathways to care. However, admission to the PEPP program is determined using a well defined catchment area, and there are no competing facilities for the treatment of early psychosis in the area, which would reduce the impact of this sampling bias. Nevertheless, the possibility remains that patients from an EI sample differ systematically from those treated in other contexts, and we are unable to assess the extent or impact of this without a comprehensive case ascertainment study. Indeed, the program excludes individuals who are involved with the criminal justice system, and these patients would likely differ on these characteristics. Consequently, we are unable to generalize our results outside of the early intervention context, which involves active engagement in early case detection and reducing treatment delay.

Many variables were measured retrospectively, and thus are subject to recall errors and biases. There is substantial heterogeneity within the categories of ethnicity that we employed, which may not accurately capture ethnic differences in the pathways to care. Additionally, in the absence of a reliable measure of social support we used living arrangements as a proxy, but this variable is too crude to capture the extent and quality of the patient's social support network. We also used ecological indicators of socioeconomic status, which tend to underestimate the disparities between groups when compared to individual-level data [55]. It is unlikely that all

potential confounders were included, or measured with sufficient accuracy, so residual confounding may remain.

Our findings on the predictors of service disengagement are only applicable to disengagement from EI services within two-years. Other factors may be important predictors of short- or long-term disengagement, or of dropout from other treatment settings, and we did not consider whether patients re-engaged at a later date. We also do not know whether PEPP clinicians used the same procedure to follow-up all patients in the event of non-attendance, and there may be systematic differences by factors such as severity of illness, co-morbid substance abuse, or lack of social support.

Conclusions

In summary, increasing the uptake of primary care services may reduce the likelihood of negative pathways to care, and primary care providers may be an efficacious target for interventions aimed at reducing overall treatment delay. Our findings draw attention to the need for further investigations of the role that the primary care system plays in early intervention for FEP, and strategies for supporting service providers in this role. Additionally, we found that patients with FEP are heavy users of emergency services, and few socio-demographic or clinical factors were predictive of pathways to care. Although contact with emergency services did not have an impact on disengagement from an EI program, further research is needed on the impact of these negative pathways to care on factors such as the quality of service engagement, satisfaction with services received, and propensity for future help-seeking.

Acknowledgements

We gratefully acknowledge the research and clinical staff of the Prevention and Early Intervention Program for Psychoses (PEPP) in Montréal for their involvement in carrying out the study.

This study was funded by a Canadian Institutes of Health Research (CIHR) Interdisciplinary Capacity Enhancement Grant in Health Inequalities (Project # HOA-80072). Kelly Anderson is supported by a Frederick Banting and Charles Best Canada Graduate Scholarship from the Canadian Institutes of Health Research (CIHR). Dr. Fuhrer holds a CIHR Canada Research Chair in Psychosocial Epidemiology, and Dr. Malla holds a CIHR Canada Research Chair in Early Psychosis. The authors have no conflicts of interest with respect to the publication of this manuscript.

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Table 1 – Demographic and clinical characteristics of the sample of patients with first-episode psychosis (n=324).

Variable		n	% of Total	Distribution
Sex	Male	226	69.8%	69.8%
	Female	98	30.2%	30.2%
	Missing	0	0.0%	-
Low Material Deprivation	Yes	84	25.9%	27.1%
	No	226	69.8%	72.9%
	Missing	14	4.3%	-
Low Social Deprivation	Yes	119	36.7%	38.4%
	No	191	59.0%	61.6%
	Missing	14	4.3%	-
Living Arrangements at Onset	Alone	55	17.0%	20.7%
	With Others	211	65.1%	79.3%
	Missing	58	17.9%	-
Ethnic Group	White	196	60.5%	63.4%
	Black	42	13.0%	13.6%
	Asian	40	12.3%	12.9%
	Other	31	9.6%	10.0%
	Missing	15	4.6%	-
Diagnostic Category	Schizophrenia-Spectrum	231	71.3%	72.4%
	Affective Psychosis	88	27.2%	27.6%
	Missing	5	1.5%	-
Comorbid Substance Abuse	Yes	176	54.3%	57.7%
	No	129	39.8%	42.3%
	Missing	19	5.9%	-
Premorbid Adjustment	Stable Good	99	30.6%	41.9%
	Stable Poor	79	24.4%	33.5%
	Deteriorating	58	17.9%	24.6%
	Missing	88	27.2%	-
Quartile of BPRS-E	Quartile I (Most Severe)	75	23.1%	25.0%
	Quartile II	72	22.2%	24.0%
	Quartile III	73	22.5%	24.3%
	Quartile IV (Least Severe)	80	24.7%	26.7%
	Missing	24	7.4%	-
		Median	IQR	Missing (%)
Age at Entry		22.6	19.8 - 25.9	0 (0%)
Duration of Untreated Illness (weeks)		194.4	66.4 - 437.4	13 (4.0%)
Length of Prodrome (weeks)		30.3	6.2 - 99.0	8 (2.5%)
Duration of Untreated Psychosis (weeks)		16.4	5.6 - 51.4	9 (2.8%)
Time from First Contact to PEPP Referral (weeks)		1.0	0.29-9.5	0 (0%)

BPRS-E = Brief Psychiatric Rating Scale (Expanded); IQR = Interquartile Range

Table 2 - Types of care pathway contacts for the first prodromal contact, the first contact after onset, and the referral source to early intervention services.

Care Pathway Contact	Prodromal Contact		First Contact		Referral Source	
	n	%	n	%	n	%
<i>Emergency Services</i>						
Emergency Department	17	5.2%	177	54.6%	172	53.1%
Crisis Team	1	0.3%	0	0.0%	1	0.3%
Inpatient Unit	1	0.3%	25	7.7%	66	20.4%
<i>Other Service Contacts</i>						
General Practitioner	11	3.4%	17	5.2%	2	0.6%
Psychiatrist	4	1.2%	11	3.4%	9	2.8%
Walk-in Clinic	13	4.0%	26	8.0%	1	0.3%
Outpatient Psychiatry	4	1.2%	12	3.7%	24	7.4%
Addiction Centre	4	1.2%	2	0.6%	0	0.0%
Psychologist	17	5.2%	18	5.6%	0	0.0%
Nurse	0	0.0%	2	0.6%	0	0.0%
Social Worker	5	1.5%	5	1.5%	0	0.0%
School Counsellor	4	1.2%	5	1.5%	0	0.0%
Community Organization	0	0.0%	0	0.0%	9	2.8%
Clergy	1	0.3%	2	0.6%	0	0.0%
Other	3	0.9%	15	4.6%	11	3.4%
Family/Self	0	0.0%	0	0.0%	29	9.0%
No Contact	239	73.8%	7	2.2%	0	0.0%

Table 3 – Results of the multivariate logistic regression of predictors of contact in the prodrome, first contact with emergency services, and referral source emergency services, for individuals with first-episode psychosis (n=324).

Predictor Variables	Value	Outcome Variable					
		Prodromal Contact		First Contact		Referral Source	
		OR	95% CI	OR	95% CI	OR	95% CI
Sex	<i>Female</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Male</i>	0.53	0.28, 1.01	0.64	0.34, 1.19	0.59	0.31, 1.12
Age	<i>N/A</i>	0.94	0.87, 1.02	1.00	0.93, 1.07	1.07	0.99, 1.15
Material Deprivation	<i>Other</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Worst Quintile</i>	1.51	0.77, 2.94	1.45	0.76, 2.75	1.30	0.69, 2.45
Social Deprivation	<i>Other</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Worst Quintile</i>	0.88	0.49, 1.58	1.03	0.58, 1.81	1.04	0.59, 1.83
Ethnic Group	<i>White</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Black</i>	0.90	0.38, 2.13	1.22	0.54, 2.73	2.15	0.82, 5.62
	<i>Asian</i>	1.09	0.47, 2.54	1.22	0.51, 2.89	0.77	0.35, 1.67
	<i>Other</i>	1.49	0.53, 4.13	0.92	0.36, 2.32	1.41	0.54, 3.68
Living Arrangements	<i>With Others</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Alone</i>	1.30	0.60, 2.82	1.21	0.59, 2.52	0.58	0.28, 1.22
DUI ^a	<i>N/A</i>	1.61	1.33, 1.94	0.90	0.74, 1.09	0.89	0.73, 1.10
Substance Abuse	<i>No</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Yes</i>	1.04	0.56, 1.95	1.52	0.81, 2.86	0.83	0.45, 1.52
Symptom Severity	<i>I (Least)</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>II</i>	0.84	0.36, 1.93	0.64	0.29, 1.41	1.91	0.89, 4.09
	<i>III</i>	1.04	0.46, 2.37	0.97	0.41, 2.30	1.85	0.87, 3.94
	<i>IV (Most)</i>	1.36	0.57, 3.21	0.87	0.39, 1.96	1.60	0.74, 3.42
Premorbid Adjustment	<i>Stable Good</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Stable Poor</i>	1.03	0.45, 2.39	1.12	0.51, 2.45	1.17	0.55, 2.48
	<i>Deteriorating</i>	0.98	0.41, 2.37	0.52	0.25, 1.09	0.84	0.40, 1.78
Contact with Primary Care	<i>No</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Yes</i>	2.70	1.48, 4.96	0.07	0.04, 0.14	0.42	0.24, 0.74

^a Length of prodrome used in lieu of DUI in prodromal contact model; NB: Statistically significant results highlighted
 CI = Confidence Intervals; OR = Odds Ratio; N/A = Not Applicable; DUI = Duration of Untreated Illness

Table 4 – Results of the multivariate regression of predictors of total contacts (logistic regression), police/ambulance contact (logistic regression), and referral delay (proportion hazards regression), for individuals with first-episode psychosis (n=324).

Predictor Variables	Value	Outcome Variables					
		>2 Total Contacts		Police/Ambulance		Referral Delay	
		OR	95% CI	OR	95% CI	exp(β)	95% CI
Sex	<i>Female</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Male</i>	0.90	0.53, 1.54	0.73	0.43, 1.25	1.25	0.74, 2.10
Age	<i>N/A</i>	0.96	0.90, 1.02	1.01	0.95, 1.08	0.99	0.93, 1.05
Material Deprivation	<i>Other</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Worst Quintile</i>	0.83	0.48, 1.42	1.51	0.88, 2.58	0.95	0.56, 1.62
Social Deprivation	<i>Other</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Worst Quintile</i>	0.62	0.38, 1.01	1.01	0.61, 1.65	0.97	0.60, 1.57
Ethnic Group	<i>White</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Black</i>	0.93	0.45, 1.90	1.98	0.87, 4.50	0.63	0.32, 1.25
	<i>Asian</i>	0.47	0.22, 0.98	1.05	0.43, 2.57	0.69	0.34, 1.41
	<i>Other</i>	0.64	0.28, 1.46	0.74	0.27, 2.01	0.86	0.38, 1.95
Living Arrangements	<i>With Others</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Alone</i>	0.84	0.43, 1.64	1.45	0.73, 2.89	0.66	0.34, 1.27
DUI	<i>N/A</i>	1.11	0.94, 1.30	1.21	1.02, 1.43	<i>Not Included</i>	
Substance Abuse	<i>No</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Yes</i>	1.20	0.69, 2.07	1.45	0.85, 2.46	0.98	0.59, 1.64
Symptom Severity	<i>I (Least)</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>II</i>	1.43	0.72, 2.84	1.44	0.72, 2.87	1.60	0.82, 3.11
	<i>III</i>	1.64	0.82, 3.29	1.42	0.71, 2.84	2.03	1.03, 3.99
	<i>IV (Most)</i>	1.92	0.94, 3.93	1.52	0.76, 3.05	1.51	0.76, 3.02
Premorbid Adjustment	<i>Stable Good</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Stable Poor</i>	0.78	0.40, 1.50	0.81	0.42, 1.55	0.86	0.44, 1.68
	<i>Deteriorating</i>	0.89	0.44, 1.81	0.71	0.34, 1.48	1.09	0.56, 2.14
Contact with Primary Care	<i>No</i>	<i>Ref.</i>		<i>Ref.</i>		<i>Ref.</i>	
	<i>Yes</i>	3.50	1.95, 6.30	0.47	0.27, 0.82	2.31	1.36, 3.92

NB: Statistically significant results highlighted

CI = Confidence Intervals; OR = Odds Ratio; N/A = Not Applicable; DUI = Duration of Untreated Illness

Table 5 – Results of the multivariate proportional hazards regression of predictors of service disengagement for individuals with first-episode psychosis (n=324).

Predictor Variables	Value	Outcome Variable	
		Service Disengagement HR	95% CI
Sex	<i>Female</i>		<i>Ref.</i>
	<i>Male</i>	1.17	0.71 , 1.92
Age	<i>N/A</i>	1.10	1.02 , 1.19
Material Deprivation	<i>Other</i>		<i>Ref.</i>
	<i>Worst Quintile</i>	1.28	0.79 , 2.07
Social Deprivation	<i>Other</i>		<i>Ref.</i>
	<i>Worst Quintile</i>	0.72	0.45 , 1.14
Ethnic Group	<i>White</i>		<i>Ref.</i>
	<i>Black</i>	2.10	1.19 , 3.70
	<i>Asian</i>	1.21	0.61 , 2.38
	<i>Other</i>	1.19	0.56 , 2.50
Living Arrangements	<i>With Others</i>		<i>Ref.</i>
	<i>Alone</i>	0.46	0.21 , 1.00
DUI	<i>N/A</i>	0.97	0.84 , 1.11
Substance Abuse	<i>No</i>		<i>Ref.</i>
	<i>Yes</i>	1.10	0.68 , 1.78
Symptom Severity	<i>I (Least)</i>		<i>Ref.</i>
	<i>II</i>	0.56	0.30 , 1.07
	<i>III</i>	0.76	0.41 , 1.38
	<i>IV (Most)</i>	0.54	0.29 , 1.03
Police/Ambulance Contact	<i>No</i>		<i>Ref.</i>
	<i>Yes</i>	0.81	0.52 , 1.26
Total Contacts	<i>0-2 Contacts</i>		<i>Ref.</i>
	<i>>2 Contacts</i>	1.27	0.83 , 1.96

NB: Statistically significant results highlighted

CI = Confidence Intervals; HR= Hazard Ratio; N/A = Not

Applicable; DUI = Duration of Untreated Illness; Ref. = Reference Category