

Individual and Community Determinants of Residential Mobility
Among Individuals with Mental Illness in Manitoba

By

Aynslie M. Hinds

A Thesis submitted to the Faculty of Graduate Studies of
The University of Manitoba
in partial fulfilment of the requirements of the degree of

MASTER OF SCIENCE

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Abstract

The purpose of this research was to examine the individual and community characteristics that are associated with residential mobility among individuals with several types of diagnosed mental illness. Physician billing claims and hospital separations in the Manitoba Centre for Health Policy (MCHP) Population Health Research Repository were used to identify individuals with diagnosed schizophrenia, anxiety disorders, substance abuse disorders, and personality disorders in the two-year period from April 1, 1998 to March 31, 2000. Postal codes from the population registry from June 1998 to June 2004 were used to construct a residential history. Individual- and community-level predictors were developed from the population registry, physician billing claims, hospital separations, Statistics Canada Census, and physician resource data. The degree, frequency, and direction of residential mobility were modeled using hierarchical logistic regression. Separate models were developed for Winnipeg Regional Health Authority (WRHA) residents and rural RHA residents. The geographic distribution of location of residence varied by type of mental disorder. Overall, 16.2% and 32.3% of the cohort moved in an 18-month and four-year period, respectively. The majority of movers only moved once, but the degree, frequency, and direction of residential mobility varied by diagnostic group. After controlling for the individual and community-level characteristics, the schizophrenia (degree of mobility for WRHA residents only), anxiety, and substance abuse disorders groups were less likely to move and move often compared to a group with co-occurring disorders. Age, marital status, income quintile, prior residential mobility, and use of health services were associated with the degree and frequency of moving. The schizophrenia group was less likely to move from the inner core to the suburbs, while the substance abuse and anxiety disorders groups were less

likely to move from the suburbs to the inner core compared to the co-occurring disorders group. Individual-level characteristics were more important determinants of residential mobility than the community-level characteristics. The results of this research can be used to identify individuals who are at high risk for moving, and to ensure that these individuals have access to resources to reduce their need to move and prevent discontinuities in the receipt of health and social services.

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Chapter 1: Introduction

Many people change their place of residence over the course of their lives. People move for many different reasons. For some individuals, moving may be related to life cycle issues, including marriage, education, employment, growth in family size, as well as unemployment, loss of income, marital break-up, and the loss of a spouse/partner. For others, moving may be related to health status, including onset of an acute or chronic illness.

Moving may be both a consequence and a contributing factor to one's health. For instance, poor health may contribute to loss of employment and/or loss of income (or low income) which in turn results in the need to move to more affordable accommodations. Poor health may also result in a need to be closer to health and/or social services and other social supports, such as family and friends (Breslow, Klinger, & Erickson, 1998; Dear & Wolch, 1987; Milligan, 1996). Good health, on the other hand, may enable individuals to move to a more desirable country/region/area/neighborhood and/or live in more desirable accommodations (i.e., the 'healthy migrant effect').

Research has shown that neighbourhoods affect health (and health-related behavior); disadvantaged neighborhoods, with high perceived (and/or actual) crime, can have a deleterious affect on health, while privileged neighbourhoods have a beneficial affect on health. In short, the health of individuals moving into a new neighbourhood may be positively or negatively affected by their change in location (Fauth, Leventhal, & Brooks-Gunn, 2004; Leventhal & Brooks-Gunn, 2003). Also, previous research has shown that characteristics of neighbourhoods explain some of the disparity in health status and health-related behaviors between neighbourhoods (Datta et al., 2006; Fone &

Dunstan, 2006; Galea, Ahern, Rudenstine, Wallace, & Vlahov, 2005; Pickett & Pearl, 2001; Ross, Tremblay, & Graham, 2004; Sundquist & Ahlen, 2006).

Previous research has examined residential mobility, including the degree, direction, and frequency of mobility, among individuals with different health conditions, such as mental illness (Abood, Sharkey, Webb, Kelly, & Gill, 2002; Breslow et al., 1998; Chafetz & Goldfinger, 1984; Dembling, Rovnyak, Mackey, & Blank, 2002; DeVerteuil et al., 2006; Lamont et al., 2000; Lesage & Tansella, 1989; Lix et al., 2006b) and HIV/AIDS (Buehler, Frey, & Chu, 1995; Cohn, Klein, Mohr, van der Horst, & Weber, 1994; Elmore, 2005; Hogg et al., 1997; Wood et al., 2000), as well as other disadvantaged and marginalized populations, such as immigrants and refugees (Warfa et al., 2005) and single mothers (Skelton, 2002; South & Crowder, 1998a), who are known to have poorer health. The focus of this research is the residential mobility of individuals with mental illness.

Mental illness refers to “health conditions that are characterized by alterations in thinking, mood, or behavior (or some combination thereof) associated with distress and/or impaired functioning”(Canadian Mental Health Association, 2006). Examples of mental illnesses include schizophrenia, depression, and personality disorders. Mental illness affects a significant proportion of the population, indiscriminate of age, sex, culture, and education and income levels. Previous research has demonstrated geographic variation in the location of residence for individuals with mental illness. Moreover, the geographic distribution varies by type of mental illness diagnosis. For example, individuals with severe mental illness tend to reside in disadvantaged and disorganized inner city neighbourhoods, while individuals with affective disorders are more evenly dispersed across urban areas (Faris & Dunham, 1967). Studies of residential mobility have been

used to explain, in part, the differences in these geographic distributions. However, most previous research has tended to focus only on the residential mobility of individuals with schizophrenia. This study compares residential mobility among individuals with different types of mental illness.

Previous studies have examined individual-level determinants of residential mobility, such as sex, age, and marital status (DeVerteuil et al., 2006; Lamont et al., 2000; Lesage et al., 1989; Lix et al., 2006b). There is a growing body of literature examining the role of community-level determinants in explaining variation in health outcomes through the use of data analytic techniques like multi-level modeling (O'Campo, 2003; Pickett et al., 2001). No previous research, however, has examined community-level factors as determinants of residential mobility among individuals with mental illness. This study of individuals with mental disorders examines the characteristics of individuals and their environments that are associated with residential mobility.

Purpose and Objectives

The purpose of this research is to examine individual and contextual (i.e., community) characteristics which are associated with residential mobility of individuals with mental illness. The specific research questions were:

- a. What individual-level factors are associated with residential mobility, mobility frequency, and direction of mobility? Individual factors that were investigated include:
 - i. Type of mental disorder
 - ii. Demographic
 - iii. Geographic

- iv. Socioeconomic
 - v. Co-morbid conditions
 - vi. Health service utilization
- b. What community-level factors are associated with residential mobility, mobility frequency, and direction of mobility? Community factors that were investigated include:
- i. Demographic
 - ii. Social isolation
 - iii. Socioeconomic
 - iv. Social disorganization
 - vi. Health care provision

Justification for the Study

Previous research on residential mobility among the mentally ill has been hampered by methodological limitations, such as a lack of comprehensive electronic data sources which would enable researchers to select representative samples and define location of residence and residential mobility over different geographic scales. Most studies utilize data from a single site (e.g., state psychiatric facility) (Abood et al., 2002; Breslow et al., 1998; Dembling et al., 2002; Pope, Jr., Ionescu-Pioggia, & Yurgelun-Todd, 1983) or from psychiatric case registers (Dauncey, Giggs, Baker, & Harrison, 1993; Lesage et al., 1989) and consequently, previous studies have small sample sizes (Abood et al., 2002; Dauncey et al., 1993; Lamont et al., 2000; Pope, Jr. et al., 1983). Generally, previous researchers have only been able to define mobility as a move between large geographic areas (e.g., counties). There is a dearth of research examining residential mobility across different (finer) scales of geography (e.g., postal codes) (Dembling et al.,

2002). Defining mobility as a move over a large geographic area may not be sensitive enough to detect differences in mobility between individuals with different types of health conditions.

There is little research examining residential mobility among individuals with different mental illnesses (e.g., schizophrenia and anxiety) and among individuals with different levels of severity of illness (e.g., individuals with a single mental illness versus individuals with multiple mental illnesses or individuals with a mental illness and one or more physical illnesses). The degree, frequency, and direction of mobility likely vary by type and severity of diagnosis.

This study uses population-based administrative data from Manitoba Health that is housed at the Manitoba Centre for Health Policy (MCHP). The MCHP Population Health Research Data Repository contains anonymized administrative health records for all Manitoba residents eligible to receive health services, such that virtually all physician visits and hospitalizations are captured and databases are linked via an encrypted personal health identification number (PHIN) to create a history of health service use. Thus, all residents in the province of Manitoba with physician-diagnosed mental disorders within a specified period of time can be easily identified. This data source also contains longitudinal information on location of residence, allowing for a residential history within the province to be constructed. Location of residence is available at various geographic scales by using the six-digit postal code as the basic building block to construct different measures of mobility. The benefits of administrative data specific to this study are: 1) the ability to construct a representative cohort of individuals with different diagnosed mental disorders, and 2) the ability to examine residential mobility across different geographic scales over time.

This research is important from a policy perspective. In order to provide the most equitable distribution of health and social services, it is important to know how need for services is distributed (i.e., where people live) as well as the likelihood that the distribution of need changes over time due to residential mobility. Knowing the level and direction of residential mobility over time will help policy makers and service providers monitor whether the placement of (new) services unintentionally induces residential mobility (particularly into stigmatized and disadvantaged neighbourhoods) and will allow them to assess whether the mental health reform goal of providing service 'as close to a person's home as possible' has been achieved. If this mental health goal is achieved, few people will be moving to access services.

Moving can be stressful. It can disrupt social support networks and create an increased sense of social isolation and lack of support. The stress associated with moving, on already vulnerable individuals, may worsen their symptoms, affect their ability to function, and contribute to a relapse. Thus, unwanted and unnecessary residential mobility should be kept to a minimum for this population. Studies of mobility can inform policy makers and service providers about the magnitude of the problem and be used as evidence for the need for funding for initiatives to reduce residential mobility (e.g., money management training, housing advocates, affordable housing options).

Frequent residential mobility has the potential to create discontinuities in the receipt of health care. In Manitoba, health care records do not accompany the patient from one health service provider to another. This study may be useful in promoting use of the electronic health record, a lifetime electronic record of an individual's health information available to authorized personnel. An electronic health record might be one way to reduce discontinuities that may arise because of residential mobility.

Chapter 2: Review of Literature

This chapter begins by describing the geographic distribution of mental illness and the two main theories to explain this geographic variation. Research on the methodological issues associated with defining location of residence and residential mobility, and defining mental disorders from administrative health data are discussed next. Theories about why people move, from the larger residential mobility literature, are discussed next. The following section focuses on residential mobility among individuals with mental illness. Three aspects of residential mobility are discussed – degree, direction, and frequency – as well as the determinants of mobility. The next two sections summarize the literature on residential mobility among individuals with other health conditions and residential mobility of other marginalized and disadvantaged populations. The summary of the literature finishes with a discussion of the effects of neighbourhoods on health and health-related behaviors.

Background and Theoretical Framework

Beginning with the pioneering work of Faris and Dunham (1967) first published in 1939, research has repeatedly demonstrated spatial variation in location of residence among individuals with mental illness (Almog, Curtis, Copeland, & Congdon, 2004; Dauncey et al., 1993; Eaton, 1974; Giggs, 1973; Hare, 1956; Loffler & Hafner, 1999; Mezey & Evans, 1970; Shern & Dilts, 1987; Youssef, Scully, Kinsella, & Waddington, 1999). This spatial variation varies by type of mental illness.

Individuals with schizophrenia tend to be geographically concentrated in economically disadvantaged (inner-city) neighbourhoods and are disproportionately represented among the poor. Faris and Dunham (1967) first reported that the highest rates

of schizophrenia were in city centre areas (in “hobohemia” communities and central rooming-house districts of Chicago) and the rates decreased in concentric circles (like a bull’s eye) outwards, with the lowest rates in peripheral (suburban) neighborhoods. Similarly, Eaton (1974) found the highest rates of first hospitalization for schizophrenia in central urban areas in Maryland, lower rates in suburban neighbourhoods, and the lowest rates in rural areas. Hare (1956) also found the highest rates of schizophrenia in the city centre in Bristol, UK as did Loffler et al. (1999) in Mannheim, Germany. In the city of Nottingham, the annual incidence of schizophrenia was three times higher in the most economically deprived areas compared to the least deprived areas (Dauncey et al., 1993).

Faris and Dunham (1967) also found that the highest rates of alcoholic psychoses were in the inner city, and that the rates decreased from the city centre. Drug addiction was less common. Rates of drug addiction were also highest in the city centre, but the geographic distribution was more diffuse.

Affective disorders, on the other hand, appear not to exhibit the same geographic pattern as schizophrenia and substance abuse disorders. Faris and Dunham (1967) found that rates of different types of affective disorders (i.e., manic-depressive psychoses, all, manic, and depressed types) were dispersed randomly across the city, with high rates in both the city centre and outlying areas of Chicago. Hare (1956) also found that manic-depressive psychosis was more evenly distributed across the city of Bristol, UK. In Denver and surrounding counties, the chronically mentally ill (which included schizophrenia, organic brain syndrome, personality disorders, dementia, and other psychoses) were over represented in urban core and underrepresented in suburban counties (Shern et al., 1987).

Almog et al. (2004) observed an economic gradient for standardized psychiatric admissions rates and standardized psychiatric volume ratios, a measure of length of hospital stay, with the highest values in the poorest areas. Similarly, Rahav, Goodman, Popper, and Lin (1986) found the higher prevalence of inpatient psychiatric admissions in the poorer two areas compared to the two more affluent areas. Sundquist et al. (2006) found that as neighborhood income decreased, rates of first psychiatric hospital admissions increased.

There are two main theories that explain the geographic distribution of individuals with severe mental illness in urban areas: social causation and social drift/selection and (Almog et al., 2004; Buszewicz & Phelah, 1994; Costello, Compton, Keeler, & Angold, 2003; Dauncey et al., 1993; Eaton, 1974; Fox, 1990; Johnson, Cohen, Dohrenwend, Link, & Brook, 1999; Loffler et al., 1999; Rahav, Goodman, Popper, & Lin, 1986; Ritsher, Warner, Johnson, & Dohrenwend, 2001; Rodgers & Mann, 1993; Timms, 1998; Turner & Wagenfeld, 1967). The social causation (or the 'breeder') hypothesis posits that individuals living in disadvantaged neighbourhoods are negatively affected by their environment, which induces psychological stress (and keeps it at a high level), and this in turn increases their risk for developing a mental illness. Various environmental factors have been identified as potential stress-inducing contributors of mental illness, including, social isolation, overcrowding and inadequate housing, lack of educational and recreational activities, pollution, unemployment, crime, low area-level socioeconomic status, and exposure to high risk behaviors such as smoking, drinking, and drug abuse. This theory implies that neighbourhoods affect health.

The social drift hypothesis postulates that individuals with severe mental illness (following the onset or intensification of symptoms (Turner et al., 1967)) are downwardly

socially mobile and move into disadvantaged neighborhoods (because of more affordable housing and closer proximity to health and social services). A related theory, social selection, refers to the failure of individuals with mental illness to rise up in social (occupational and educational) status as much as would have been reasonably expected given their social status of origin (Timms, 1998; Turner et al., 1967). (Researchers make a distinction between these two related theories.)

Another related theory is the social residue or stagnation hypothesis, which suggests that healthy individuals are able to move out of disadvantaged neighbourhoods, while the ill are less likely to move. Thus, as healthy individuals flee from disadvantaged neighbourhoods, the proportion of unhealthy individuals increases.

These theories are not mutually exclusive - they operate together. There is support for both theories, although the evidence suggests that the degree to which they are operate varies by type of mental illness (Costello et al., 2003; Dohrenwend et al., 1992; Johnson et al., 1999; Loffler et al., 1999; Rahav et al., 1986; Ritsher et al., 2001; Timms, 1998). The social drift, selection, and residue hypotheses each include an element of residential mobility. The social drift and selection hypotheses predict directional residential mobility; that is, individuals with severe mental illness relocate their place of residence from less disadvantaged to more disadvantaged areas. The social stagnation hypotheses predicts that individuals with severe mental illness residing in more disadvantaged areas are less likely to move to less disadvantaged neighbourhoods than healthier individuals. Thus, residential mobility is one approach to examine the geographic distribution of mental illness and to obtain direct and indirect evidence to support these theories.

Defining and Monitoring Residential Mobility

Most studies examining residential mobility among individuals with mentally illness have used administrative data from a single health care facility (or service) (e.g., state psychiatric hospital) (Abood et al., 2002; Appleby & Desai, 1987; Breslow et al., 1998; Chesteen, Jr., Bergeron, & Addison, 1970; Dembling et al., 2002; Pope, Jr. et al., 1983) or from psychiatric case registers (Dauncey et al., 1993; Lesage et al., 1989). Few studies have used population-based data (DeVerteuil et al., 2006; Lix et al., 2006a; Lix et al., 2006b).

Many studies examining residential mobility among other populations have used survey data (Butler, McAllister, & Kaiser, 1973; Gober, McHugh, & Reid, 1991; Larson, Bell, & Young, 2004; Magdol, 2002; Verheij, van de Mheen, de Bakker, Groenewegen, & Mackenbach, 1998). The Panel Study of Income Dynamics, which is a U.S. longitudinal study (Crowder & South, 2005; Kan, 1999; Massey, Gross, & Shibuya, 1994; South & Crowder, 1997; South et al., 1998a; South & Crowder, 1998b) has been used to study residential mobility.

Researchers have used different definitions to define location of residence, which is important because the geographic scale used to define location of residence affects the estimates of residential mobility. Location of residence has been defined according to small areas such as postal or zip codes (Almog et al., 2004; Lix et al., 2006b), geopolitical boundaries (e.g., counties, census tracts) (Breslow et al., 1998; Dembling et al., 2002; South et al., 1997), administrative health boundaries (i.e., regional health authorities) (Lix et al., 2006a). Other researchers have defined areas/regions – such as rural/urban, inner city or central city, and suburbs or metropolitan area - using

community-level variables, such as population size (density) (Buehler et al., 1995; DeVerteuil et al., 2006; Larson et al., 2004; Loffler et al., 1999), housing age (DeVerteuil et al., 2006), median household income (DeVerteuil et al., 2006), degree of urbanicity (Eaton, 1974), and proximity (Loffler et al., 1999; South et al., 1997).

There are three categories of definitions of residential mobility: any move (degree of residential mobility), direction of move, and frequency of moves. There is no standard length of time by which any of these definitions of residential mobility have been examined.

The residential mobility definition 'any move' distinguishes individuals who moved from those who did not move. In Lix et al.'s (2006b) study, movers and non-movers were identified by comparing six-digit postal codes, available twice a year, over a three year-period. Movers had at least one change in postal code, while non-movers did not have a change in postal code. Lesage et al. (1989) defined residential mobility as any move during a five-year period. Appleby et al. (1987) defined mobility as "a recorded change in community area address (geocode)" between inpatient admissions at one state psychiatric facility over the course of one year beginning with an initial admission. Dembling et al. (2002) used geographic boundaries corresponding to counties to identify location of residence. They defined residential mobility as a change in county of residence between the first and last psychiatric inpatient admission (which corresponded to a mean period of 5.6 years). Researchers using longitudinal survey data define mobility as a self-reported change in address between waves of the survey, identifying movers and non-movers (Crowder et al., 2005; Kan, 1999; South et al., 1997; South et al., 1998a; South et al., 1998b).

Moves from one specific geographic area to another constitute directional moves. Researchers have examined residential mobility between intra-urban areas (DeVerteuil et al., 2006; South et al., 1997), between rural areas (Lix et al., 2006b), and between rural and urban areas (Dembling et al., 2002; Lix et al., 2006b). Lix et al. (2006b) defined rural-to-rural residential mobility as a change in postal code corresponding to a change in rural regional health authority over a three-year period. Dembling et al. (2002) classified counties on an urban-rural continuum. By using this typology they were able to examine moves across counties of different levels of urbanicity. Lix et al. (2006b) defined rural-to-urban residential mobility as change in postal code corresponding to a change from a rural regional health authority to an urban regional health authority. Lastly, Breslow (1998) defined residential mobility as one move from a specific county to one of the eight surrounding counties or one move from one of the surrounding eight counties to the county of interest over a two-year period. Moves within counties and multiple moves between the county of interest and the surrounding counties were not considered.

Researchers have also examined the chronicity or frequency of residential mobility; defining single and multiple movers. Magdol (2000) defined frequent movers as those having two or more moves in a two-year period. Similarly, Lix et al. (2006a) defined multiple movers as having two or more changes in postal code during a 2.5-year period, and single movers as only have a single change in postal code during the same period. Lamont et al. (2000) examined the number of moves (changes in address) in a one-year and two-year period. More than one change in address in a one-year period was the primary outcome variable as one or more changes in addresses is “by no means an indicator of residential instability” (p. 166). Participants in Abood et al.’s (2002) study were interviewed and reported the number of times they ‘moved house’ before and after

the onset of their illness. Appleby et al. (1987) defined residentially unstable as two or more moves in a one-year period, and residentially stable as less than two moves during this time period.

Identifying Individuals with Mental Illness Using Administrative Data

There are different standards for diagnosing or classifying individuals with mental disorders. The two most common are the International Classification of Diseases (ICD) and the Diagnostic and Statistical Manual of Mental Disorders (DSM). The DSM is more specific and detailed in classifying mental disorders than the ICD. In hospital discharge abstracts and physician billing claims databases in Manitoba mental disorders are coded using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9). Most jurisdictions, like Manitoba, only have ICD codes and not DSM codes in their administrative data.

Watson, Heppner, Roos, Reid, and Katz (2005) used administrative data to identify individuals 18 years and older with and without mental illness within two-year periods in the City of Winnipeg. They classified individuals with mental disorders into two groups: those with major disorders and those with minor disorders. Major disorders included schizophrenia, paranoid conditions, and major depression (ICD-9 codes 295 to 299) and minor mental disorders included mild affective, neurotic, and personality disorders (ICD-9 codes 300, 301, 306 to 309, and/or 311).

Individuals with schizophrenia are consistently identified with an ICD-9 diagnostic code of 295 (Almog et al., 2004; Goldner, Jones, & Waraich, 2003; Lichtermann, Ekelund, Pukkala, Tanskanen, & Lonnqvist, 2001; Martens et al., 2004; Preti & Miotto, 2000; Rawson, Malcolm, & D'Arcy, 1997). Goldner et al. (2003)

identified individuals 15 to 64 years old with schizophrenic disorders residing in British Columbia. Specifically, the cohort definition was the presence of an ICD-9 or DSM-IV code of 295 in at least one of the following data sources: physician services, hospital discharge abstracts or the community mental health information management system within a three year period. To generate prevalence estimates of mental illness, Martens et al. (2004) used a five-year period to identify individuals 10 years and older with mental illness from administrative data. Individuals with schizophrenia were identified as having an ICD-9 diagnostic code of 295 in either the hospital discharge abstracts and/or physician billing claims databases. Loffler et al. (1999) used a broader definition of schizophrenia; ICD-9 diagnostic codes 295, 297, 298.3, or 289.4.

Drug-induced psychoses and addiction disorders were identified from hospital administrative data with an ICD-9 code of 292 and 304 respectively (Prete et al., 2000). Sundquist and Frank (2004) used data from the Swedish Hospital Discharge Register to identify individuals with substance abuse disorders; individuals with alcohol-related disorders (ICD-9 303, 291, and 305; ICD-10 F10) were distinguished from individuals with drug-related disorders (ICD-9 292, 304, 305; ICD-10 F11-F19). Individuals with substance abuse disorders were identified as having ICD-9 diagnostic codes of 291, 292, 303, 304, or 305 in either the hospital discharge abstracts and/or physician billing claims databases in a five-year period (Martens et al., 2004).

In Rawson et al.'s (1997) Saskatchewan study, individuals with depressive disorders were identified by having an ICD diagnostic code of 311 in the 1986 hospital data. Depressive disorders are difficult to define from administrative data and have been shown to be less accurate (i.e., lower sensitivity and specificity) than other mental

illnesses (Rawson et al., 1997; Timms, 1998). Also, specific depressive disorders, such as major depression and mania, are only distinguishable at the fourth ICD-9 digit.

In Martens et al.'s (2004) study, individuals with personality disorders were identified as having an ICD-9 diagnostic code of 301 in either the hospital discharge abstracts and/or physician billing claims databases. To obtain prevalence estimates for anxiety disorders, Martens et al. (2004) required a claim with one or more of the following ICD-9-CM codes: 300.0 (anxiety states), 300.2 (phobic disorders), and 300.3 (obsessive-compulsive disorders) in the hospital abstracts or Mental Health Management Information System (MHMIS) files, and at least three 300 ICD-9-CM codes in the physician billing claims.

Residential Mobility among Individuals with Mental Illness

Degree of Residential Mobility

Previous research has demonstrated that individuals with mental health disorders, particularly those with severe mental illness, have a high degree of residential mobility compared to the general population and to individuals with a debilitating and chronic physical illness (Dembling et al., 2002; DeVerteuil et al., 2006; Lamont et al., 2000; Lix et al., 2006b), although this has not always been the case. In a population-based study, Dembling et al. (2002) found that approximately one-third of individuals with severe mental illness migrated to a different county between their first and last hospital admission, which corresponded to a mean time period of 5.6 years, whereas only 15% of the general population moved in a five-year period. In Lix et al.'s (2006b) population-based study, a cohort of individual with schizophrenia were more mobile during a three-year period (34.0% moved) than an age- and sex-matched cohort without mental illness

(21.6% moved) and a cohort with a severe physical illness (inflammatory bowel disease) (23.2% moved). In a population-based study of residential mobility in an urban setting, DeVerteuil et al. (2006) found that a cohort of individuals with schizophrenia were more residentially mobile (35% moved) than an age- and sex-matched cohort (22% moved) within a 3-year period. McNaught et al. (1997) found that 19.5% of individuals with schizophrenia reported moving in the previous year, while 17.9% of the general population reported moving – a non-significant difference. Similarly, Lamont et al. (2000) found that 28% of psychiatric inpatients moved in the year prior to the index hospital admission, while 39% moved in the two years prior to admission. In Appleby et al.'s (1987) study, more than half of the psychiatric inpatients moved in a one-year period. Lesage et al. (1989), however, found that a cohort with schizophrenia (17.6% moved; N=68) was less mobile than an age and sex-matched sample from the general population (22.0% moved; N=68), and both groups were less mobile than an age and sex-matched cohort with non-psychotic disorders (29.4% moved; N=68). Similarly, Chesteen, Jr. et al. (1970) found that only 4% of a psychiatric sample moved in a one year period and only 8% moved in a two-year time period, while the nationally-reported mobility rate was 20%, and hence they conclude that the “mentally ill are among those who do not migrate” (p. 32). Comparing maps of residence location of time, Dauncey et al. (1993) showed little residential mobility among individuals with schizophrenia after the onset of symptoms.

Determinants of the Moving

Residential mobility among the mentally ill has been associated with various individual characteristics, although this varies by study. Some studies have found sex (Lix et al., 2006b; McNaught et al., 1997), race (Dembling et al., 2002), marital status

(Dembling et al., 2002; Lix et al., 2006b), type of mental disorder (Pope, Jr. et al., 1983), presence of co-occurring mental illnesses (such as personality disorder or substance abuse disorders) (Breslow et al., 1998), health service use (Dembling et al., 2002; Lamont et al., 2000; Lix et al., 2006b), location of accessed health care services (Breslow et al., 1998; Lamont et al., 2000), and area of residence (Dembling et al., 2002; Lamont et al., 2000; Lix et al., 2006b) to be significantly associated with mobility. Males are more likely to move than females (Lix et al., 2006b; McNaught et al., 1997). Individuals who are not married tend to be more mobile than individuals who are married (Dembling et al., 2002; Lamont et al., 2000; Lix et al., 2006b). Pope, Jr. et al. (1983) found that individuals with bipolar disorder were significantly more likely to be foreign-born than individuals with schizophrenia and a similar pattern was observed among the patients' parents, indicating that individuals with bipolar disorder (and their parents) are more likely to migrate than individuals with schizophrenia. Those hospitalized more often or had more inpatient days also tended to be more mobile (Dembling et al., 2002; Lamont et al., 2000; Lix et al., 2006b). In McNaught et al.'s (1997) study, individuals with schizophrenia who moved were less likely to have a family physician than those who did not move, while Lix et al. (2006) and DeVerteuil et al. (2006) found those who had a greater number of physician visits were more likely to move. Lamont et al. (2000) found those residing in inner London areas were more mobile than those residing in outer London areas. Lix et al. (2006b) found the odds of moving was lower for those residing in rural areas and those residing in wealthier areas. Both Lamont et al. (2000) and Breslow et al. (1998) found that those admitted to their parent hospital or received treatment in their own county were less mobile than those admitted to a hospital outside their catchment area or received care outside their county, respectively.

Directional Mobility and Determinants

Previous research has found that individuals with severe mental illness tend to move into and out of different geographic areas than the general population (Dembling et al., 2002; DeVerteuil et al., 2006). For instance, in an urban context, individuals with schizophrenia were more likely to move from the suburbs to the inner city and less likely to move from the inner city to the suburbs than the general population (DeVerteuil et al., 2006). Moving from the suburbs to the inner city was associated with age (younger), sex (male), marital status (single or widowed), and number of physician visits (many) and hospitalizations (few), while moving from the inner city to the suburbs was associated with age (young), and number of physician visits (DeVerteuil et al., 2006). McNaught et al. (1997) found that individuals with schizophrenia were more likely to relocate to an inner London area from outer London areas than the reverse. Dembling et al. (2002) found that individuals with mental illness tended to move to low income urban areas. They also observed that individuals moved into areas with poorer health status, and higher concentrations of health workers, institutionalized populations, and nonfamily households. Lix et al. (2006b) found that a cohort of individuals with schizophrenia, an age and sex matched cohort with no mental illness, and a cohort with a severe physical illness (inflammatory bowel disease) were more likely to move from one rural area to another than move from a rural area to an urban centre during a three-year period. The schizophrenia and age-sex matched cohorts tended to move to different areas in the urban centre (from rural areas). Individuals with schizophrenia were more likely to move to inner city neighbourhoods, while individuals with no mental illness were more likely to move to suburban neighbourhoods. Moving from one rural area to another was associated with younger age, being single or widowed, having many physician visits, and residing in

wealthier areas. Moving from a rural area to an urban centre was associated with being single or widowed, having many physician visits, and residing in wealthier areas.

Breslow et al. (1998) found that of the individuals who accessed a Psychiatric Emergency Service in one county, those who were lived outside the county were significantly more likely to move in to it than those who lived in that county were to move out of it.

Frequency of Mobility and Determinants

Research suggests that individuals with mental illness tend to move often. For instance, McNaught et al. (1997) found that in a five-year period, movers with schizophrenia moved on average 3.7 times. Lix et al. (2006a) found that 25.5% of individuals with schizophrenia who moved, moved two or more times in a 2.5 year period (multiple movers). In fact, 69% of the multiple movers moved twice, 22% moved three times, and 9% moved four or more times. Lamont et al. (2000) found that in the year prior to a psychiatric admission, 13% of patients moved more than once. Appleby et al. (1987) found that three-quarters of those who had three or more psychiatric hospitalizations in one year moved; 80% moved two or more times. In Abood et al.'s (2002) study, after (but not before) the onset of illness, a sample of individuals with bipolar disorder moved more often than a sample of individuals with other psychotic illnesses (such as depression, substance abuse, anxiety, and personality disorders).

There is evidence that individuals with mental illness who move infrequently have different demographic, severity of illness, and health service use characteristics than those who move often. The demographic characteristics associated with being a multiple mover include, sex (McNaught et al., 1997), age (Lix et al., 2006a), marital status (Appleby et al., 1987), and area of residence. Lix et al. (2006a), however, did not find a significant association between type of mover (multiple/single) and sex and marital status. In

general, though, multiple movers are more likely to be male, young, divorced or separated, and reside in poor, inner city areas. Lix et al. (2006a) found that the multiple movers with schizophrenia were significantly more likely to have co-morbid substance abuse disorders and arthritis than single movers.

In Lamont et al.'s (2000) study, the multiple movers had a higher rate of psychiatric inpatient admissions outside their health service area compared to those who only moved once and those who did not move at all. Individuals with schizophrenia who moved often were less likely to have contact with a family physician in McNaught et al.'s (1997) study, while Appleby et al. (1987) found that individuals with severe mental illness who moved often were higher health service users than those who did not move often. Similarly, Lix et al. (2006a) found that multiple movers had higher rate of inpatient hospitalizations for schizophrenia, other mental disorders, and physical disorder than single movers, but there was no difference between multiple and single movers in terms of length of hospital stay. Multiple movers also had a higher rate of physician visits for physical disorders and other mental disorders (not schizophrenia) reasons than single movers (Lix et al., 2006a).

Residential Mobility and Other Populations

Residential mobility has also been examined among individuals with other health conditions, such as HIV/AIDS (Buehler et al., 1995; Cohn et al., 1994; Elmore, 2005; Hogg et al., 1997; London, Wilmoth, & Fleishman, 2004; Wood et al., 2000) and pregnancy (Fell, Dodds, & King, 2004; Shaw & Malcoe, 1992). Researchers have also examined the relationship between health status in general or changes in health status and residential mobility (Moorin, Holman, Garfield, & Brameld, 2006; Larson et al., 2004).

Research on residential mobility has also been conducted among other marginalized and disadvantaged populations, such as refugees (Warfa et al., 2005), single mothers (Skelton, 2002; South et al., 1998a), and Blacks in the United States (Crowder et al., 2005; Frey, 1985; Massey et al., 1994; South et al., 1998b; South et al., 1997).

Residential Mobility and HIV/AIDS

Studies on residential mobility among individuals with HIV/AIDS have defined residential mobility as a change in location of residence post-HIV/AIDS diagnosis. Hogg et al. (1997) found that 3% of individuals moved to a different (Canadian) province/territory between diagnosis and death. Using the same definition, but a finer scale of geography, Buehler et al. (1995) found that 10.6% of individuals moved, either within a state or to a different state. In London et al.'s (2004) study, 31.8% of participants reported they had moved at least once since being diagnosed. In Wood et al.'s (2000) study, 30.3% of HIV positive individuals moved during a 26-month period; 11.6% moved to a different census subdivision and 18.7% moved within their census subdivision. Using a very liberal mobility definition, Cohn et al. (1994) found that 60% of individuals lived out-of-state for at least one month in a 10-year period; two-thirds had lived there previously.

Residential mobility among individuals with HIV/AIDS has been associated with both demographic characteristics and clinical factors. Age is associated with mobility among this population; younger adults are more likely to move than older adults (Buehler et al., 1995; Hogg et al., 1997; London et al., 2004). Other demographic characteristics associated with mobility include: sex (Buehler et al., 1995), race (Buehler et al., 1995; London et al., 2004), sexual orientation/mode of HIV exposure/transmission (Buehler et al., 1995; Hogg et al., 1997; Wood et al., 2000), province of diagnosis (Hogg et al., 1997),

and population of location of origin (Wood et al., 2000). Individuals residing in British Columbia, Ontario, and Quebec were less likely move post-HIV diagnosis than individuals residing in the other provinces/territories (Hogg et al., 1997). Males were more likely to move than females (Buehler et al., 1995). Clinical factors associated with residential mobility include: earlier diagnosis of HIV/AIDS (Hogg et al., 1997; London et al., 2004), and AIDS status (Wood et al., 2000).

Researchers have also examined movement of people into and out of different areas (i.e., direction of mobility). Of particular concern is the movement of individuals into rural areas where specialty health care is less available. Buehler et al. (1995) found that the majority of people with AIDS/HIV moved to large metropolitan centres; however, there was a net increase of people in rural areas while there was a net decrease of people in metropolitan centres. In fact, of the people who died in rural areas, almost one third had moved there from urban centres (Buehler et al., 1995). In British Columbia, Wood et al. (2000) found that 27.5% of the movers moved from urban to rural areas.

Research on the residential mobility of those with HIV/AIDS has also examined the reasons why individuals move. In general, that decision is complex and multifaceted. Most people cite more than one reason for a move. For individuals with HIV/AIDS, mobility may be associated with one's health (i.e., move for formal or informal health care) or incidental to their health. In London et al.'s (2004), 15.5% reported moving for non-care reasons. Some of the reasons reported for moving include those that draw or pull individuals to the destination location, such as better social support (including being near a community or group that shares the same needs and interests), closer to family, health (e.g., access and quality of health care, access to clinical trials, 'come home to die'), work/educational opportunities, and care for a family member or friend who is sick

(Cohn et al., 1994; Elmore, 2005; London et al., 2004). Other reported reasons for moving include those that push or drive individuals away from the location of origin, such as to escape intolerance in the place of origin, and to get away from situations that foster high-risk behavior (e.g., intravenous drug use) (Cohn et al., 1994; Elmore, 2005; London et al., 2004). London et al. (2004) found that moving for formal and informal care reasons and moving for non-care reasons varied by sociodemographic characteristics. For instance, females were at a higher risk of moving for care reasons (compared to never moving), but were at a lower risk of moving for formal care reasons (compared to informal care reasons). There was evidence that higher income individuals move for informal care reasons, while those with lower incomes move for formal or formal and informal care reasons (in other words, they move for better access to health care services) (London et al., 2004).

Residential Mobility and Pregnancy

In a case-control study of mothers with children with severe congenital cardiac disease, 24.8% of the women moved between conception and delivery (Shaw et al., 1992). In another case-control study, only 12% of women moved between conception and delivery (Fell et al., 2004). In the first study, the majority of the women only moved once (19.1% cases, 22.9% controls), while a few women moved two or more times (3.3% cases, 4.0% controls) (Shaw et al., 1992). Socio-demographic factors associated with moving included: maternal age (Fell et al., 2004; Shaw et al., 1992), level of education (Shaw et al., 1992), marital status (Fell et al., 2004), income (Fell et al., 2004), and smoking status (Fell et al., 2004). Women who were young, had a low level of education, were unmarried, smoked, and had a low income were more likely to move during pregnancy.

Residential Mobility and Health-Status

There is some evidence that movers are healthier than non-movers (Moorin et al., 2006), but there is also conflicting evidence that shows movers are less healthy than non-movers (Larson et al., 2004; Verheij et al., 1998).

Larson et al. (2004) found that unhealthy middle-aged (i.e., 45 to 50 years) women were more likely to move than healthy middle-aged women. After controlling for socio-demographic characteristics, short distance moves were associated with expectations of declining health, having two or more chronic diseases, and being a smoker, while long distance moves were associated with having chronic diseases, being a smoker, and frequent visits to health specialists. In a two-year period, 14% of the sample moved.

Moorin et al. (2006) found the opposite. They examined mobility between metropolitan, rural, and remote areas for individuals with newly diagnosed serious physical and mental diseases and for healthy individuals. The incidence rate of residential mobility in each direction for the diseased group was less than the healthy group; meaning that individuals were not drawn to areas with better access to health services following diagnosis of a serious illness as expected. However, this finding did not hold for all health conditions. Individuals with mental disorders were more likely to move from rural to metropolitan areas and from rural to remote areas than healthy individuals, while those with certain physical disorders (e.g., digestive disorders, pulmonary disorders) were less likely to move. Both individuals with physical disorders and individuals with mental disorders were less likely to move from remote to less remote areas than healthy individuals. Individuals with mental disorders did not differ from healthy individuals in moving out of metropolitan areas

In Verheij et al.'s (1998) study, after controlling for socio-demographic characteristics, the movers had more health complaints than non-movers (with the exception of younger age groups). There was little difference between the health status of movers into rural areas and movers in urban areas. This suggested that the differences in health status in rural and urban areas could not be explained by the health of movers.

In Van Lenthe's (2005) study of the relationship between residential mobility and health in the general population, age and marital status were associated with residential mobility into advantaged and disadvantaged neighbourhoods; the likelihood of moving decreased with age; single and divorced individuals are more likely to move than married individuals. Sex (being female) was associated with moving into a more economically advantaged area while (less) education was associated with moving into an economically disadvantaged area. After controlling for socio-demographic characteristics, Van Lenthe (2005) found, for the most part, only weak associations between health and health-related behaviors and moving from advantaged to disadvantaged areas and vice versa. Those reporting having two or more chronic health conditions, those reporting their health as 'moderate' and 'sometime good/bad', and those reporting moderate amounts of exercise were more likely to move from less deprived to more deprived neighbourhoods.

Norman, Boyle, and Rees (2005), on the other hand, found support that disparities in health between the most and least deprived areas were due to health selective residential mobility. Over a 20 year interval, the least deprived areas experienced a net gain of healthy people, while the most deprived areas experienced a net loss of healthy people and net gain of unhealthy people. That is, the healthy moved into the least deprived areas, while the unhealthy moved into the most deprived areas. In fact, the movers in the least deprived area were healthier and the movers in the most deprived

areas were less healthy than the non-movers of those respective areas (as measured by standardized illness ratios and standardized mortality ratios).

Residential Mobility and Other Marginalized Populations

Research on residential mobility among refugees, single mothers, and Blacks in the United States suggests that these populations also have a high degree of residential mobility, move frequently, and move within or to disadvantaged neighbourhoods.

For example, in Warfa et al.'s (2005) study, Somali refugees in the UK moved on average four times in five years before they found permanent accommodations.

Participants in this study reported moving from one deprived area to another due to lack of adequate housing, employment, and racism/discrimination.

In Skelton's (2002) study of single Aboriginal mothers in Winnipeg's inner city, all nine women had moved at least three times and most had moved six or seven times in a two-year period. The primary reasons for moving in the past and for making future moves were: cost and size of the residence, unsafe neighbourhood, and problems with the neighbours.

South et al. (1998a) found that more than 25% of single mothers moved in a one year-period. The majority moved between neighbourhoods with similar levels of poverty; however, a higher percentage of single mothers move from poor to nonpoor neighbourhoods than in the opposite direction. Age was also a determinant of mobility among this population – as age increased, the likelihood of moving decreased. Marriage and employment increased the chances, while race (being African American versus being White) and home ownership impeded the chances of moving from poor to non-poor neighbourhoods. Race (being African American versus being White) increased the

chances while an increase in income decreased the probability of moving from non-poor to poor neighbourhoods.

A stream of research on residential mobility from the United States focuses on racial differences (i.e., Black and White) in directional mobility – between poor and non-poor neighbourhoods (Massey et al., 1994; Crowder et al., 2005), between central city and suburban neighbourhoods (Frey, 1985; South et al., 1997), and between predominantly Black, predominantly White, and racially mixed neighbourhoods (South et al., 1998b). In general, Black and White people move in opposite directions. Blacks are more likely to move from the suburbs to the central city than from the central city to the suburbs, while Whites are more likely to move from the central city to the suburbs than from the suburbs to the central city (even after controlling for individual and community-level factors) (Frey, 1985; South et al., 1997). In another South et al. (1998b) study, Blacks were more likely to move out of and less likely to move into predominantly White neighbourhoods and Whites were more likely to move out of and not move into racially mixed and predominantly black neighbourhoods. Blacks were less likely than whites to move from poor to non-poor neighbourhoods and were more likely to move from non-poor to poor neighbourhoods.

The specific individual-level determinants of mobility vary by outcome variable. However, age is consistently statistically significant (regardless of race or direction); the likelihood of moving decreases with age (Crowder et al., 2005; South et al., 1997; South et al., 1998b). Having young children decreased the likelihood of moving (South et al., 1998b), and moving from the central city to the suburbs. Having older children decreased the likelihood of moving for Blacks and Whites (South et al., 1998b), and from moving from the suburbs to the central city (South et al., 1997). A high income decreased the

likelihood of moving from the suburbs to the city (i.e., individuals with a high income were more likely to remain in the suburbs) (South et al., 1997) and from a non-poor to poor neighbourhood (Crowder et al., 2005), but a higher income was associated with an increased likelihood of moving (South et al., 1998b) and moving from poor to non-poor neighbourhoods (Crowder et al., 2005). Being married was associated with lower likelihood of moving (South et al., 1998b) and moving from non-poor to poor neighbourhoods (Crowder et al., 2005). Homeownership was associated with lower odds of moving (South et al., 1998b) and moving from poor to non-poor and from non-poor to poor neighbourhoods (Crowder et al., 2005).

Community-level Determinants of Residential Mobility

Geographic variation has been observed for many health outcomes (including mental illness as described earlier). The differences in health outcomes between neighbourhoods may be due to: 1) compositional effects, that is, the aggregation of individual-level characteristics (such as socioeconomic status), or 2) contextual effects - neighbourhoods independently affect the health, that is, the shared (social and physical) environment influences residents' health.

Increasingly, health researchers are using hierarchical models to examine the characteristics of individuals and their environments that are associated with different health outcomes (O'Campo, 2003). Various health outcomes have been examined, including health status (Ross et al., 2004), mental health status (Fone et al., 2006), prevalence of common mental disorders (i.e., depression and anxiety) (Galea et al., 2005; Weich, Twigg, Holt, Lewis, & Jones, 2003b; Weich, Holt, Twigg, Jones, & Lewis, 2003a), mortality (Roos, Magoon, Gupta, Chateau, & Veugelers, 2004; Veugelers, Yip, &

Kephart, 2001), health-related behaviors like smoking (Datta et al., 2006), and mental health service use (Drukker, Driessen, Krabbendam, & Van, 2004; Sundquist et al., 2006). However, the findings are conflicting as to the importance of community-level variables and their effects on health outcomes. The mixed finding may be partly attributed to methodological issues, such as different definitions of 'neighbourhood' (i.e., size) and the choice of community-level variables. The definition of 'neighbourhood' has challenged researchers and is widely debated (O'Campo, 2003; Ross et al., 2004; Sundquist et al., 2006; Weich et al., 2003a). Researchers, however, are typically constrained by the availability of the data. For the most part, researchers use geo-political boundaries, such as census tracts to define neighbourhoods, as the data tends to be most readily available at this geographic level, but neighbourhoods can be defined in other ways, such as by ethnicity or socioeconomic status. Neighbourhoods have been defined as electoral wards or divisions (Fone et al., 2006; Wainwright & Surtees, 2004; Weich et al., 2003a; Weich, Twigg, Lewis, & Jones, 2005), census tracts (Datta et al., 2006; Silver, Mulvey, & Swanson, 2002), small area market statistics (Sundquist et al., 2006), community districts (Galea et al., 2005), boroughs (Reijneveld & Schene, 1998), which vary in size and meaningfulness. Interestingly, using two different definitions of neighbourhood, 'natural neighbourhoods' and census tract areas, Ross et al.'s (2004) found similar results for the multi-level models assessing the association between health status and various area-level measures. They concluded that "Our findings ... suggest that the additional effort to produce these units analysis [natural neighbourhoods] is probably not warranted, especially in studies where there are both a sufficient number of pre-defined geostatistical units to draw from and where the units have some social meaning" (Ross et al., 2004).

The choice of the community-level variables depends on the research question and the availability of the data. However, in most previous studies the community-level variables are measures of socio-economic deprivation (Fone et al., 2006; Reijneveld et al., 1998; Sundquist et al., 2006; Wainwright et al., 2004), such as composite indices like the Carstairs and Townsend indices (Fone et al., 2006; Wainwright et al., 2004; Weich et al., 2005; Weich et al., 2003b). However, other researchers have used different characteristics of neighbourhoods, including neighbourhood residential instability/mobility (Drukker, Kaplan, & Van, 2005; Drukker et al., 2004; Silver et al., 2002) and features of the built environment (Galea et al., 2005).

Many studies have found that community-level variables (i.e., neighbourhood factors) directly affect the health of residents after controlling for individual-level variables, albeit moderately - most of the variation in the health outcome is due to the individual-level variables and not the community-level variables) (Pickett et al., 2001). Neighbourhood characteristics have been found to directly affect mental health outcomes (Galea et al., 2005; Silver et al., 2002; Sundquist & Frank, 2004; Wainwright et al., 2004), health-related behaviours (Datta et al., 2006).

For example, Silver et al. (2002) found that rates of schizophrenia were significantly associated with area-level residential mobility, but not area-level deprivation, after controlling for individual-level characteristics while rates of major depression and substance abuse disorders were significantly associated with area-level residential mobility and socioeconomic disadvantage. Schizophrenia, major depression, and substance abuse disorders were thus more prevalent in residentially unstable and socio-economically deprived (not schizophrenia) neighbourhoods, even after adjusting for individual-level characteristics.

Fone et al. (2006) found a significant association between mental health status, as measured by SF-36, and areal-level social deprivation, as measured by the Townsend Index, after controlling for individual-level characteristics (such as socioeconomic status and unemployment) in Wales. There was a significant cross-level interaction between area-level deprivation (community-level variable) and economic inactivity (individual-level variable), such that there was a greater negative affect of areal-level deprivation on mental health for those who were economically inactive compared to the economically active, which is consistent with Weich et al.'s (2003a) findings of an association between prevalence of common mental disorders and the Carstairs index for only the economically inactive. (The variability between individuals accounted for most of the variability in mental health scores between areas.) They conclude that neighbourhoods affect mental health.

After controlling for individual-level variables, Sundquist et al. (2006) found that the risk of first psychiatric admission increased as neighbourhood income decreased, meaning that individuals living in low income neighbourhoods were at a higher risk for having a psychiatric admission once the individual-level characteristics were statistically controlled.

Galea et al. (2005) found that individuals residing in physically run-down neighbourhoods (e.g., buildings deteriorating, more than three heat breakdowns in winter) were more likely to report current and lifetime depression than individuals residing in neighbourhoods in better physical condition, after adjusting for individual-level variables. Other studies have found that the differences in health outcomes between neighbourhoods to be entirely due to compositional effects (i.e., differences in individual-level characteristics) – that, is once individual-level characteristics are adjusted for,

community-level variables are no longer significantly associated with the health outcome (Henderson et al., 2005; Reijneveld et al., 1998; Veugelers et al., 2001; Weich et al., 2005; Weich et al., 2003a).

Reijneveld et al. (1998) did not find an association between the distribution of mental disorders, as measured by General Health Questionnaire, and areal-level deprivation, after controlling for individual-level income, in Amsterdam, Netherlands. In other words, the prevalence of mental disorders in disadvantaged areas was due to the clustering of low income individuals. Weich et al. (2003b) and Weich et al. (2005) came to the same conclusion in the UK – ward-level deprivation was not significantly associated with the onset, maintenance, and prevalence of common mental disorders after controlling for individual and household-level characteristics. Weich et al. (2005) suggests that geographic mobility may “be important but remains poorly understood” in explaining the concentration of mentally ill in disadvantaged neighbourhoods. Similarly, Wainwright et al. (2004) found that the association between the prevalence of current mood disorders (anxiety and depression) and areal-level deprivation disappeared after adjusting for individual-level demographic and socioeconomic characteristics.

Drukker et al. (2004) used hierarchical modeling to examine mental health service use rates and mental health service consumption in the Netherlands. Neighbourhood-level characteristics for the most part were non-significant when the individual-level variables were in the model. However, there was an interaction between socioeconomic deprivation and residential instability in the model for mental health outpatient service consumption, such that individuals in stable yet socioeconomically disadvantaged neighbourhoods used less outpatient days. Drukker et al. (2005) followed this study up with a similar multi-level study on health-related quality of life. They found a significant interaction between

socioeconomic deprivation and residential instability; such that there was a negative association between health-related quality of life and socioeconomic deprivation in residentially stable neighbourhoods, but not in residentially unstable neighbourhoods.

Contextual (or community-level) characteristics may also affect residential mobility, particularly directional mobility. "Neighbourhoods provide residents with certain constraints and opportunities" (Datta et al., 2006), which may draw people in, drive people out, or prevent people from leaving (i.e., moving). For example, as mentioned above, pull factors, such as low-cost housing and proximity to health and social service may draw individuals with mental illness into inner city areas, while push factors, such as high crime and high population density may drive people from the inner city to the suburbs.

No previous research has examined community-level factors as determinants of residential mobility among individuals with mental illness, however, South et al. (South et al., 1998b; South et al., 1997) and Crowder et al. (2005) have examined individual and community-level characteristics associated with intra-urban residential mobility among Black and White people in the United States. Community-level variables, such as unemployment rate, percentage of new housing, vacancy rate, were significantly associated with directional mobility after controlling for individual-level variables. For instance, a high unemployment city-to-suburb ratio increased the likelihood of moving from the city centre to the suburbs (particularly for Black) and decreased the likelihood of moving from the suburbs to the city centre for Whites. They concluded that "Comprehensive explanations for residential mobility between cities and suburbs must therefore include individual-level characteristics as well as features of the broader social and geographic context" (South et al., 1997).

Chapter 3: Methods

Hypotheses

The research hypotheses were:

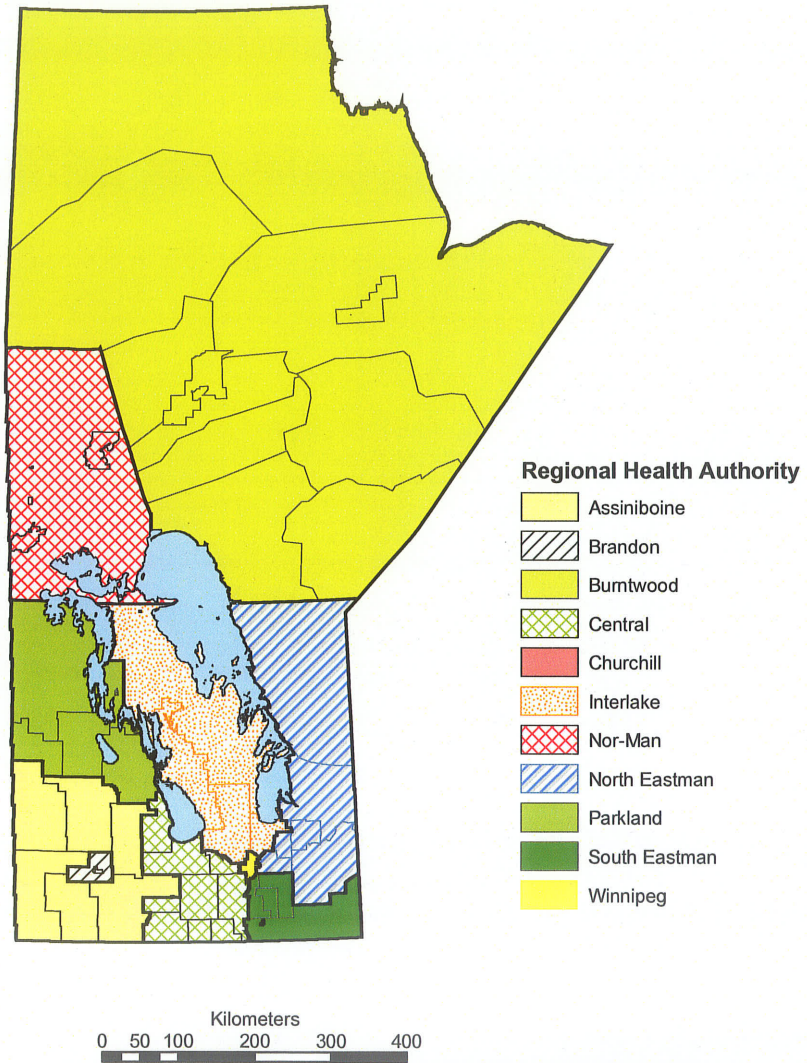
- The degree, direction, and frequency of residential mobility will vary by type of mental disorder. Specifically, it was hypothesized that:
 - Individuals with the most severe types of mental disorders will be more mobile than individuals with less severe types of mental disorders.
 - Individuals with the most severe types of mental disorders will move more frequently than individuals with less severe types of mental disorders.
 - Within the Winnipeg Regional Health Authority (WRHA), individuals with less severe types of mental disorders will be more likely to move from the inner city to the suburbs, while individuals with more severe types of mental disorders will be more likely to move from the suburbs to the inner city.
- Rural residents will be less mobile than urban residents.
- Individual and community-level factors will be associated with residential mobility.

Study Geographic Area

Manitoba contains 11 Regional Health Authorities (RHAs), which are administrative units responsible for “the delivery and administration of health services in specified geographic areas” (Manitoba Centre for Health Policy, 2003b). The majority of the population of Manitoba lives in the Winnipeg Regional Health Authority (WRHA), which includes the City of Winnipeg and surrounding areas. As of June 1, 2004, the total population of Manitoba was 1,169,667 and the total population of the WRHA was

663,443 (Manitoba Health, 2004). The rural RHAs (Figure 1) are often grouped into rural south (Brandon, Assiniboine, and South Eastman), central rural RHAs (Central, Interlake, Parkland, and North Eastman) and rural north RHAs (Burntwood, Churchill, and Nor-Man). RHA representatives and Manitoba Centre for Health Policy (MCHP) researchers (Martens et al., 2003; Manitoba Centre for Health Policy, 2004) developed boundaries for sub-dividing each RHA into districts. A total of 51 non-Winnipeg RHA districts were formed (see Figure 1).

Figure 1. Manitoba Regional Health Authorities and Districts



The City of Winnipeg has also been sub-divided into regions by researchers and health planners (Manitoba Centre for Health Policy, 2001). One method for subdivision

was developed by the General Council of Winnipeg Community Centres, in which 75 Community Centre Areas (CCAs) were formed (see Figure 2). Each CCA represents the area surrounding a Winnipeg Community Centre building. DeVerteuil et al. (2006) grouped these 75 neighbourhoods into three broad regions: suburbs, inner core, and outer core (see Figure 3). This categorization was based on 2001 Statistics Canada Census indicators: density (persons per hectare), housing age (proportion of housing stock built before 1946), and median household income (McLemore, Aass, & Keilhofer, 1975; Ram, Norris, & Skof, 1989). Core neighbourhoods have a higher population density and older homes than the suburbs. Inner core neighbourhoods are poorer than outer core neighbourhoods. On average, outer core neighbourhoods are more affluent than suburb neighbourhoods.

Figure 2. Winnipeg Community Centre Areas

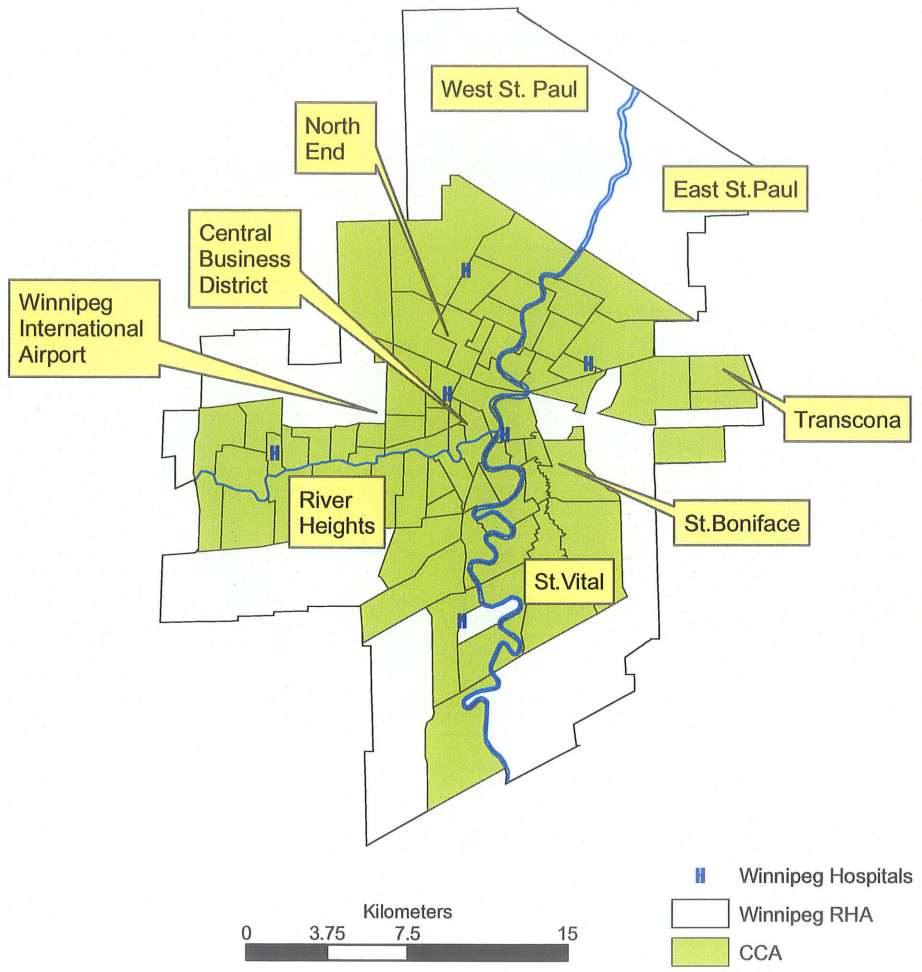
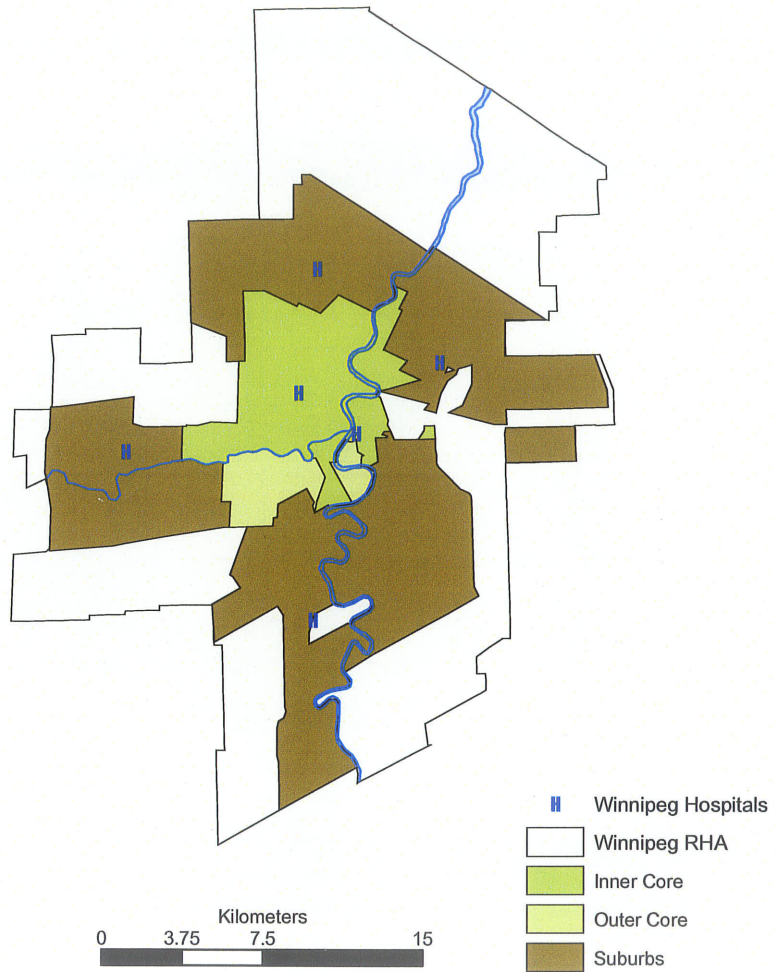


Figure 3. Winnipeg Intra-Urban Areas



The City of Winnipeg is contained within the WRHA, so there are postal codes outside the City of Winnipeg, but within the WRHA that are contained within a CCA, and were therefore not assigned to one of DeVerteuil et al's (2006) three urban areas. Using MapQuest, these postal codes were located and designated to one of the three urban areas. Examples of postal codes not assigned to one of the three urban areas include: East St. Paul, West St. Paul, around the University of Manitoba Fort Garry campus, areas around Vermette, Ill Des Chenes, St. Germain, east Transcona, and by the Winnipeg airport. Postal codes in the periphery of the City or outside the City were assigned to the suburbs as they are predominantly newer areas with low population density and high household incomes.

Source of Data

The data source is anonymized administrative data housed by the MCHP in its Population Health Research Data Repository. The specific data files used for this research are: the population registry, hospital discharge abstracts, physician billing claims, and Statistics Canada Census files.

The population registry contains the following information on all individuals registered with the Manitoba Health Insurance Services Plan (MHSIP): a unique, de-identified personal identification number and a numeric family identifier, date of birth, sex, marital status, six-digit postal code of residence, municipal code of residence, coverage enrollment and cancellation dates, and codes to indicate the reason for cancellation of coverage. The MCHP population registry is updated every six months, in June and December, from "snapshots" of registry files provided by Manitoba Health. The data in successive registries enables residential histories to be created and changes in health coverage and marital status to be monitored.

The hospital discharge abstract database contains a variety of information on discharges from acute care facilities in Manitoba including admission and separation dates and ICD-9-CM diagnostic codes in up to 16 diagnosis fields.

In Manitoba, most physicians (both generalists and specialists) work on a fee-for-service basis. In order to be reimbursed for their services, fee-for-service physicians submit a record, a medical claim, of the visit to the Manitoba Health Insurance Services Plan (MHISP). Each claim contains a three-digit ICD-9-CM diagnostic code for the diagnosis deemed most responsible for the visit, a code identifying the physician, and codes for services and procedures provided during the visit. A small number of Manitoba physicians are salaried, but the majority of these also submit parallel billing claims (i.e., shadow billing). Thus, the MCHP repository contains data on virtually all contacts with physicians in Manitoba.

The Repository also contains a physician resource file. It captures data on the characteristics of physicians who submit claims, including type of specialty and billing address.

The 2001 Statistic Canada Census database contains over 1,000 variables, including marital status, employment, income, residential mobility, education, ethnicity, and type and size of dwellings. Dissemination areas (DAs) are the smallest geographic unit for which Census data are reported by Statistics Canada. DAs have a population of between 400 and 700 people (Statistics Canada, 2003). The Census variables were aggregated to the Regional Health Authority (RHA) district level (51 non-Winnipeg RHA districts) outside of the WRHA and to the level of the 75 CCAs within the WRHA.

Hospital discharge abstracts and physician billing claims with ICD-9-CM codes specifying particular mental health conditions (e.g., ICD-9-CM for 295 schizophrenia)

were used to identify the study cohort. Hospital discharge abstracts and physician billing claims were also used to define individual-level health service utilization variables. The population registry was used to refine the cohort, identify changes in location of residence over time, and create some of the individual-level explanatory variables, such as age and marital status. The RHA district and Winnipeg CCA-level explanatory variables were derived from the 2001 Statistic Census data as well as from the physician supply database.

Study Period

The study period is from April 1, 1998 to June 30, 2004 and is divided into the Cohort Definition Period and the Observation Period. The cohort is defined based on ICD-9-CM diagnostic codes in the hospital discharge abstracts and physician billing claims databases in the first two years of the study period, April 1, 1998 to March 31, 2000 (Cohort Definition Period). The Observation Period, the four-year period in which the outcome measures of residential mobility were defined, is June 1, 2000 to June 30, 2004. The study period is divided this way because the cohort is defined using health data which is based on fiscal years (April to March) and residential location information is available only twice a year, in June and December. To ensure a temporal relationship between diagnosis and mobility, the baseline date was June 2000, the first date outside of the Cohort Definition Period that location of residence was available.

Defining the Study Cohort

All Manitoba residents 19 years of age and older as of June 1998, who were continuous residents of Manitoba for the period April 1, 1998 to June 30, 2004, and had at least one hospital separation or one physician ambulatory visits in the two-year period

fiscal year (FY) 1998/1999 to 1999/2000 with an ICD-9-CM diagnosis code of 291, 292, 295, 300, 301, 303, 304, and/or 305 were selected for inclusion in the study cohort. Public trustees and residents of Deer Lodge and Riverview were excluded from the cohort. Public trustees are individuals who are unable to look after their own personal affairs (e.g., financial). In the Registry, their address is the Office of the Public Trustees (Manitoba Centre for Health Policy, 2003a). For this study, the selected ICD-9-CM codes could be in any one of the 16 diagnosis fields in a hospital discharge abstracts. The selected diagnostic codes represent several mental disorders (see Table 1).

Table 1. ICD-9 Diagnostic Codes for Identifying Individuals with Mental Disorder

Disorder	ICD-9-CM Code	Diagnosis
Anxiety	300	Anxiety Disorders
Personality	301	Personality Disorders
Schizophrenia	295	Schizophrenia
Substance Abuse	291	Alcoholic Psychoses
	292	Drug Psychoses
	303	Alcoholic Dependence
	304	Drug Dependence
	305	Non-Dependent Abuse of Drugs

Each individual in the cohort had a diagnosis code for at least one of the identified mental disorders, however, they may have also had other mental disorder (ICD-9-CM codes in the range from 290 to 319 inclusive). It was possible to distinguish individuals who had a diagnosis for a single mental disorder from those who had diagnoses for more than one mental disorder. The cohort was divided into groups based on the presence of one or multiple mental disorder diagnoses. There were four groups with a diagnosis for a single mental disorder; only schizophrenia, only personality disorders, only anxiety disorders, and only substance abuse disorders. There was one group, co-occurring disorders, with diagnoses for more than one mental disorder (where at least one of the

mental disorder diagnoses were one of the four specified diagnoses). These five groups were mutually exclusive.

Variable Definitions

Outcome Measures

Residence location was tracked for each individual in the cohort over the entire six-year study period, June 1998 to June 2004. Thus, postal code was captured at 13 points in time for each individual in the cohort. However, the residential mobility outcome measures were defined using only those data in the Observation Period, June 2000 to June 2004.

The postal codes were used as the basic building blocks to define measures of residential mobility across different geographic areas including regions, municipalities, RHA districts, RHAs, Winnipeg CCAs, and intra-urban areas. Residential mobility was also defined according to the frequency of changes in residential location.

The primary definitions of residential mobility used in this study were:

- Any move
 - Any change in postal code during the first 18 months of the Observation Period (June 2000 to December 2001), distinguishing individuals who moved (movers) from those who did not move (non-movers).
 - Any change in postal code during the full four-year Observation Period (June 2000 to June 2004), distinguishing individuals who moved (movers) from those who did not move (non-movers).
- Intra-urban move

- Inner core to suburb move – a postal code corresponding to the inner core at baseline (June 2000) and a postal code corresponding to the suburbs at end point (June 2004), identifying inner core-to-suburbs movers and non-movers; non-movers included individuals who did not move as well as individuals who moved within the inner core. Anyone who had a postal code corresponding to the outer core during the Observation Period was not included.
- Suburb to inner core move – a postal code corresponding to the suburbs at baseline (June 2000) and a postal code corresponding to the inner core at end point (June 2004), which identified inner core-to-suburbs movers and non-movers; non-movers included individuals who did not move as well as individuals who moved within the suburbs. Anyone who had a postal code corresponding to the outer core during the Observation Period was not included.
- Frequency of moves - Non-movers had no postal code changes, single (infrequent) movers had one postal code change, and multiple (frequent) movers had two or more (up to a maximum of eight) postal code changes in the Observation Period.

Explanatory Variables

The explanatory variables include individual-level characteristics and community-level characteristics.

i. Individual Characteristics

The individual characteristics include: type of mental disorder, demographic, geographic, socioeconomic, level of co-morbidity, and health service utilization.

Type of mental disorder was defined as the presence (1) or absence (0) of a single mental disorders diagnosis or multiple mental disorders diagnoses as noted previously.

The demographic characteristics include: age, sex, and marital status. Age, sex, and marital status were defined from the population registry. Age was based on age (in years) at the start of the study period (i.e., June 1998). There are two categories for marital status, married (1) and other (0); where the 'other' category includes single, divorced, and widowed. Marital status was defined at the start of the Observation Period (i.e., June 2000). Residential mobility during the Cohort Definition Period was also used as an explanatory variable. Residential mobility was defined here as any change in postal code between June 1998 and December 1999, identifying movers and non-movers. A maximum of three moves were possible during this time period (i.e., a total of four postal codes are captured).

The geographic characteristics include: region of residence, RHA region of residence for rural RHA residents, and intra-urban area of residence for WRHA residence. These geographic variables were defined at the start of the Observation Period. Region of residence was defined as either Winnipeg RHA or rural (non-Winnipeg) RHA. The rural RHAs were grouped into three regions (to form the RHA region of residence): north, rural south, and central rural. The north region was comprised of the Burntwood, Churchill, and Nor-Man RHAs. The Brandon, Assiniboine, and South Eastman RHAs formed the rural south region. The central rural included the North Eastman, Interlake, and Parkland RHAs. The WRHA was divided into the three intra-urban areas described earlier; inner core, outer core, and suburbs.

The sole socioeconomic characteristic was income quintile. Income quintile was derived from 2001 Statistics Canada Census data. Income quintile is an area-level

measure based on the average household income for a dissemination area. The average household income for the dissemination area is attributed to every person residing in that area. Each quintile represents approximately 20% of the population and separate income quintiles are defined for rural and urban residents. Urban residents include those residing in Winnipeg; approximately 20% of this population is assigned to one of the five urban income quintiles (U1 (poorest) to U5 (most affluent)). All other Manitobans are assigned to one of the five rural income quintiles (R1 (poorest) to R5 (most affluent)). Income quintile was treated as an individual-level variable in this study because 1) individual-level income information (e.g., household income) is not available in administrative data, and 2) income quintile is not available at the same geographic unit of analysis (CCAs in WRHA and RHA districts outside of the WRHA) as the second-level variables. DAs are smaller than CCAs and RHA districts. In the instances where an income quintile cannot be assigned, participants were placed into the "Income Unknown" category. Income quintile was defined at the start of the Observation Period.

Level of co-morbidity was defined by counting the number of Ambulatory Diagnostic Groups (ADGs). ADGs are groups of ICD-9/ICD-9-CM codes that represent diagnoses that are clinically similar and for which the expected or actual use of health care services is similar. Diagnoses (ICD-9-CM codes) are based on physician billings claims and hospital abstract data. Each ICD-9 code is categorized into one ADG; there are 32 ADGs in total. MCHP researchers have developed a methodology for using ADGs to measure severity of illness (i.e., counting the number of ADGs each person has). Previous researchers have grouped the population into ADG quartiles (e.g., 25 % have between 0 and 2 ADGs, 25 % have 3 to 4 ADGs, etc.). ADGs are based on single years of health data because there has been no methodology yet developed to handle multiple

years of ADG data (e.g., average ADGs, maximum number of ADGs). In this study, ADGs were defined for FY 1999/00.

Measures of health services utilization were defined for each individual in the cohort, including number of in-patient hospitalizations and number of ambulatory physician visits. Health service utilization data was available for each fiscal year, but were aggregated across the four-year Observation Period. Four variables are defined from hospital discharge abstracts:

- number of hospital separations with a mental disorder diagnosis (ICD-9-CM codes 290 to 319);
- number of hospital separations with a non-mental disorder diagnosis (ICD-9-CM codes excluding 290 to 319); and
- total number of hospital separations.

In this study, a hospital separation is considered a mental disorder hospitalization if an ICD-9-CM code is recorded in any one of the 16 diagnosis fields on the hospital discharge abstract. An inpatient is “someone who is admitted and discharged from hospital with a LOS [length of stay] of 1 or more days” (MCHP Glossary, 2003).

An ambulatory physician visit is “any contact between a patient and physician at one of the following locations: physician's office, outpatient or emergency department, clinics, Personal Care Home, the patient's home, or northern / remote nursing stations. Contact with patients who are in hospital are not included” (MCHP Glossary, 2003). Physicians are classified as either general practitioners or specialists. A general practitioner is “a physician who operates a general or family practice and provides ambulatory care” and specialists are “Physicians whose practices are limited to a specific

area of medicine in which they have undergone additional training” (MCHP Glossary, 2003). Specialties include: psychiatry, paediatrics, obstetrics and gynaecology, medical specialists, general surgeons, and surgical specialists. Nine ambulatory physician visit variables were defined for this study:

- the number of ambulatory physician visits to a general practitioner with a mental disorder diagnosis (ICD-9-CM codes 290 to 319);
- the number of ambulatory physician visits to a psychiatrist with a mental disorder diagnosis (ICD-9-CM codes 290 to 319);
- the number of ambulatory physician visits to another specialist with a mental disorder diagnosis (ICD-9-CM codes 290 to 319);
- the total number of ambulatory physician visits with a mental disorder diagnosis;
- the number of ambulatory physician visits to a general practitioner with a non-mental disorder diagnosis (ICD-9-CM codes excluding 290 to 319);
- the number of ambulatory physician visits to a psychiatrist with a non-mental disorder diagnosis (ICD-9-CM codes excluding 290 to 319);
- the number of ambulatory physician visits to another specialist with a non-mental disorder diagnosis (ICD-9-CM codes excluding 290 to 319);
- the total number of ambulatory physician visits with a non-mental disorder diagnosis; and
- the total number of ambulatory physician visits.

ii. Community Characteristics

The contextual variables that were developed for each RHA district or CCA were grouped into the following categories: demographic, social isolation, socioeconomic,

social disorganization, and health care provision. The health care provision data was not available for the WRHA. The contextual characteristics were assigned to all members of the cohort based on their location of residence at baseline (June 2000).

The health care provision category included physician supply. Data on physician supply was obtained from the physician resource file. The number of general practitioners (GPs), psychiatrists, and other specialists per 1,000 adult population (19+ years of age) was computed for each RHA district.

The remaining contextual characteristics were obtained from 2001 Statistics Canada Census data. All the demographic variables were marital status variables and included the percentage of the population that were married, divorced, widowed, and separated.

The social isolation variable was the percentage of individuals who reported living alone. The socioeconomic variables were subdivided into the following categories: income, employment, and education. The income variable was median household income. The employment variable was the percentage of the population unemployed. The education variable was the percentage of individuals with less than grade 9 education. Lastly, the social disorganization variables were the: (a) percentage of individuals who moved in a one year period, (b) percentage of individuals who have moved in a five year period, and (c) percentage of single parent households. This categorization of contextual characteristics has been used in ecological studies of small area variations in mental health service use (Almog et al., 2004; Silver et al., 2002; Stuart, 2000; Thornicroft, 1991).

Data Analysis

Basic descriptive statistics, including means, standard deviations, and frequency distributions, were used to characterize the cohort on the outcome and explanatory variables. No bi-variate inferential analyses (tests of significance) were performed on the individual and community-level variables to determine whether there was a significant association with residential mobility. Spearman-Brown correlation coefficients were used to examine the degree of association among community-level explanatory variables to assess the data for collinearity.

The means and standard deviations for the community characteristics are computed as follows: each individual is assigned a value for each community characteristic based on where she/he lived in June 2000. The means and standard deviations represent the average amount of variation in each contextual characteristic for each diagnostic group, and each diagnostic group and mover status. For example, the mean for the 1 year mobility variable represents the mean percentage of the population who moved in the last year in each RHA district, weighted by the number of individuals in each RHA district.

The data are also presented using visual/spatial techniques. Various mapping techniques are available to present geographic information. All mapping was undertaken using ArcMAP, a Geographic Information System (GIS). A choropleth map is used to illustrate the geographic variation in location of residence at baseline. The values represent the percentage of the adult population (19 years and older) in each area (RHA district or CCA). The data is divided into quartiles (or tertiles).

Choropleth maps are also used to illustrate the geographic variation in the community variables. Only one selected variable from each of the categories of

contextual characteristics were mapped because of the large numbers of variables that were described; percentage of the adult population who is divorced, percentage of the population unemployed, median household income, percentage of the population with less than secondary education, percentage of the population who moved in one year, percentage of the population who live alone, and number of family physicians per 1,000 adult population.

Initially, logistic regression analyses were used to model mobility as a function of the individual characteristics to determine which of the individual-level characteristics to include in the hierarchical models. The Hosmer-Lemeshow Goodness of Fit test (Hosmer & Lemeshow, 1989) was used to assess the adequacy of fit of each model; a non-significant χ^2 indicates a good fitting model. Wald χ^2 tests were used to assess statistical significance of main effects and interactions. These analyses were conducted using PROC LOGISTIC in SAS (SAS Institute, 1999).

Logistic regression models were first applied to the any move variable (i.e., moved/did not move during the Observation Period) for the entire cohort. The Hosmer-Lemeshow Goodness of Fit test revealed that none of the models were a good fit to the data, so separate models were created for the WRHA cohort and non-WRHA cohort. The WRHA cohort resided in the WRHA for the full study period (April 1998 to June 2004) and rural RHA cohort resided outside the WRHA for the full study period. The Hosmer-Lemeshow Goodness of Fit test revealed that these models were a better fit to the data. Consequently, all analyses were conducted separately for the WRHA cohort and the rural RHA cohort.

Selected two-way interactions between diagnosis group and other individual-level variables were also included in the preliminary models. However, none of these models

were a significant improvement in fit over the main effects models and the interaction terms were non-significant. Consequently, all reported models include main effects only. Correlational analyses revealed a high degree of collinearity between the number of physician visits, the number of hospitalizations and the number of ADGs. Logistic regression models that contained the number of physician visits and the number of hospitalizations were a better fit to the data, according to the Hosmer-Lemeshow Goodness of Fit test, than the logistic regression models that included number of ADGs as an explanatory variable. Therefore, all reported models include the number of physician visits and the number of hospitalizations as explanatory variables.

Hierarchical non-linear models were then applied to the data. Hierarchical models are appropriate to use for clustered data, that is, for data in which individuals are clustered within small geographic areas (Snijders & Bosker, 1999). These models were selected to examine the variation in residential mobility that can be attributed to the individual's characteristics, as well as the region in which he/she lives. The data had a hierarchical data structure, such that individuals (level 1) were nested within CCAs or RHA districts (level 2). This approach was taken because it was hypothesized that individuals would be clustered in areas – thus, it was assumed that individuals within an area are more alike than individuals between areas and this should account for some of the error variation in the data. Hierarchical non-linear mixed models were conducted using the NLMIXED procedure in SAS (SAS Institute, 1999).

Due to the presence of collinearity among the community-level characteristics, only one variable from each of the social disorganization, social isolation, and socioeconomic categories was selected to include in the WRHA models; the rural RHA

models included these same variables, as well as one variable from the health care provision category.

Each model included a random intercept. Random slopes for the community-level characteristics did not result in a significant improvement in model fit and resulted in model convergence problems. Therefore, random slopes were not included in the final models. The equation for our final model has the form:

$$\text{Log}\left[\frac{p_{ij}}{1-p_{ij}}\right] = \beta_0 + b_{0j} + \sum_{k=1}^K \alpha_k X_{ijk} + \sum_{m=1}^M \gamma_m Y_{jm} + \varepsilon_{ij}$$

where p_{ij} is the probability of moving for person i in RHA district/CCA j , where $i = 1, \dots, N$ and $j = 1, \dots, J$. The population-average intercept is denoted β_0 . The intercept for the j th area is b_{0j} , which is distributed as $N(0, \hat{\sigma}_{b_j}^2)$ where $\hat{\sigma}_{b_j}^2$ denotes the variance of the random intercept. The individual-level covariates are represented by X_k , where $k = 1, \dots, K$, and the RHA district/CCA covariates are represented by Y_m , where $m = 1, \dots, M$. The parameters of interest are represented by α (individual-level characteristics) and γ (the community-level characteristics). The residual error is denoted as ε_{ij} . The variance of the residual error is a function of the mean. It is assumed that observations in different areas are independent.

The default options in NLMIXED were used to fit the models to the data. The parameter estimates were estimated using maximum likelihood estimation using adaptive Gaussian quadrature. The default optimization technique was dual quasi-Newton algorithm method of integration of likelihood over random effects. For some of the models the optimization procedure did not converge and no reliable estimates were produced.

The Aikake Information (AIC) criterion was used to assess model fit. Given competing models, the model selected is the one that minimizes

$$\begin{aligned} \text{AIC} &= -2(\text{maximized log-likelihood}) + 2(\text{number of parameters}) \\ &= -2(\hat{l} - c) \end{aligned}$$

where \hat{l} is the maximized REML log-likelihood and c is the number of covariance parameters. The AIC balances two objectives: “the covariance model must be sufficiently complex to provide a good fit to the data, but at the same time a premium is attached to a parsimonious model” (Fitzmaurice, Laird, & Ware, 2004). The Bayesian Information Criterion (BIC) is another criterion to select the best-fitting model. Fitzmaurice et al. (2004) recommend using the AIC over the BIC, however, because the BIC “entails a high risk of selecting a model that is too simple or parsimonious for the data” (p. 177).

The outcome variable for the first set of models was any move, a binary variable, which defined movers as those with a change in postal code and non-movers as those with no change in postal code within the specified period time. Any move was modeled for the non-WRHA and WRHA cohorts. Any move was defined for an 18-month period (June 2000 to December 2001) and the 4-year Observation Period (June 2000 to June 2004). There is no standard length of time in which residential mobility has been examined – in previous studies the length of the mobility periods range from one to five years. The outcome variable, any move, was examined for two time periods for a number of reasons, including, to check consistency of results across different definitions. For comparison purposes, Census statistics on residential mobility were available for one- and five-year periods. An 18-month period was chosen because this length of time was as close to a one-year period as was possible with administrative data (given that the registry

data is only updated twice a year). At the data extraction phase of this study, the most recent registry data available was June 2004; this restricted the Observation Period to a four-year interval (as opposed to a five-year period).

Directional mobility between the inner core and suburbs was examined next. Mobility from the inner core to the suburbs was examined first. Inner core to suburbs move was defined as a change in area of residence between June 2000 and June 2004 that corresponded to a move from the inner core to suburbs. The outcome variable was binary; moved from the inner core to suburbs or did not move out of the inner core. The inner core to suburbs analyses included anyone who resided in the inner core at baseline (June 2000) and either resided in the inner core or suburbs at end point (June 2004). Anyone who did not move and anyone who moved within the inner core were combined as lived in the inner core. Anyone who resided in the outer core at end point was removed from the analyses.

Mobility from the suburbs to the inner core was examined next. Suburb to inner core move was defined as a change in area of residence between June 2000 and June 2004 that corresponded to a move from the suburbs to the inner core. The outcome variable was binary; moved from the suburbs to the inner core or did not move out of the suburbs. The suburbs to inner core analyses included anyone who resided in the suburbs at baseline (June 2000) and either resided in the inner core or suburbs at end point (June 2004). Anyone who did not move and anyone who moved within the suburbs were combined as lived in the suburbs. Anyone who resided in the outer core at end point was removed from the analyses. Since only the baseline and end point dates were used to define directional mobility, some individuals may have changed areas more than once.

The last set of models tested the association between type of mover, defined as infrequent and frequent, and the individual and community-level determinants for WRHA and non-WRHA cohorts. Single movers were defined as having a single postal code change in the observation period and multiple movers had two or more changes in postal code during the observation period.

The regression coefficients for all of the models were exponentiated to produce odds ratios (ORs); 95% confidence intervals were computed and were used to determine significance. Because of small cell sizes, the personality disorders and schizophrenia groups were removed from some of the analyses. The percentage change in the model deviance was used to assess the benefit of using a subject-specific model over a population-average model.

The individual-level variables in the hierarchical models were defined using a series of dummy variables. The diagnostic groups formed the categories for type of diagnosis; schizophrenia, personality, substance abuse, anxiety, and co-occurring disorders. For the WRHA models, the age categories were: 19 to 29 years, 30 to 44 years, 45 to 64 years, and 65 years and older, and for the non-WRHA models, the two oldest age categories were combined (due to small cell sizes). The categories for sex were male and female. The categories of income quintile corresponded to the five income quintiles. Moved and did not move were the categories for mobility during the Cohort Definition Period. The categories for hospitalizations were 0 and 1 or more hospitalizations during the Observation Period. The categories for physician visits were 20 or less and more than 20 during the Observation Period for all the models except the ones with the outcome variable any move during the 18-month Observation Period. The categories for physician visits were 9 or less and 10 or more during FY 99/00 for the models with the outcome

variable any move during the 18-month Observation Period. Married and not married were the categories for marital status. The reference categories were co-occurring mental disorders, 65 years and older (WRHA models), 45 years and older (non-WRHA models), female, not married, did not move, wealthiest income quintile, 0 hospitalizations, 21 or more physician visits. The community-level variables were continuous in the models.

Random effects models are often called subject-specific models, while models containing only fixed effects are referred to as population-average models (Fitzmaurice et al., 2004). In subject-specific models, the regression coefficients represent the “influence of covariates on a *specific* subject’s mean response” (Fitzmaurice et al., 2004). In marginal models, the regression coefficients represent the influence of covariates on “changes in the (transformed) mean responses over time in the study population” (Fitzmaurice et al., 2004). These two models address different scientific questions – subject-specific models address the case where the data is correlated (observations clustered within areas) and population-average models address the case where the observations are independent.

Study Assumptions

There are a number of assumptions underlying this research. The main assumption is that the cohort is representative of all individuals in Manitoba with specific mental illnesses. Since the cohort was created based on contact with the health care system in a two-year period (April 1998 to June 2004) which resulted in at least one ICD-9 diagnostic code for schizophrenia, anxiety, substance abuse, and personality disorders, it does not include everyone in the province with those specific mental illnesses. Anyone with those specific mental illnesses that was not hospitalized or did not visit a physician that resulted

in the specified ICD-9 diagnostic codes was not included. It is assumed that the characteristics of the cohort are comparable to the characteristics of the population of individuals with mental illness in the province.

A secondary assumption is that the cohort members were accurately diagnosed; meaning that they truly have the mental disorder that was recorded in the physician billing claims and/or hospital discharge abstracts databases.

A third assumption is that the residential information is accurate. Residential mobility was determined by detecting changes to six-digit postal codes that were available every six months. In order for a change to be detected, the new address had to be reported to Manitoba Health.

A fourth assumption is that the frequency of residential mobility is accurate. Since postal code information is only available for June and December, only one change of address can be detected between these months. Thus, it is assumed that if there was a change in address between these two months, there was only one move and it was assumed that if postal codes six months apart were the same there were no moves.

Chapter 4: Results

This chapter begins with a description of the characteristics of the entire study cohort. The characteristics of the WRHA cohort, those individuals who resided in the WRHA for the entire six-year study period, are described next, and followed by a description of the rural RHA residents, those individuals who resided in the rural RHAs for the entire six-year study period. The results of the hierarchical logistic regression analyses to test the associations between individual and community characteristics and residential mobility conclude the chapter. These inferential analyses are also reported separately for the WRHA and rural RHA cohorts.

Description of Study Cohort

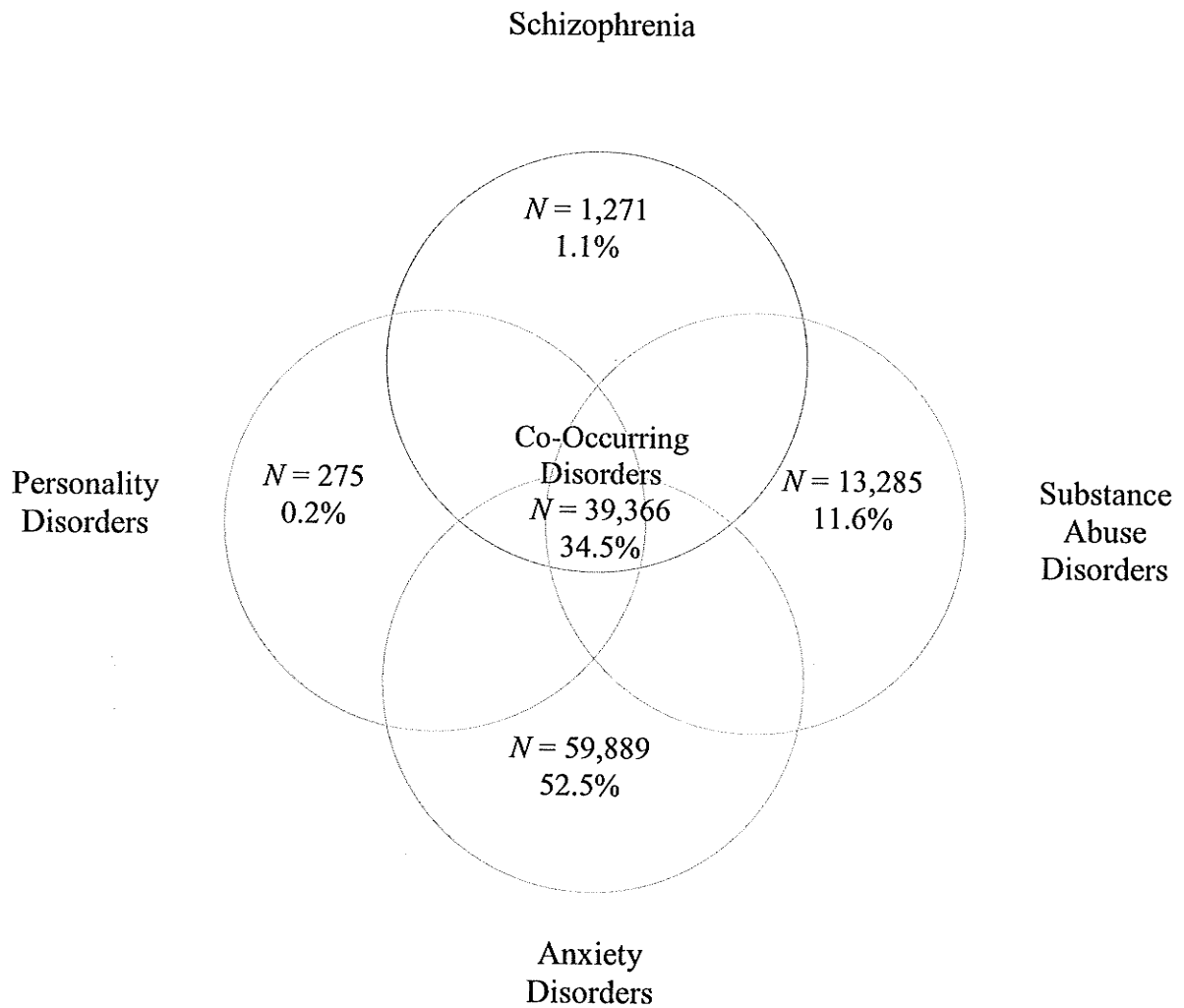
The study cohort consisted of 114,086 individuals with a diagnosis of schizophrenia, substance abuse, personality, and/or anxiety disorders in the physician billing claims or hospital discharge abstracts in the two-year Cohort Definition Period. A total of 67,330 (59.0%) of these individuals were continuous residents of the WRHA for the six-year study period. Another 37,591 individuals (32.9%) were continuous residents of rural RHAs for the six-year study period. The remaining 9,165 individuals (8.0%) changed their region of residence between the WRHA and rural RHAs during the six-year study period. The 8% of the study cohort that changed regions during the study period are included in the discussion of the Description of the Study Cohort, but are excluded from all further descriptive and inferential analyses.

Individual-Level Characteristics

Type of Mental Disorders Diagnosis

The cohort was classified according to the type of diagnosis (see Figure 4). Individuals with a single diagnosis (65.5%) were distinguished from those with co-occurring mental disorder diagnoses ($N = 39,366$; 34.5%). There were four sub-groups with diagnoses for only one mental disorder: schizophrenia ($N = 1,271$; 1.1%), personality disorders ($N = 275$; 0.2%), substance abuse disorders ($N = 13,285$; 11.6%), and anxiety disorders ($N = 59,889$; 52.5%). Individuals with two or more mental disorder diagnoses formed the co-occurring disorders group; at least one of the diagnoses was one of schizophrenia, substance abuse, personality, or anxiety disorders. In the co-occurring disorders group, 85.5% had 2 disorders, 11.8% had 3 disorders, 1.5% had 4 disorders, and 0.2% had 5 disorders. The majority of the co-occurring disorders group had an anxiety disorder (86.6%) and some other mental disorder (91.6%) (e.g., depression, bi-polar disorder), while 23.7% had a substance abuse diagnosis, 6.8% had a personality disorders diagnosis, and 6.5% had a schizophrenia diagnosis.

Figure 4. Distribution of the Diagnostic Groups in the Study Cohort



Demographic

The percentage of individuals in each of the sex, age, and marital status categories are presented in Table 2. The majority of individuals were female (61.0%). The mean age of the cohort was 44.1 (SD = 15.9). The majority of the cohort was married (55.50%).

Overall, 17% of the cohort moved during the Cohort Definition Period.

Geographic

The geographic distribution of the cohort is presented in Table 2. The majority of the cohort (63.3%) resided in the WRHA at the beginning of the Observation Period. The majority of the cohort who resided in the WRHA at baseline resided in the suburbs (61.8%). Among those who resided in rural RHAs, the majority resided in rural central RHAs (48.8%).

Socioeconomic

The percentage of individuals in each income quintile is presented in Table 2. Among the rural residents, the smallest percentage of individuals resided in the poorest areas (R1), while the highest percentage of individuals resided in the wealthiest areas (R5). Among the urban dwellers, the smallest percentage of individuals resided in the wealthiest areas (U5), while the greatest percentage of individuals resided in the poorest areas (U1).

Table 2. Demographic, Geographic, and Socioeconomic Characteristics for the Study

Cohort

Variable	Category	<i>N</i>	%
Sex	Male	44,517	39.0
	Female	69,568	61.0
Age	19 to 29	22,826	20.0
	30 to 44	41,076	36.0
	45 to 64	35,285	30.9
	65+	14,898	13.1
Marital Status	Not married	51,368	45.0
	Married	62,717	55.0
Mobility in Cohort	Did not move	94,692	83.0
Definition Period	Moved	19,393	17.0
Region	Non-Winnipeg	41,924	36.7
	Winnipeg	72,161	63.3
Rural RHA Region	North	7,064	16.8
	Rural Central	20,453	48.8
	Rural South	14,407	34.4
WRHA Area	Inner Core	22,930	31.8
	Outer Core	4,610	6.4
	Suburbs	44,621	61.8
Income Quintile	R1 (poorest)	7,050	6.2
	R2	7,369	6.5
	R3	7,234	6.3
	R4	7,279	6.4
	R5 (wealthiest)	8,405	7.4
	U1 (poorest)	17,628	15.5
	U2	16,175	14.2
	U3	15,510	13.6
	U4	14,321	12.6
	U5 (wealthiest)	12,618	11.1
	NF	496	0.4

Level of Co-morbidity

The frequency distribution of ADGs in the fiscal year 1999/2000 is presented in Table 3. The mean number of ADGs was 4.5 (SD = 2.9). The majority of the cohort had between 3 and 5 ADGs (41.7%).

Hospital Separations

The frequency distribution of the number of hospital separations in the Observation Period is presented in Table 3. The results are presented separately for hospitalizations with a mental disorders diagnosis, hospitalizations with a non-mental disorders diagnosis, and all hospitalizations. The majority of the cohort did not have any hospital separations with a mental disorders diagnosis during the Observation Period (95.4%). More of the cohort had at least one hospital separation with a non-mental disorders diagnosis (45.9%). Almost half of the cohort was hospitalized during the Observation Period (48.1%).

Table 3. Level of Co-morbidity and Health Service Use for the Study Cohort

Variable	Category	N	%
ADGs	0	4,080	3.6
	1 to 2	25,895	22.7
	3 to 5	47,539	41.7
	6 to 9	29,741	26.1
	10+	6,830	6.0
Hospital Separations			
Mental Disorder Diagnoses	0	108,865	95.4
	1 or more	5,220	4.6
Non-Mental Disorder Diagnoses	0	61,726	54.1
	1 or more	52,359	45.9
All Diagnoses	0	59,218	51.9
	1 or more	54,867	48.1
Physician Visits			
Mental Disorder Diagnoses	0 to 4	80,252	70.3
	5 to 8	12,627	11.1
	9 to 12	6,219	5.5
	13 to 16	3,639	3.2
	17 to 20	2,469	2.2
	21 or more	8,879	7.8
Non-Mental Disorder Diagnoses	0 to 4	8,157	7.1
	5 to 8	8,802	7.7
	9 to 12	9,381	8.2
	13 to 16	9,325	8.2
	17 to 20	8,890	7.8
	21 or more	69,530	60.9
All Diagnoses	0 to 4	5,813	5.1
	5 to 8	6,698	5.9
	9 to 12	7,733	6.8
	13 to 16	8,015	7.0
	17 to 20	7,936	7.0
	21 or more	77,890	68.3

Physician Visits

The average annual number of physician visits per year during the Observation Period is reported in Table 4. The results are presented separately for visits with a mental disorders diagnosis, visits with a non-mental disorders diagnosis, and all visits. Physician

visits with mental and non-mental disorder diagnoses are reported by type of physician. On average, the cohort had 1.6 visits with a mental disorder diagnosis. The majority of the cohort had four or fewer physician visits with a mental disorder diagnosis (70.3%). On average, the cohort visited GPs more often ($M = 1.0$ visits per year) than psychiatrists ($M = 0.6$ visits per year).

On average, the cohort visits physicians more often with non-mental disorder diagnoses ($M = 8.9$) than mental disorder diagnoses. In fact, the majority of the cohort had more than 20 visits during the Observation Period (60.9%). The cohort visited GPs ($M = 5.5$ visits per year) more often than specialists (other than psychiatrists) ($M = 3.4$ visits per year) with a non-mental disorders diagnosis.

Overall, the cohort had on average 10.5 physician visits per year. The majority of the cohort (68.3%) had more than 20 physician visits per year.

Table 4. Average Annual Number of Hospital Separations and Physician Visits for the Study Cohort

Variable	Category	Mean	Median	SD
Hospital Separations				
	Mental	0.0	0.0	0.2
	Non-Mental	0.3	0.0	0.7
	All	0.3	0.0	0.7
Physician Visits				
Mental Disorder Diagnoses	GP	1.0	0.3	2.1
	Other	0.0	0.0	0.2
	Psychiatrist	0.6	0.0	3.1
	All	1.6	0.3	4.0
Non-Mental Disorder Diagnoses	GP	5.5	4.0	5.3
	Other	3.4	1.8	5.1
	Psychiatrist	0.0	0.0	0.3
	All	8.9	6.8	8.3
All Diagnoses		10.5	8.0	9.5

Residential Mobility

The residential mobility results for the cohort are presented in Table 5. Overall, 16.2% of the cohort had at least one change in postal code in the first eighteen months of the Observation Period and 32.3% of the cohort had at least one change in postal code over the entire four-year Observation Period.

Table 5 also presents frequency of moves during the Observation Period. During the Observation Period, a maximum of eight moves were possible (i.e., nine different postal codes). Of those who moved, the majority only moved once (69.9%), 20.1% moved twice, 6.2% moved three times, and 3.8% moved four or more times.

Table 5. Type and Frequency of Moves for the Study Cohort

Variable	Category	<i>N</i>	%
Any Move	18 Months	18,516	16.2
	4 years	36,798	32.3
Number of Moves (4 years)	0	77,287	67.8
	1	25,723	22.6
	2	7,403	6.5
	3	2,284	2.0
	4	807	0.7
	5	364	0.3
	6	159	0.1
	7	48	0.0
	8	10	0.0

Description of WRHA Cohort

Individual-Level Characteristics

Type of Mental Disorders Diagnosis

Of the 67,330 individuals who resided in the WRHA for the entire study period, the majority had a single mental disorders diagnosis (64.5%); schizophrenia (1.3%), personality disorders (0.3%), substance abuse disorders (9.0%), and anxiety disorders

(53.9%). Approximately one third of individuals had co-occurring mental disorders diagnoses (35.5%). The majority of the co-occurring disorders group had two disorders (86.2%), 11.9% had three disorders, 1.6% had four disorders and 0.2% had five disorders. The majority (87.2%) of individuals in the co-occurring disorders group had an anxiety disorder diagnosis, 21.5% had a substance abuse disorders diagnosis, 7.9% had a personality disorders diagnosis, and 7.5% had a schizophrenia diagnosis. The majority of the co-occurring disorders group had some other mental disorders diagnosis (91.9%) (e.g., depression). Subsequent analyses of the WRHA cohort are presented separately for each of these diagnosis groups.

Demographic

The demographic characteristics for the five groups are presented in Table 6. The majority of individuals in the schizophrenia group were male (60.7%), while the majority of individuals in the anxiety disorders (61.5%) and co-occurring disorders (64.4%) groups were female. The substance abuse (56.5% male) and personality (52.4% male) disorders groups had almost an equal number of females and males.

On average, the personality disorders group was the youngest ($M = 40.8$ years) and the schizophrenia group was the oldest ($M = 45.9$ years). The mean age for the other groups are as follows: substance abuse disorders 42.1 years ($SD = 13.4$), anxiety disorders 44.9 years ($SD = 16.3$), and co-occurring disorders 44.4 years ($SD = 15.3$). The largest percentage of individuals in the schizophrenia group was in the 45 to 64 years age category (41.5%), while the largest percentage of individuals in the other groups was in the 30 to 44 age category.

The majority of individuals in the schizophrenia (79.7%) and personality disorders (64.6%) groups were not married, while the majority of individuals in the anxiety

disorders group (57.8%) were married. The substance abuse disorders and co-occurring disorders groups were fairly evenly divided between married and not married.

The personality disorders group (27.0% moved) was the most residentially mobile group during the Cohort Definition Period. The next most residentially mobile was the co-occurring disorders group (22.0% moved).

Geographic

The percentage of the adult population in each of the five groups in each of the 75 Winnipeg CCAs is presented in Figures 5 through 9. The maps illustrate the variation in the geographic distribution of the cohort. The schizophrenia group comprised a larger percentage of the adult population in the inner city neighbourhoods than suburban neighbourhoods. The personality group comprised a very small percentage of the adult population in all CCAs (at most 0.1%). The personality group is slightly more concentrated in the core CCAs than in suburban CCAs. The substance abuse disorders group comprised a large portion of population just north of Downtown, west of the Red River (i.e., the North End). Also, the substance abuse group comprised a large proportion of the adult population in the most eastern (i.e., Transcona) and western (i.e., St. James) CCAs. The map for the anxiety disorders group was the complement of the map for the schizophrenia group; this group comprised a larger portion of the population in the suburbs, and the small percentage of the population in the core. Individuals with anxiety disorders made up as much as 11.3% of the adult population in some areas – in the most eastern CCAs of the city (Transcona). The geographic distribution of the co-occurring disorders group was similar to the geographic distribution of the schizophrenia group; the co-occurring group comprised the largest proportion of the adult population in the inner core CCAs (at most 9.5% of the population). The smallest percentage of the adult

population that the co-occurring group comprised was in the most southern CCAs (i.e., Fort Garry and Fort Richmond).

Figure 5. The Percentage of the Adult Population in the Schizophrenia Group by
Winnipeg Community Centre Area

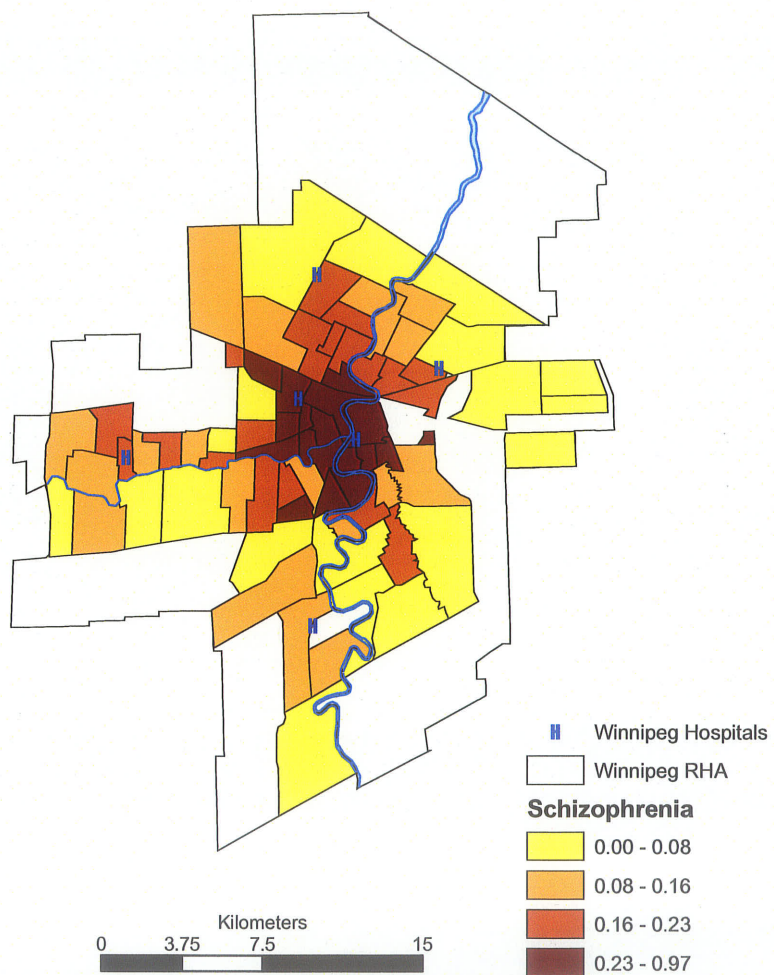


Figure 6. The Percentage of the Adult Population in the Personality Disorders Group by
Winnipeg Community Centre Area

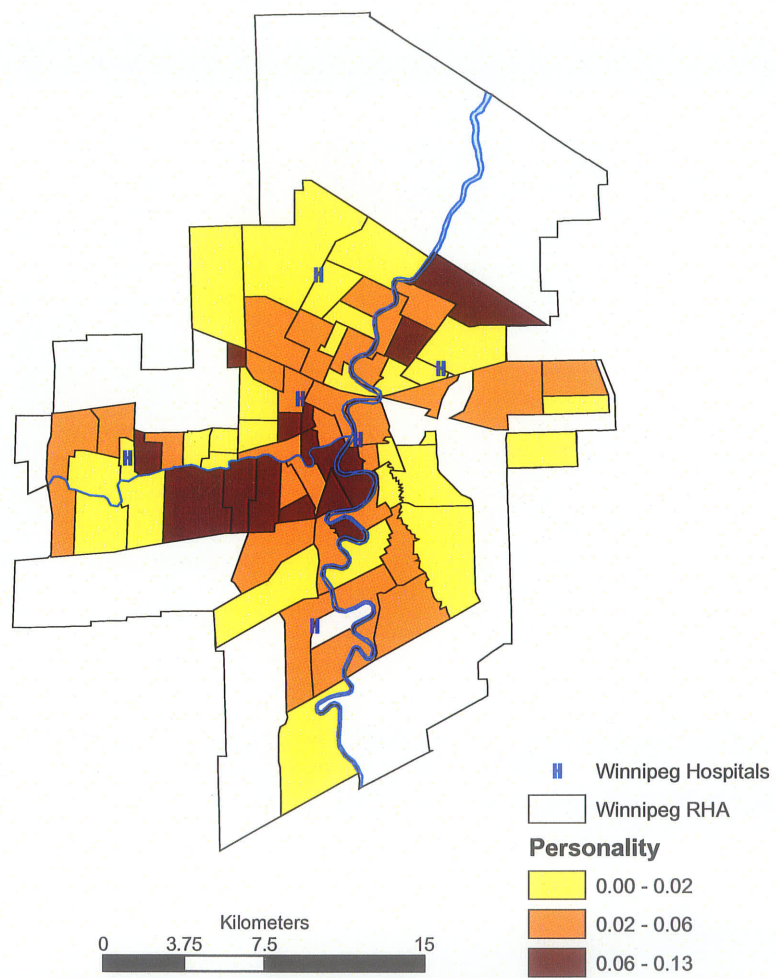


Figure 7. The Percentage of the Adult Population in the Substance Abuse Disorders Group by Winnipeg Community Centre Area

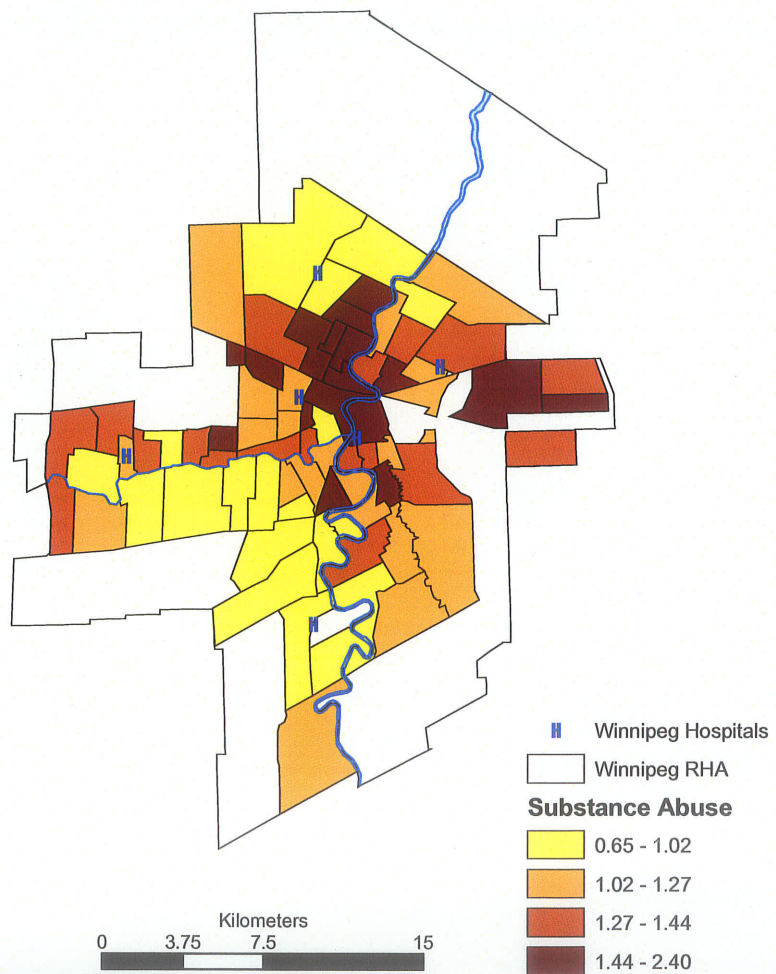


Figure 8. The Percentage of the Adult Population in the Anxiety Disorders Group by
Winnipeg Community Centre Area

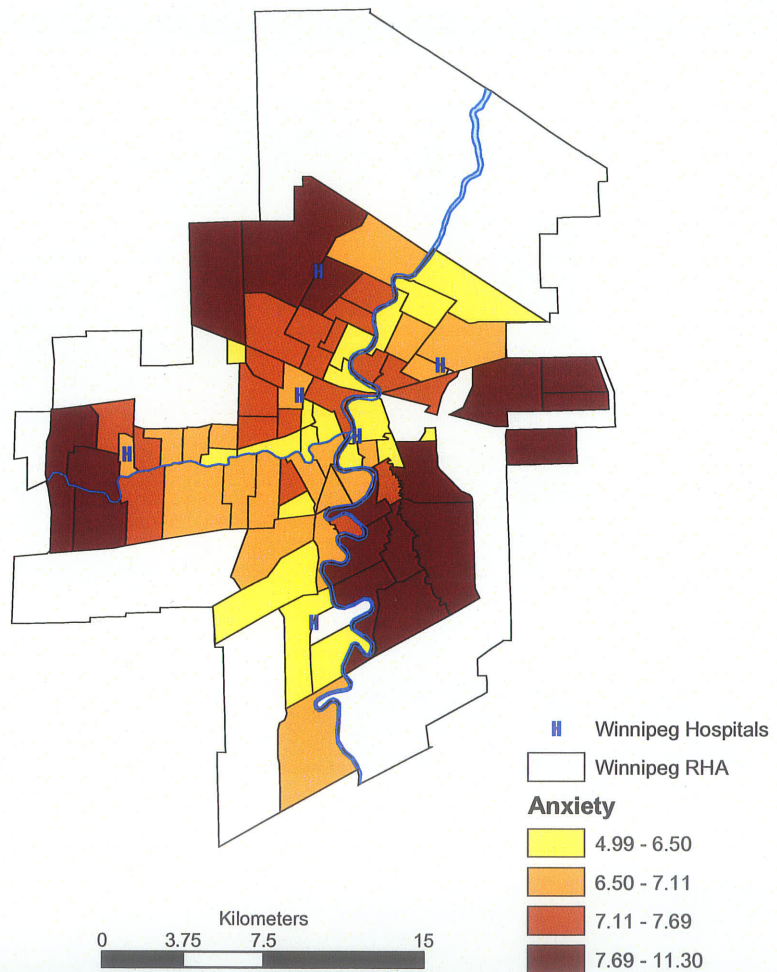
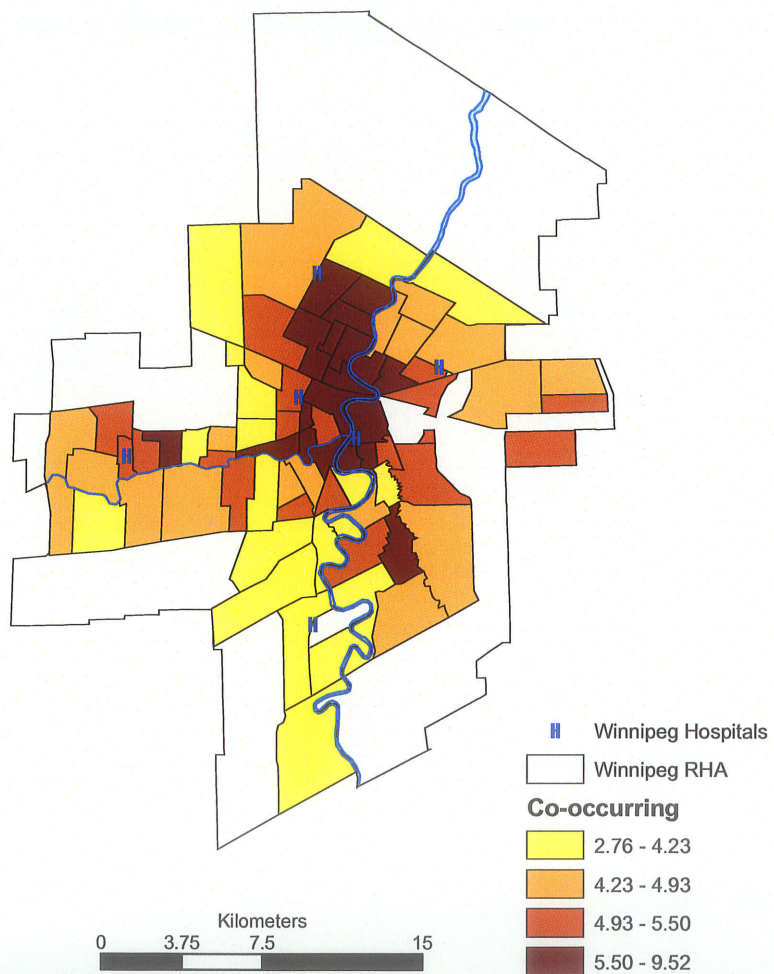


Figure 9. The Percentage of the Adult Population in the Co-occurring Disorders Group by
Winnipeg Community Centre Area



The percentage of individuals in each group in each of the intra-urban areas is reported in Table 6. The substance abuse, anxiety, personality, and co-occurring disorders groups were distributed similarly across the three areas of inner core, outer core, and suburbs. The majority of individuals in the schizophrenia group lived in the inner core (54.9%), while the majority of individuals in the other groups resided in the suburbs. The personality disorders group had a higher percentage of individuals in the outer core (12.7%) than any other group. The anxiety disorders group was the most likely to live in the suburbs (66.6%) and the schizophrenia group was the most likely to live in the inner core (54.9%).

Socioeconomic

The percentage of individuals in each group in each income quintile is reported in Table 6. The distribution of the schizophrenia, substance abuse, and co-occurring disorders groups across the income quintiles showed a clear gradient, with the highest percentages in the poorest income quintiles. The schizophrenia group (39.8%) was most likely to live in the poorest income quintile areas, while the personality (19.6%) and anxiety disorders (19.8%) groups were most likely to reside in the wealthiest income quintile areas. There are similar percentages of individuals in the anxiety disorders group across the income quintiles.

Table 6. Demographic, Geographic, and Socioeconomic Characteristics by Diagnostic Group, Winnipeg Regional Health Authority Cohort

Variable	Category	Schizophrenia (N = 861)		Personality (N = 189)		Substance Abuse (N = 6,045)		Anxiety (N = 36,322)		Co-Occurring (N = 23,913)	
		N	%	N	%	N	%	N	%	N	%
Sex	Male	523	60.7	99	52.4	3,416	56.5	13,990	38.5	8,505	35.6
	Female	338	39.3	90	47.6	2,629	43.5	22,332	61.5	15,408	64.4
Age	19 to 29	95	11.0	45	23.8	1,105	18.3	7,311	20.1	4,060	17.0
	30 to 44	322	37.4	83	43.9	2,581	42.7	12,179	33.5	9,326	39.0
	45 to 64	357	41.5	44	23.3	1,933	32.0	11,401	31.4	7,546	31.6
	65+	87	10.1	17	9.0	426	7.1	5,431	15.0	2,981	12.5
Marital Status	Not married	686	79.7	122	64.6	3,167	52.4	15,344	42.2	12,978	54.3
	Married	175	20.3	67	35.5	2,878	47.6	20,978	57.8	10,935	45.7
Mobility in Cohort Definition Period	Did not move	725	84.2	138	73.0	4,886	80.8	30,770	84.7	18,665	78.1
	Moved	136	15.8	51	27.0	1,159	19.2	5,552	15.3	5,248	22.0
WRHA Area	Inner Core	473	54.9	69	36.5	2,143	35.5	9,835	27.1	8,381	35.1
	Outer Core	63	7.3	24	12.7	359	5.9	2,351	6.5	1,601	6.7
	Suburbs	325	37.8	96	50.8	3,543	58.6	24,136	66.5	13,931	58.3
Income Quintile	U1 (poorest)	343	39.8	53	28.0	1,424	23.6	6,730	18.5	6,200	25.9
	U2	211	24.5	37	19.6	1,306	21.6	7,515	20.7	5,126	21.4
	U3	126	14.6	37	19.6	1,191	19.7	7,258	20.0	4,495	18.8
	U4	96	11.2	23	12.2	1,187	19.6	7,585	20.9	4,131	17.3
	U5 (wealthiest)	62	7.2	37	19.6	929	15.4	7,193	19.8	3,718	15.6

Level of Co-morbidity

On average, the co-occurring disorders group ($M = 5.5$; $SD=2.6$) had the most ADGs while the schizophrenia group ($M = 3.2$; $SD = 2.5$) has the fewest ADGs in a one-year period. The mean number of ADGs for the other groups was as follows: substance abuse 3.5 ADGs ($SD = 2.5$), personality disorder 3.8 ADGs ($SD = 2.5$), and anxiety disorder 4.2 ADGs ($SD = 2.6$). The distribution of ADGs is presented in Table 7. Data is suppressed where cell counts are between one and five. Compared to the other three groups, the anxiety disorders and co-occurring disorders groups had a smaller percentage of individuals with one or two ADGs, but a greater percentage of individuals with six to nine ADGs.

Hospital Separations

The frequency distribution of the number of hospital separations during the Observation Period are reported in Table 7 and means and medians (SDs) are reported in Table 8. Hospital separations with a mental disorders diagnosis were distinguished from hospital separations with a non-mental disorders diagnosis.

The majority of individuals had no hospitalizations with a mental disorders diagnosis during the Observation Period. The schizophrenia group, on average, had the highest number of hospitalizations with a mental disorders diagnosis ($M = 0.11$ hospitalizations per year). Only 1.0% of the anxiety disorders group and less than 10.0% of the co-occurring, substance abuse, and personality disorders groups were hospitalized with a mental disorders diagnosis, while, in sharp contrast, 22.2% of the schizophrenia group was hospitalized with a mental disorders diagnosis.

More individuals were hospitalized with a non-mental disorders diagnosis than a mental disorders diagnosis. The schizophrenia group had the lowest percentage of individuals with at least one hospitalization with a physical disorders diagnosis (26.2%), while the co-occurring disorders group had the highest percentage of individuals hospitalized at least once (45.2%). The co-occurring disorders group averaged 0.3 hospitalizations per year and the schizophrenia group only averaged 0.1 hospitalizations per year with a physical disorders diagnosis.

Overall, approximately half of the co-occurring disorders group was hospitalized during the Observation Period (49.9%). A substantial number of individuals in the other groups were hospitalized during this period, ranging from 34.9% for the personality disorders group to 41.5% for the schizophrenia group. The personality disorders group had on average the fewest number of hospitalizations per year for any reason ($M = 0.19$)

while the co-occurring disorders group, on average, had the most hospitalizations per year for any reason ($M= 0.30$).

Table 7. Level of Co-morbidity and Health Service Use, Winnipeg Regional Health Authority Cohort

Variable	Category	Schizophrenia (<i>N</i> = 861)		Personality (<i>N</i> = 189)		Substance Abuse (<i>N</i> = 6,045)		Anxiety (<i>N</i> = 36,322)		Co-Occurring (<i>N</i> = 23,913)	
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
ADGs	0	39	4.5	s	s	371	6.1	1,541	4.2	250	1.1
	1 to 2	389	45.2	55	29.1	2,084	34.5	9,090	25.0	3,511	14.7
	3 to 5	287	33.3	85	45.0	2,497	41.3	15,901	43.8	9,698	40.6
	6 to 9	127	14.8	36	19.1	932	15.4	8,449	23.3	8,022	33.6
	10+	19	2.2	s	s	2,616	2.7	1,341	3.7	2,432	10.2
Hospital Separations											
Mental Disorder Diagnoses	0	670	77.8	179	94.7	5,871	97.1	35,954	99.0	21,945	91.8
	1 or more	191	22.2	10	5.3	174	2.9	368	1.0	1,968	8.2
Non-Mental Disorder Diagnoses	0	636	73.9	129	68.3	3,753	62.1	21,480	59.1	13,109	54.8
	1 or more	225	26.13	60	31.75	2,292	37.92	47,746	40.86	10,804	45.18
All Diagnoses	0	504	58.5	123	65.1	3,671	60.7	21,288	58.6	11,969	50.1
	1 or more	357	41.46	66	34.92	2,374	39.27	15034	41.39	11,944	49.95
Physician Visits											
Mental Disorder Diagnoses	0 to 4	171	19.9	105	55.6	5,204	86.1	29,622	81.6	10,440	43.7
	5 to 8	128	14.9	18	9.5	439	7.3	3,373	9.3	3,580	15.0
	9 to 12	104	12.1	13	6.9	154	2.6	1,320	3.6	2,270	9.5
	13 to 16	102	11.9	s	s	77	1.3	611	1.7	1,496	6.3
	17 to 20	71	8.3	s	s	51	0.8	397	1.1	1,132	4.7
	21 or more	285	33.1	35	18.5	120	2.0	999	2.8	4,995	20.9
Non-Mental Disorder Diagnoses	0 to 4	168	19.5	25	13.2	625	10.3	2,457	6.8	1,102	4.6
	5 to 8	112	13.0	15	7.9	594	9.8	2,531	7.0	1,336	5.6
	9 to 12	75	8.7	16	8.5	609	10.1	2,714	7.5	1,506	6.3
	13 to 16	70	8.1	13	6.9	584	9.7	2,854	7.9	1,648	6.9
	17 to 20	51	5.9	20	10.6	480	7.9	2,762	7.6	1,620	6.8
	21 or more	385	44.7	100	52.9	3,153	52.2	23,004	63.3	16,701	69.8
All Diagnoses	0 to 4	24	2.8	15	7.9	516	8.5	1,960	5.4	425	1.8
	5 to 8	43	5.0	14	7.4	518	8.6	2,114	5.8	628	2.6
	9 to 12	44	5.1	16	8.5	557	9.2	2,379	6.6	891	3.7
	13 to 16	54	6.3	6	3.2	573	9.5	2,551	7.0	1,014	4.2
	17 to 20	61	7.1	8	4.2	466	7.7	2,631	7.2	1,156	4.8
	21 or more	635	73.8	130	68.8	3,415	56.5	24,687	68.0	19,799	82.8

Note. 's' indicates data suppressed due to small numbers

Physician Visits

The frequency distributions of the number of physician visits during the Observation Period are presented in Table 7 and means and medians (SDs) are reported in

Table 8. Physician visits with mental disorders diagnosis are distinguished from physician visits with non-mental disorders diagnosis.

On average, the schizophrenia group visited any physician with a mental disorders diagnosis most frequently ($M = 4.94$ visits per year), while the substance abuse ($M = 0.68$ visits per year) and the anxiety disorders ($M = 0.86$ visits per year) groups visited any physician with a mental disorders diagnosis least often. The distribution of the groups across the categories of physician visits resulting in a mental disorder diagnosis also varied substantially. For example, the schizophrenia group was fairly evenly distributed across the categories, with the highest percentage having 21 or more physician visits during the Observation Period (33.1%). The highest percentage of individuals in the substance abuse (86.1%) and anxiety (81.6%) disorders groups had between zero and four visits in the Observation Period.

On average, the personality disorders group visited psychiatrists most often ($M = 3.79$ visits per year) while the schizophrenia group visited GPs most often ($M = 1.93$ visits per year) with a mental disorders diagnosis. On average, the schizophrenia and personality disorders groups visited psychiatrists more often than GPs, while the substance abuse and anxiety disorders groups visited GPs more often than psychiatrists with a mental disorder diagnosis. The co-occurring disorders group visited GPs ($M = 1.84$ visits per year) about as often as psychiatrists ($M = 1.81$ visits per year) with a mental disorders diagnosis.

The majority of individuals in each of the groups had more than 20 visits with a non-mental disorder diagnosis. The co-occurring disorders group, had on average, the most physician visits with a non-mental disorders diagnosis ($M = 10.53$ visits per year) while the schizophrenia group had the fewest ($M = 7.13$ visits per year).

The co-occurring disorders group visited GPs ($M = 6.17$ visits per year) and other specialists ($M = 4.33$ visits per year) most often with a non-mental disorders diagnosis. For all of the groups, there were on average more visits to GPs than to specialists with non-mental disorders diagnoses. The suburb-dwelling schizophrenia and substance abuse disorders groups had on average more visits to specialists than GPs.

The majority of individuals in each group had more than 20 visits to physicians during the Observation Period; this ranged from 56.5% for the substance abuse disorders group to 82.8% of the co-occurring disorders group. The co-occurring disorders group, on average, visited physicians most often ($M = 14.22$ visits per year), while the substance abuse disorders groups visited physicians least often ($M = 8.35$ visits per year).

Table 8. Average Annual Number of Hospital Separations and Physician Visits per Year, Winnipeg Regional Health Authority Cohort

Variable	Category	Schizophrenia (N = 861)			Personality (N = 189)			Substance Abuse (N = 6,045)			Anxiety (N = 36,322)			Co-Occurring (N = 23,913)		
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Hospital Separations																
	Mental	0.1	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2
	Physical	0.1	0.0	0.3	0.2	0.0	0.3	0.2	0.0	0.4	0.2	0.0	0.4	0.3	0.0	0.5
	All	0.3	0.0	0.4	0.2	0.0	0.3	0.2	0.0	0.4	0.2	0.0	0.4	0.3	0.0	0.6
Physician Visits																
Mental Disorder Diagnoses	GP	1.9	0.5	3.9	0.6	0.3	1.1	0.6	0.3	1.7	0.6	0.3	1.1	1.8	1.0	2.8
	Other	0.1	0.0	0.7	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.3
	Psychiatrist	3.0	1.5	4.4	3.8	0.0	9.4	0.1	0.0	1.2	0.3	0.0	2.2	1.8	0.0	5.6
	All	4.9	3.3	5.7	4.4	0.5	9.5	0.7	0.3	2.1	0.9	0.3	2.5	3.7	1.5	6.4
Non-Mental Disorder Diagnoses	GP	3.8	2.3	4.8	4.1	2.5	4.6	4.0	2.8	4.2	4.9	3.8	4.4	6.2	4.5	5.7
	Other	3.3	1.3	6.3	3.5	2.0	4.7	3.6	1.8	5.3	4.4	2.5	5.9	4.3	2.5	5.7
	Psychiatrist	0.0	0.0	0.0	0.3	0.0	2.3	0.0	0.0	0.6	0.0	0.0	0.4	0.0	0.0	0.4
	All	7.1	4.3	8.9	7.9	5.5	7.5	7.7	5.5	7.7	9.2	7.0	8.5	10.5	8.3	9.1
All Diagnoses		12.1	9.3	10.7	12.3	9.0	12.4	8.3	6.0	8.2	10.1	7.8	8.9	14.2	11.5	11.4

Community-Level Characteristics

Table 9 presents the weighted means and standard deviations for the community characteristic variables for each of the five diagnosis groups. The personality disorders group did not have anyone residing in 14 of the 75 CCAs. The schizophrenia group did not have anyone residing in one of the CCAs. The community characteristics are reported in the following categories: demographic, social isolation, socioeconomic, and social disorganization.

Demographic

There is little difference among the groups on the marital status variables. On average, the anxiety disorders group lived in areas where a smaller percentage of the population was divorced, separated, and widowed, and a higher percentage of the population was married, while the schizophrenia group on average resided in areas with where a higher percentage of the population was divorced, separated, and widowed and a smaller percentage of the population was married.

Social Isolation

The schizophrenia group on average resided in areas with a high percentage of the population who lived alone. The anxiety disorders group on average lived in areas where on average smaller percentages of the population lived alone.

Socioeconomic

The schizophrenia group resided in the poorest areas; on average, they resided in areas with a low median household income. The anxiety disorders group, on the other hand, resided in the wealthiest areas; on average, they resided in areas where the median household income was high.

On average the schizophrenia group resided in areas where a larger percentage of the population was unemployed compared to the other groups. The anxiety disorders group on average lived in areas where smaller percentages of the population were unemployed.

There was little difference among the groups in the average percentage of the population with less than secondary education (grade nine). On average, though, the schizophrenia group resided in CCAs with the highest proportion of the population who did not have secondary education.

Social Disorganization

The schizophrenia group on average resided in areas where a higher percentage of the population was single parents. The anxiety disorders group on average lived in areas where on average smaller percentage of the population were single parents.

On average, the schizophrenia group resided in less residentially stable neighbourhoods compared to the other groups. The anxiety disorders group on averaged lived in less residentially mobile neighbourhoods.

Table 9. Community Characteristics by Diagnostic Group, Winnipeg Regional Health Authority Cohort

Category	Variable	Schizophrenia (N = 856)		Personality (N = 189)		Substance Abuse (N = 5,935)		Anxiety (N = 35,688)		Co-Occurring (N = 23,555)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Demographics											
Marital Status	Divorced	8.80	2.09	8.20	2.21	7.96	2.17	7.53	2.12	7.95	2.17
	Separated	3.74	0.87	3.39	0.89	3.40	0.90	3.22	0.85	3.39	0.89
	Widowed	8.08	2.49	7.70	2.66	7.47	2.72	7.19	2.72	7.53	2.69
	Married	32.54	10.60	36.36	10.24	37.71	9.34	39.46	8.70	37.44	9.76
Social Isolation											
	Live Alone	18.94	10.93	16.50	10.32	13.93	8.49	12.84	8.30	14.74	9.52
Social Deprivation											
	Median Household										
Income	Income	\$39,705	\$15,565	\$48,104	\$20,893	\$47,072	\$15,903	\$50,123	\$16,189	\$47,122	\$16,682
Employment	Unemployed	4.75	1.89	4.09	1.63	4.10	1.63	3.86	1.40	4.09	1.62
Education	Less than Grade 9	34.58	11.12	30.79	10.53	33.74	10.24	32.16	9.61	32.80	10.09
Social Disorganization											
Mobility	Single Parent	24.19	9.08	20.71	8.26	20.58	8.19	19.06	7.36	20.52	8.10
	1 year	19.52	8.06	17.14	7.47	15.80	6.36	14.86	5.91	16.19	6.83
	5 year	48.74	12.65	45.59	12.13	42.93	10.34	41.64	9.99	43.79	11.24

Residential Mobility

Residential mobility of the WRHA cohort is reported in Table 10. Overall, 16.7% of the cohort moved in the first 18 months of the Observation Period and 32.8% moved during the full four-year Observation Period. During these 18-month and four-year intervals, the anxiety disorders group was the least residentially mobile and the personality disorders group was the most residentially mobile. The rank order of the groups for the two time periods stayed the same. The majority of the movers only moved once during the full Observation Period (single movers). Specifically, among the movers, 75.0% of the anxiety disorders, 70.6% of the schizophrenia, 69.6% of the personality disorders, 69.4% of the substance abuse disorders, and 65.0% of the co-occurring disorders groups were single movers. Overall, 20.2% of the movers moved twice, 5.9% moved three times, 2.1% moved four times, and 1.4% moved five times.

Table 10. Type and Frequency of Moves, Winnipeg Regional Health Authority Cohort

Variable	Category	Substance									
		Schizophrenia		Personality		Abuse		Anxiety		Co-Occurring	
		<i>(N = 861)</i>		<i>(N = 189)</i>		<i>(N = 6,045)</i>		<i>(N = 36,322)</i>		<i>(N = 23,913)</i>	
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Any Move	18 months	150	17.4	51	27.0	1,064	17.6	5,185	14.3	4,813	20.1
	4 years	296	34.4	79	41.8	2,085	34.5	10,558	29.1	9,074	38.0
Number of Moves (4 years)	0	565	65.6	110	58.2	3,960	65.5	25,764	70.9	14,839	62.1
	1	209	24.3	55	29.1	1,446	23.9	7,914	21.8	5,901	24.7
	2	55	6.4	15	7.9	399	6.6	1,950	5.4	2,056	8.6
	3+	32	3.72	9	4.77	240	3.96	694	1.91	1,117	4.66

Residential mobility for inner core residents, individuals who resided in the inner core at June 2000 (baseline), was also examined. More than four in ten of the inner core residents (42.6% moved) moved during the Observation Period. The inner core-dwelling personality disorders group was the most residentially mobile (49.3% moved), while the anxiety disorders group was the least residentially mobile (37.0% moved). The percentage of individuals who moved in the other groups is as follows: schizophrenia 40.0%, substance abuse disorders 46.2%, and co-occurring disorders 48.5%.

Residential mobility for the suburb-dwellers, individuals who resided in the suburbs at June 2000 (baseline) was also examined. Overall, 28.3% of the suburb residents moved during the Observation Period. The suburb dwelling personality disorders group was the most residentially mobile (38.5% moved), while the anxiety disorders group was the least residentially mobile (26.1% moved). The suburb-dwelling schizophrenia group was slightly more residentially mobile (29.5% moved) than the substance abuse disorders group (27.9%). Among the co-occurring disorders group 32.0% moved.

Directional mobility from the inner core to the suburbs was examined. The schizophrenia group was least likely to move from the inner core (June 2000) to the

suburbs (June 2004) (6.1%). A similar percentage of individuals in the other four groups moved from the inner core to the suburbs (substance abuse disorders, 12.2%; co-occurring disorders, 12.7%; personality disorders 13.0%, and anxiety disorders 13.3%). Directional mobility from the suburbs to the inner core was also examined. The schizophrenia group was most likely to move from the suburbs (June 2000) to the inner core (June 2004) (11.1%), while anxiety disorders group was least likely to move from the suburbs to the inner core (5.0%). The percentage of individuals in the other groups that moved from the suburbs to the inner core is as follows: substance abuse disorders 7.1%, personality disorders 8.3%, and co-occurring disorders 8.7%.

Description of WRHA Cohort Movers and Non-Movers

The characteristics of WRHA residents were next examined by mover status. Individuals were classified as moving or not moving during the four-year Observation Period.

Individual-Level Characteristics

Type of Mental Disorders

There were 22,092 movers and 45,238 non-movers in the WRHA cohort. The schizophrenia (1.3%), personality (0.4%), substance abuse (9.4%), and co-occurring disorders (41.1%) groups make up a larger percentage of the movers than the non-movers. The anxiety disorders group makes up a larger percentage of the non-movers (57.0%) than movers.

Demographic

The demographic characteristics for the groups by mover status are presented in Table 11. The percentage of male and female movers was similar to the percentage of male and female non-movers for the substance abuse, anxiety, and co-occurring disorders groups. For the schizophrenia and personality disorders groups, movers were more likely to be male than non-movers. For all of the groups, the movers were more likely to be younger, not married, and to have moved during the Cohort Definition Period compared to the non-movers. In all cases, the percentage of movers who moved during the Cohort Definition Period was more than double the percentage of non-movers who moved during the Cohort Definition Period.

Geographic

The percentage of individuals in each of the groups across the three intra-urban areas by mover status is presented in Table 11. In all cases, a higher percentage of movers than non-movers resided in the inner core, while a higher percentage of the non-movers resided in the suburbs compared to the movers.

Socioeconomic

The percentage of individuals in each group in each of the income quintiles by mover status is presented in Table 11. In all cases, movers were more common in the poorest two income quintiles (Q1 and Q2) than non-movers, while non-movers were more common in the wealthiest three income quintiles (Q3, Q4, and Q5) than movers. The difference between the percentage of movers in the poorest and wealthiest was greatest for the schizophrenia group.

Table 11. Demographic, Geographic, and Socioeconomic Characteristics by Mover Status for each Diagnostic Group,
Winnipeg Regional Health Authority Cohort

Variable	Category	Schizophrenia		Personality				Substance Abuse				Anxiety				Co-Occurring					
		Mover (N = 296)		Non-Mover (N = 565)		Mover (N = 79)		Non-Mover (N = 110)		Mover (N = 2,085)		Non-Mover (N = 3,960)		Mover (N = 10,558)		Non-Mover (N = 25,764)		Mover (N = 9,074)		Non-Mover (N = 14,839)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Sex	Male	200	67.6	323	57.2	50	63.3	49	44.6	1,206	57.8	2,210	55.8	3,993	37.8	9,997	38.8	3,348	36.9	5,157	34.8
	Female	96	32.4	242	42.8	29	36.7	61	55.5	879	42.2	1,750	44.2	6,565	62.2	15,767	61.2	5,726	63.1	9,682	65.3
Age	19 to 29	46	15.5	49	8.7	28	35.4	17	15.5	622	29.8	483	12.2	3,770	35.7	3,541	13.7	2,421	26.7	1,639	11.1
	30 to 44	131	44.3	191	33.8	39	49.4	44	40.0	896	43.0	1,685	42.6	3,767	35.7	8,412	32.7	3,823	42.1	5,503	37.1
	45 to 64	101	34.1	256	45.3	s	s	35	31.8	473	22.7	1,460	36.9	2,027	19.2	9,374	36.4	2,044	22.5	5,502	37.1
	65+	18	6.1	69	12.2	s	s	14	12.7	94	4.5	332	8.4	994	9.4	4,437	17.2	786	8.7	2,195	14.8
Marital Status	Not married	248	83.8	438	77.5	57	72.2	65	59.1	1,425	68.4	1,742	44.0	6,108	57.9	9,236	35.9	6,176	68.1	6,802	45.8
	Married	48	16.2	127	22.5	22	27.9	45	40.9	660	31.7	2,218	56.0	4,450	42.2	16,528	64.2	2,898	31.9	8,037	54.2
Mobility in Cohort Definition Period	Did not move	225	76.0	500	88.5	52	65.8	100	90.9	1,452	69.6	3,434	86.7	7,907	74.9	22,863	88.7	5,957	65.7	12,708	85.6
	Moved	71	24.0	65	11.5	27	34.2	10	9.1	633	30.4	526	13.3	2,651	25.1	2,901	11.3	3,117	34.4	2,131	14.4
WRHA Area	Inner Core	189	63.9	284	50.3	34	43.0	35	31.8	989	47.4	1,154	29.1	3,634	34.4	6,201	24.1	4,061	44.8	4,320	29.1
	Outer Core	11	3.7	52	9.2	8	10.1	16	14.6	106	5.1	253	6.4	636	6.0	1,715	6.7	549	6.1	1,052	7.1
	Suburbs	96	32.4	229	40.5	37	46.8	59	53.6	990	47.5	2,553	64.5	6,288	59.6	17,848	69.3	4,464	49.2	9,467	63.8
Income Quintile	U1 (poorest)	148	50.0	195	34.5	29	36.7	24	21.8	747	35.8	677	17.1	2,912	27.6	3,818	14.8	3,301	36.4	2,899	19.5
	U2	69	23.3	142	25.1	19	24.1	18	16.4	472	22.6	834	21.1	2,472	23.4	5,043	19.6	2,082	22.9	3,044	20.5
	U3	32	10.8	94	16.6	10	12.7	27	24.6	370	17.8	821	20.7	1,956	18.5	5,302	20.6	1,543	17.0	2,952	19.9
	U4	29	9.8	67	11.9	6	7.6	17	15.5	270	13.0	917	23.2	1,722	16.3	5,863	22.8	1,157	12.8	2,974	20.0
	U5 (wealthiest)	15	5.1	47	8.3	15	19.0	22	20.0	224	10.7	705	17.8	1,474	14.0	5,719	22.2	930	10.3	2,788	18.8

Note. 's' indicates data suppressed due to small numbers

Level of Co-morbidity

The percentage of individuals in each group in each ADG category by mover status is presented in Table 12. For the schizophrenia group, a higher percentage of the movers compared to the non-movers had two or fewer ADGS compared to the non-movers, while a higher percentage of the non-movers compared to the movers had three or more ADGs. The distributions of the movers and non-movers across the ADG categories were fairly similar for the other four groups.

Hospitalizations

The frequency distribution of hospital separations for each diagnostic group by mover status is presented in Table 12. In all cases, a higher percentage of the movers had at least one hospital separation with a mental disorder diagnosis than the non-movers. For the schizophrenia, substance abuse, and anxiety disorders groups, the percentage of movers who were hospitalized with a mental disorder diagnosis was approximately double the percentage of the non-movers who had a hospitalization with a mental disorder diagnosis.

A higher percentage of non-movers compared to movers in the substance abuse, anxiety, and co-occurring disorders groups had no hospitalizations with non-mental disorders diagnoses, while a higher percentage of the movers compared to the non-movers had one or more hospitalizations with a non-mental disorders diagnosis, although the differences were small.

The movers in the schizophrenia, substance abuse, anxiety, and co-occurring disorders groups were more likely to be hospitalized compared to the non-movers, while the non-movers were more likely than the movers to not be hospitalized. The movers in

the personality disorders group were more likely not to be hospitalized or to have one or two hospitalizations than the non-movers.

Table 12. Level of Co-morbidity and Health Service Use by Mover Status for each Diagnostic Group, Winnipeg Regional

Health Authority Cohort

Variable	Category	Schizophrenia				Personality				Substance Abuse				Anxiety				Co-Occurring			
		Mover (N = 296)		Non-Mover (N = 565)		Mover (N = 79)		Non-Mover (N = 110)		Mover (N = 2,085)		Non-Mover (N = 3,960)		Mover (N = 10,558)		Non-Mover (N = 25,764)		Mover (N = 9,074)		Non-Mover (N = 14,839)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
ADGs	0	11	3.7	28	5.0	s	s	s	s	140	6.7	231	5.8	483	4.6	1,058	4.1	95	1.1	155	1.0
	1 to 2	129	43.6	260	46.0	27	34.2	28	25.5	678	32.5	1,406	35.5	2,647	25.1	6,443	25.0	1,214	13.4	2,297	15.5
	3 to 5	95	32.1	192	34.0	33	41.8	52	47.3	812	38.9	1,685	42.6	4,626	43.8	11,275	43.8	3,486	38.4	6,212	41.9
	6 to 9	50	16.9	77	13.6	12	15.2	24	21.8	385	18.5	547	13.8	2,417	22.9	6,032	23.4	3,177	35.0	4,845	32.7
	10 or more	11	3.7	8	1.4	s	s	s	s	70	3.4	91	2.3	385	3.7	956	3.7	1,102	12.1	1,330	9.0
Hospitalizations																					
Mental Disorder Diagnoses	0	200	67.6	470	83.2	s	s	s	s	1,982	95.1	3,889	98.2	10,370	98.2	25,584	99.3	7,995	88.1	13,950	94.0
	1 or more	96	32.4	95	16.8	s	s	s	s	103	4.9	71	1.8	188	1.8	180	0.7	1,079	11.9	889	6.0
Non-Mental Disorder Diagnoses	0	223	75.3	413	73.1	56	70.9	73	66.4	1,252	60.1	2,501	63.2	6,007	56.9	15,473	60.1	4,764	52.5	8,345	56.2
	1 or more	73	25	152	27	23	29	37	34	833	40	1,459	37	4,551	43	10,291	40	4,310	47	6,494	44
All Diagnoses	0	154	52.0	350	62.0	53	67.1	70	63.6	1,207	57.9	2,464	62.2	5,914	56.0	15,374	59.7	4,173	46	7,796	52.5
	1 or more	142	48	215	38	26	33	40	36	878	42	1,496	38	4,644	44	10,390	40	4,901	54	7,043	47
Physician Visits																					
Mental Disorder Diagnoses	0 to 4	52	17.6	119	21.1	48	60.8	57	51.8	1,700	81.5	3,504	88.5	8,322	78.8	21,300	82.7	3,593	39.6	6,847	46.1
	5 to 8	42	14.2	86	15.2	9	11.4	9	8.2	178	8.5	261	6.6	1,059	10.0	2,314	9.0	1,292	14.2	2,288	15.4
	9 to 12	29	9.8	75	13.3	s	s	8	7.3	71	3.4	83	2.1	454	4.3	866	3.4	870	9.6	1,400	9.4
	13 to 16	22	7.4	80	14.2	6	7.6	s	s	33	1.6	44	1.1	217	2.1	394	1.5	601	6.6	895	6.0
	17 to 20	26	8.8	45	8.0	s	s	s	s	34	1.6	17	0.4	132	1.3	265	1.0	496	5.5	636	4.3
	21 or more	125	42.2	160	28.3	9	11.4	26	23.6	69	3.3	51	1.3	374	3.5	625	2.4	2,222	24.5	2,773	18.7
Non-Mental Disorder Diagnoses	0 to 4	55	18.6	113	20.0	18	22.8	7	6.4	227	10.9	398	10.1	722	6.8	1,735	6.7	389	4.3	713	4.8
	5 to 8	36	12.2	76	13.5	8	10.1	s	s	204	9.8	390	9.9	847	8.0	1,684	6.5	507	5.6	829	5.6
	9 to 12	29	9.8	46	8.1	11	13.9	s	s	209	10.0	400	10.1	924	8.8	1,790	7.0	592	6.5	914	6.2
	13 to 16	23	7.8	47	8.3	s	s	9	8.2	192	9.2	392	9.9	941	8.9	1,913	7.4	657	7.2	991	6.7
	17 to 20	21	7.1	30	5.3	s	s	12	10.9	166	8.0	314	7.9	921	8.7	1,841	7.2	604	6.7	1,016	6.9
	21 or more	132	44.6	253	44.8	30	38.0	70	63.6	1,087	52.1	2,066	52.2	6,203	58.8	16,801	65.2	6,325	69.7	10,376	69.9
All Diagnoses	0 to 4	6	2.0	18	3.2	11	13.9	s	s	186	8.9	330	8.3	570	5.4	1,390	5.4	141	1.6	284	1.9
	5 to 8	13	4.4	30	5.3	8	10.1	6	5.5	179	8.6	339	8.6	697	6.6	1,417	5.5	251	2.8	377	2.5
	9 to 12	11	3.7	33	5.8	12	15.2	s	s	178	8.5	379	9.6	825	7.8	1,554	6.0	346	3.8	545	3.7
	13 to 16	18	6.1	36	6.4	s	s	s	s	201	9.6	372	9.4	828	7.8	1,723	6.7	367	4.0	647	4.4
	17 to 20	19	6.4	42	7.4	s	s	s	s	153	7.3	313	7.9	857	8.1	1,774	6.9	432	4.8	724	4.9
	21 or more	229	77.4	406	71.9	42	53.2	88	80.0	1,188	57.0	2,227	56.2	6,781	64.2	17,906	69.5	7,537	83.1	12,262	82.6

Note. 's' indicates data suppressed due to small numbers

Physician Visits

The frequency distribution of physician visits for each diagnostic group by mover status is presented in Table 12. The mean and median (SD) number of physician visits with mental, non-mental, and all disorders diagnosis by physician type is reported in Table 13. With the exception of the personality disorders group, the movers were more likely to have more physician visits with a mental disorders diagnosis compared to the non-movers. For the personality group, the non-movers were more likely to have more physician visits with a mental disorders diagnosis than the movers. The movers in the schizophrenia, substance abuse, anxiety, and co-occurring disorders groups had on average more visits to GPs, psychiatrists, and other specialists than the non-movers with a mental disorders diagnosis.

There were few differences in the distribution of movers and non-movers across the categories of physician visits for non-mental disorders diagnoses for the schizophrenia, substance abuse, and co-occurring disorders groups. For the personality and anxiety disorders groups, the non-movers were more likely to have more physician visits for physical disorders diagnoses than the movers. The movers in the schizophrenia and personality disorders groups averaged fewer visits to GPs and other specialists for with non-mental disorders diagnosis than the non-movers. The movers in the substance abuse and co-occurring disorders groups had on average more visits to GPs and fewer visits to other specialists with non-mental disorders diagnoses than the non-movers. The movers in the anxiety disorders groups also had on average fewer visits to other specialists with non-mental disorders diagnosis.

The movers in the schizophrenia group were more likely to have more physician visits than the non-movers. The movers in the personality and anxiety disorders groups

had fewer physician visits than the non-movers. There was little difference in the distributions of movers and non-movers across the categories of physician visits for the substance abuse and co-occurring disorders groups.

Table 13. Average Annual Number of Hospital Separations and Physician Visits by Mover Status for each Diagnostic Group, Winnipeg Regional Health Authority Cohort

Variable	Category	Schizophrenia						Personality						Substance Abuse						Anxiety				Co-Occurring									
		Mover (N = 296)			Non-Mover (N = 565)			Mover (N = 79)			Non-Mover (N = 110)			Mover (N = 2,085)			Non-Mover (N = 3,960)			Mover (N = 10,558)		Non-Mover (N = 25,764)		Mover (N = 9,074)		Non-Mover (N = 14,839)							
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD					
Hospital Separations																																	
	Mental	0.2	0.0	0.4	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.2
	Non-Mental	0.1	0.0	0.3	0.1	0.0	0.3	0.1	0.0	0.2	0.2	0.0	0.3	0.2	0.0	0.4	0.2	0.0	0.4	0.2	0.0	0.4	0.2	0.0	0.4	0.3	0.0	0.5	0.2	0.0	0.5		
	All	0.3	0.0	0.5	0.2	0.0	0.4	0.1	0.0	0.3	0.2	0.0	0.4	0.2	0.0	0.5	0.2	0.0	0.4	0.2	0.0	0.4	0.2	0.0	0.4	0.3	0.3	0.6	0.3	0.0	0.6		
Physician Visits																																	
	Mental																																
	GP	2.2	0.8	3.7	1.8	0.5	4.0	0.6	0.3	1.2	0.5	0.3	0.9	0.8	0.3	2.1	0.5	0.0	1.4	0.7	0.3	1.3	0.5	0.3	1.0	2.2	1.0	3.3	1.6	0.8	2.5		
	Other	0.2	0.0	1.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.4	0.0	0.0	0.3			
	Disorder Diagnoses																																
	Psychiatrist	3.5	2.0	5.4	2.7	1.5	3.8	2.3	0.0	6.8	4.9	0.0	10.9	0.2	0.0	1.7	0.1	0.0	0.7	0.3	0.0	2.2	0.2	0.0	2.1	1.8	0.0	5.4	1.8	0.0	5.6		
	All	5.9	4.4	6.7	4.5	3.3	5.0	2.9	0.5	6.9	5.5	1.0	10.9	1.0	0.3	2.8	0.5	0.0	1.7	1.0	0.3	2.7	0.8	0.3	2.4	4.1	1.8	6.5	3.4	1.3	6.3		
	Non-Mental																																
	GP	4.4	2.5	5.7	3.5	2.0	4.2	3.7	1.8	4.7	4.4	2.9	4.5	4.6	3.0	5.0	3.7	2.8	3.8	4.8	3.5	4.7	4.9	3.8	4.2	6.7	5.0	6.4	5.8	4.5	5.2		
	Other	2.9	1.0	5.0	3.5	1.3	6.9	1.7	1.0	2.1	4.8	2.8	5.5	3.2	1.5	4.9	3.8	2.0	5.5	3.6	2.0	4.8	4.7	2.8	6.3	3.8	2.3	5.0	4.7	2.8	6.0		
	Disorder Diagnoses																																
	Psychiatrist	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	2.3	0.3	0.0	2.4	0.0	0.0	1.0	0.0	0.1	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.5	0.0	0.0	0.4			
	All	7.3	4.4	8.8	7.0	4.3	8.9	5.7	4.0	5.8	9.5	6.9	8.2	7.8	5.5	8.0	7.6	5.5	7.6	8.5	6.3	7.7	9.5	7.5	8.7	10.5	8.3	9.1	10.5	8.3	9.1		
All Diagnoses		13.2	9.8	11.8	11.5	8.8	10.1	8.6	5.5	9.2	14.9	10.6	13.7	8.8	6.3	8.7	8.1	6.0	7.8	9.5	7.3	8.3	10.3	8.3	9.1	14.6	11.5	11.7	14.0	11.3	11.2		

Community-Level Characteristics

Table 14 presents the means and standard deviations for the community characteristics by mover status for each of the five diagnostic groups.

Demographic

The movers, on average, resided in areas where a higher percentage of the population was divorced, separated, and widowed, and smaller percentage of the population were married compared to the non-movers.

Social Isolation

On average, the movers lived in areas where a higher percentage of the population lives alone compared to the non-movers.

Socioeconomic

On average the non-movers resided in areas where the median household income was higher than in areas where the movers resided. In all instances, the movers, on average, resided in areas with a higher unemployed population compared to the areas where the non-movers resided. In all instances, the movers resided in areas where a higher percentage of the population had less than secondary education compared to the non-movers.

Social Disorganization

On average, the movers lived in areas where a higher percentage of the population were single parents compared to the non-movers. In all instances, the movers resided in less residentially stable CCAs than the non-movers - the percentage of population who moved in one year and five years was higher, on average, where the movers resided compared to where the non-movers resided.

Table 14. Community Characteristics by Mover Status for each Diagnostic Group, Winnipeg Regional Health Authority

Cohort

Category	Variable	Schizophrenia		Personality		Substance Abuse		Anxiety		Co-Occurring											
		Non-Mover (N = 570)		Mover (N = 327)		Non-Mover (N = 111)		Mover (N = 92)		Non-Mover (N = 3,953)		Mover (N = 2,589)		Non-Mover (N = 25,623)		Mover (N = 12,235)		Non-Mover (N = 14,859)		Mover (N = 10,613)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Demographics																					
Marital Status	Divorced	8.7	2.0	9.1	2.1	8.1	2.3	8.4	2.1	7.7	2.1	8.5	2.2	7.4	2.1	7.9	2.2	7.7	2.1	8.4	2.2
	Separated	3.7	0.9	3.9	0.9	3.4	0.9	3.5	0.9	3.3	0.9	3.6	1.0	3.2	0.8	3.4	0.9	3.3	0.9	3.6	0.9
	Widowed	8.1	2.5	8.1	2.5	7.5	2.7	8.0	2.6	7.3	2.7	7.7	2.6	7.1	2.7	7.3	2.7	7.4	2.7	7.8	2.6
	Married	33.5	10.4	30.4	10.8	37.3	9.9	35.0	10.5	39.1	8.5	34.7	10.3	40.3	8.2	37.4	9.5	38.9	9.1	34.8	10.5
Social Isolation																					
	Single Parent	23.2	8.6	26.1	9.6	20.1	8.1	22.0	8.6	19.4	7.4	23.2	9.1	18.4	7.0	20.6	8.0	19.3	7.5	22.7	8.8
Socioeconomic																					
	Median Household Income	\$41,166	\$15,872	\$36,629	\$14,762	\$49,126	\$19,447	\$46,005	\$22,119	\$49,136	\$15,368	\$42,637	\$16,028	\$51,367	\$15,999	\$46,922	\$16,048	\$49,339	\$16,554	\$43,109	\$16,188
Income	Income																				
Employment	Unemployed	4.5	1.8	5.2	2.0	3.9	1.6	4.5	1.8	3.9	1.4	4.6	1.9	3.8	1.3	4.1	1.6	3.9	1.5	4.5	1.8
Education	Less than Grade 9	33.7	11.1	36.2	11.3	30.7	10.3	32.2	11.3	32.9	9.7	35.5	11.0	31.8	9.4	33.1	10.1	32.0	9.7	34.2	10.7
Social Disorganization																					
Mobility	Live Alone	18.5	10.9	20.2	11.4	15.5	9.5	17.3	11.0	13.0	7.8	15.9	9.7	12.2	7.7	14.4	9.4	13.7	8.8	16.7	10.6
	1 year	18.8	7.8	21.1	8.4	16.4	7.3	17.9	7.8	14.9	5.6	17.8	7.3	14.3	5.5	16.2	6.6	15.2	6.2	17.9	7.6
	5 year	47.8	12.5	50.9	12.9	44.5	11.5	46.5	12.8	41.5	9.5	46.0	11.5	40.8	9.4	43.9	11.0	42.4	10.4	46.4	12.2

Description of WRHA Cohort Multiple and Single Movers

There were 22,092 WRHA residents who had at least one postal code change during the four-year Observation Period. These individuals were divided into two groups, single and multiple movers. Almost one-third (29.7%) of the movers were classified as multiple movers.

Individual-Level Characteristics

Type of Mental Disorders Diagnosis

Overall, 70.3% of the WRHA movers were single movers. The anxiety disorders group of movers had the highest percentage of single movers (75.0%). The movers in the co-occurring group were the least likely to be single movers (65.0%). The percentage of single movers among the movers in the schizophrenia, personality, and substance abuse disorder groups is as follows: 70.6%, 69.6%, and 69.4%.

Demographic

The demographic characteristics of the multiple and single movers are reported in Table 15. The multiple and single mover categories had similar percentages of females and males for the schizophrenia, substance abuse, anxiety, and co-occurring disorders groups. The multiple movers were more likely to be male than the single movers in the personality disorders group. For all the groups, the multiple and single movers age distributions were similar, although there was a slight tendency for the multiple movers to be younger than the single movers. Multiple movers were more likely not to be married than single movers.

The multiple movers were more likely to have moved during the Cohort Definition Period than the single movers. Among the multiple movers, the substance abuse disorders group was the most residentially mobile (48.0% moved), while the schizophrenia group was the least residentially mobile (35.6% moved).

Geographic

The distribution of multiple and single movers by WRHA area is presented in Table 15. For all of the diagnosis groups, multiple movers were more likely to reside in the inner core than single movers. The multiple movers in the schizophrenia, personality, substance abuse and co-occurring disorders groups were more likely to live in the inner core than the outer core or the suburbs. The single movers in the personality, substance abuse, anxiety, and co-occurring disorders groups were more likely to live in the suburbs than the inner core or outer core. For the personality, substance abuse, and co-occurring disorders groups, the majority of the multiple movers resided in a different area than the majority of the single movers.

Socioeconomic

The distribution of multiple and single movers by income quintile is presented in Table 15. For both the multiple and single movers in all of the groups, except personality, the highest percentage of individuals resided in the poorest income quintiles. There were fewer individuals in higher income quintiles.

Table 15. Demographic, Geographic, and Socioeconomic Characteristics by Type of Mover for each Diagnostic Group,
Winnipeg Regional Health Authority Cohort

Variable	Category	Schizophrenia				Personality				Substance Abuse				Anxiety				Co-Occurring			
		Multiple Movers (N = 87)		Single Movers (N = 209)		Multiple Movers (N = 24)		Single Movers (N = 55)		Multiple Movers (N = 639)		Single Movers (N = 1,446)		Multiple Movers (N = 2,644)		Single Movers (N = 7,914)		Multiple Movers (N = 3,173)		Single Movers (N = 5,901)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Sex	Male	59	67.8	141	67.5	s	s	31	56.4	364	57.0	842	58.2	910	34.4	3,083	39.0	1,203	37.9	2,145	36.4
	Female	28	32.2	68	32.5	s	s	24	43.6	275	43.0	604	41.8	1,734	65.6	4,831	61.0	1,970	62.1	3,756	63.7
Age	19 to 29	20	23.0	26	12.4	s	s	s	s	234	36.6	388	26.8	1,205	45.6	2,565	32.4	1,054	33.2	1,367	23.2
	30 to 44	37	42.5	94	45.0	s	s	s	s	270	42.3	626	43.3	867	32.8	2,900	36.6	1,406	44.3	2,417	41.0
	45 to 64	26	29.9	75	35.9	s	s	s	s	121	18.9	352	24.3	411	15.5	1,616	20.4	540	17.0	1,504	25.5
	65+	4	4.6	14	6.7	s	s	s	s	14	2.2	80	5.5	161	6.1	833	10.5	173	5.5	613	10.4
Marital Status	Not married	76	87.4	172	82.3	18	75.0	39	70.9	503	78.7	922	63.8	1,837	69.5	4,271	54.0	2,419	76.2	3,757	63.7
	Married	11	12.6	37	17.7	6	25.0	16	29.1	136	21.3	524	36.2	807	30.5	3,643	46.0	754	23.8	2,144	36.3
Mobility in Cohort	Did not move	56	64.4	169	80.9	14	58.3	38	69.1	332	52.0	1,120	77.5	1,601	60.6	6,306	79.7	1,655	52.2	4,302	72.9
Definition Period	Moved	31	35.6	40	19.1	10	41.7	17	30.9	307	48.0	326	22.5	1,043	39.5	1,608	20.3	1,518	47.8	1,599	27.1
WRHA Area	Inner Core	63	72.4	126	60.3	s	s	18	32.7	386	60.4	603	41.7	1,132	42.8	2,502	31.6	1,790	56.4	2,271	38.5
	Outer Core	3	3.5	8	3.8	s	s	7	12.7	22	3.4	84	5.8	138	5.2	498	6.3	128	4.0	421	7.1
	Suburbs	21	24.1	75	35.9	s	s	30	54.6	231	36.2	759	52.5	1,374	52.0	4,914	62.1	1,255	39.6	3,209	54.4
Income Quintile	U1 (poorest)	53	60.9	95	45.5	s	s	s	25.5	316	49.5	431	29.8	981	37.1	1,931	24.4	1,467	46.2	1,834	31.1
	U2	19	21.8	50	23.9	s	s	s	30.9	123	19.3	349	24.1	657	24.9	1,815	22.9	733	23.1	1,349	22.9
	U3	s	s	27	12.9	s	s	s	16.4	106	16.6	264	18.3	428	16.2	1,528	19.3	465	14.7	1,078	18.3
	U4	7	8.1	22	10.5	s	s	s	5.5	50	7.8	220	15.2	334	12.6	1,388	17.5	300	9.5	857	14.5
	U5 (wealthiest)	s	s	13	6.2	s	s	s	21.8	44	6.9	180	12.5	239	9.0	1,235	15.6	191	6.0	739	12.5

Note. 's' indicates data suppressed due to small numbers

Level of Co-morbidity

The distribution of ADGs for the single and multiple movers is reported in Table 16. For all the groups, except the personality disorders group, the multiple movers have more ADGs than the single movers. The personality disorders group is too small to present the results (cell sizes between one and five); the values have been suppressed.

Hospitalizations

For all of the groups, the multiple movers were more likely to have been hospitalized than the single movers (see Table 16). Note that because of small cell sizes (between one and five), the results for the personal disorders group have been suppressed.

Table 16. Level of Co-morbidity and Health Service Use by Type of Mover for each Diagnostic Group, Winnipeg Regional

Health Authority Cohort

		Schizophrenia		Personality				Substance Abuse				Anxiety				Co-Occurring					
		Multiple Movers (N = 87)		Single Movers (N = 209)		Multiple Movers (N = 24)		Single Movers (N = 55)		Multiple Movers (N = 639)		Single Movers (N = 1,446)		Multiple Movers (N = 2,644)		Single Movers (N = 7,914)		Multiple Movers (N = 3,173)		Single Movers (N = 5,901)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
ADGs	0	s	s	10	4.8	2	8.3	3	5.5	37	5.8	103	7.1	101	3.8	382	4.8	34	1.1	61	1.0
	1 to 2	s	s	98	46.9	5	20.8	22	40.0	167	26.1	511	35.3	611	23.1	2,036	25.7	328	10.3	886	15.0
	3 to 5	s	s	66	31.6	13	54.2	20	36.4	252	39.4	560	38.7	1,125	42.6	3,501	44.2	1,114	35.1	2,372	40.2
	6 to 9	s	s	28	13.4	3	12.5	9	16.4	151	23.6	234	16.2	682	25.8	1,735	21.9	1,173	37.0	2,004	34.0
	10 or more	s	s	7	3.4	1	4.2	1	1.8	32	5.0	38	2.6	125	4.7	260	3.3	524	16.5	578	9.8
Hospital Separations																					
Mental Disorder Diagnoses	0	50	57.5	150	71.8	23	95.8	51	92.7	591	92.5	1,391	96.2	2,569	97.2	7,801	98.6	2,658	83.8	5,337	90.4
	1 or more	37	42.5	59	28.2	1	4.2	4	7.3	48	7.5	55	3.8	75	2.8	113	1.4	515	16.2	564	9.6
Non-Mental Disorder Diagnoses	0	61	70.1	162	77.5	15	62.5	41	74.6	350	54.8	902	62.4	1,407	53.2	4,600	58.1	1,607	50.7	3,157	53.5
	1 or more	26	29.88	47	22.49	9	37.5	14	25.46	289	45.22	544	37.62	1,237	46.78	3,314	41.88	1,566	49.35	2,744	46.5
All Diagnoses	0	38	43.7	116	55.5	14	58.3	39	70.9	328	51.3	879	60.8	1,372	51.9	4,542	57.4	1,339	42.2	2,834	48.0
	1 or more	49	56.33	93	44.5	10	41.67	16	29.09	311	48.67	567	39.21	1,272	48.11	3,372	42.61	1,834	57.8	3,067	51.97
Physician Visits																					
Mental Disorder Diagnoses	0 to 4	s	s	38	18.2	s	s	s	s	489	76.5	1,211	83.8	1,910	72.2	6,412	81.0	1,073	33.8	2,520	42.7
	5 to 8	s	s	30	14.4	s	s	s	s	72	11.3	106	7.3	314	11.9	745	9.4	412	13.0	880	14.9
	9 to 12	s	s	20	9.6	s	s	s	s	27	4.2	44	3.0	139	5.3	315	4.0	292	9.2	578	9.8
	13 to 16	s	s	17	8.1	s	s	s	s	12	1.9	21	1.5	90	3.4	127	1.6	230	7.3	371	6.3
	17 to 20	s	s	18	8.6	s	s	s	s	16	2.5	18	1.2	47	1.8	85	1.1	205	6.5	291	4.9
	21 or more	s	s	86	41.2	s	s	s	s	23	3.6	46	3.2	144	5.5	230	2.9	961	30.3	1,261	21.4
Non-Mental Disorder Diagnoses	0 to 4	14	16.1	41	19.6	s	s	s	s	47	7.4	180	12.5	148	5.6	574	7.3	98	3.1	291	4.9
	5 to 8	11	12.6	25	12.0	s	s	s	10.9	62	9.7	142	9.8	204	7.7	643	8.1	151	4.8	356	6.0
	9 to 12	7	8.1	22	10.5	s	s	s	14.6	47	7.4	162	11.2	214	8.1	710	9.0	162	5.1	430	7.3
	13 to 16	6	6.9	17	8.1	s	s	s	5.5	48	7.5	144	10.0	231	8.7	710	9.0	214	6.7	443	7.5
	17 to 20	7	8.1	14	6.7	s	s	s	9.1	49	7.7	117	8.1	227	8.6	694	8.8	182	5.7	422	7.2
	21 or more	42	48.3	90	43.1	s	s	s	34.6	386	60.4	701	48.5	1,620	61.3	4,583	57.9	2,366	74.6	3,959	67.1
All Diagnoses	0 to 4	s	s	s	s	s	s	s	16.4	38	6.0	148	10.2	112	4.2	458	5.8	30	1.0	111	1.9
	5 to 8	s	s	s	s	s	s	s	12.7	54	8.5	125	8.6	166	6.3	531	6.7	64	2.0	187	3.2
	9 to 12	s	s	s	s	s	s	s	14.6	40	6.3	138	9.5	179	6.8	646	8.2	93	2.9	253	4.3
	13 to 16	s	s	s	s	s	s	s	1.8	51	8.0	150	10.4	192	7.3	636	8.0	104	3.3	263	4.5
	17 to 20	s	s	s	s	s	s	s	5.5	37	5.8	116	8.0	207	7.8	650	8.2	115	3.6	317	5.4
	21 or more	s	s	s	s	s	s	s	49.1	419	65.6	769	53.2	1,788	67.6	4,993	63.1	2,767	87.2	4,770	80.8

Note. 's' indicates data suppressed due to small numbers

Physician Visits

For all the groups, multiple movers were more likely to have more visits to physicians with both mental disorders and non-mental disorders diagnoses than single movers (see Table 17). Multiple movers had on average more GP visits with mental and non-mental disorder diagnoses than single movers. The multiple movers in the schizophrenia, anxiety, and co-occurring disorders group had on average more visits per year to psychiatrists than the single movers. For all the groups, except schizophrenia, the single movers averaged more visits per year to specialists with non-mental disorder diagnoses than the multiple movers. Overall, the multiple movers had on average more visits per year to physicians for all reasons than single movers.

Table 17. Average Annual Number of Hospital Separations and Physician Visits by Type of Mover for each Diagnostic Group, Winnipeg Regional Health Authority Cohort

Variable	Category	Schizophrenia						Personality						Substance Abuse						Anxiety						Co-Occurring								
		Multiple Movers (N = 87)			Single Movers (N = 209)			Multiple Movers (N = 24)			Single Movers (N = 55)			Multiple Movers (N = 639)			Single Movers (N = 1,446)			Multiple Movers (N = 2,644)			Single Movers (N = 7,914)			Multiple Movers (N = 3,173)			Single Movers (N = 5,901)					
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD			
Hospital Separations	Mental	0.3	0.0	0.5	0.2	0.0	0.3	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.3	0.1	0.0	0.2	
	Non-Mental	0.2	0.0	0.4	0.1	0.0	0.3	0.2	0.0	0.2	0.1	0.0	0.2	0.2	0.0	0.4	0.2	0.0	0.4	0.2	0.0	0.4	0.2	0.0	0.4	0.2	0.0	0.4	0.3	0.0	0.5	0.3	0.0	0.6
	All	0.5	0.3	0.6	0.3	0.0	0.4	0.2	0.0	0.2	0.1	0.0	0.3	0.3	0.0	0.4	0.2	0.0	0.5	0.3	0.0	0.4	0.2	0.0	0.4	0.2	0.0	0.4	0.4	0.3	0.7	0.3	0.3	0.6
Physician Visits	GP	2.8	1.3	4.3	2.0	0.8	3.5	0.9	0.5	1.1	0.5	0.0	1.2	0.9	0.3	2.0	0.7	0.3	2.1	0.9	0.3	1.7	0.6	0.3	1.2	2.8	1.5	3.8	1.9	1.0	2.9			
Disorder Diagnoses	Other	0.2	0.0	1.6	0.1	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.3	0.0	0.0	0.4				
	Psychiatrist	4.1	2.0	6.7	3.3	1.8	4.7	0.8	0.0	1.6	2.9	0.0	8.0	0.1	0.0	0.5	0.2	0.0	2.0	0.3	0.0	2.2	0.3	0.0	2.2	1.9	0.0	5.0	1.8	0.0	5.6			
	All	7.1	4.5	8.8	5.3	4.0	5.4	1.7	0.5	2.4	3.4	0.3	8.1	1.0	0.3	2.3	0.9	0.3	3.0	1.3	0.3	2.9	0.9	0.3	2.6	4.7	2.5	6.3	3.8	1.5	6.5			
Non-Mental	GP	5.6	2.8	7.8	3.8	2.3	4.5	4.8	2.3	6.1	3.3	1.8	3.9	6.0	4.0	6.1	4.0	2.8	4.2	5.6	4.0	5.3	4.6	3.3	4.4	8.2	5.8	7.6	5.9	4.5	5.5			
Disorder Diagnoses	Other	3.1	1.3	4.2	2.9	1.0	5.4	1.5	0.9	1.9	1.8	1.0	2.2	3.1	1.5	4.9	3.3	1.5	4.9	3.2	1.8	4.3	3.8	2.3	4.9	3.5	2.0	4.6	3.9	2.3	5.2			
	Psychiatrist	0.0	0.0	0.1	0.0	0.0	0.0	0.8	0.0	4.1	0.0	0.0	0.1	0.1	0.0	1.6	0.0	0.0	0.6	0.0	0.0	0.2	0.0	0.0	0.5	0.0	0.0	0.2	0.0	0.6				
	All	8.7	5.0	9.7	6.7	4.0	8.3	7.1	4.8	7.0	5.1	3.0	5.1	9.1	6.5	8.7	7.3	4.8	7.5	8.8	6.8	7.9	8.4	6.3	7.7	11.7	9.0	9.7	9.9	7.8	8.7			
All Diagnoses		15.8	12.0	14.1	12.1	9.3	10.6	8.8	5.9	7.4	8.5	5.0	9.9	10.1	7.3	9.4	8.2	5.5	8.3	10.1	7.8	8.6	9.3	7.0	8.2	16.4	12.8	12.3	13.7	11.0	11.2			

Community-Level Characteristics

Table 18 presents the means and standard deviations for the community characteristics by type of mover for each of the five diagnostic groups.

Demographic

The multiple movers, on average, resided in areas where a higher percentage of the population were divorced, separated, and widowed (except the schizophrenia group), and smaller percentage of the population were married compared to the single movers.

Social Isolation

On average, the multiple movers lived in areas where a higher percentage of the population lived alone.

Socioeconomic

On average, the single movers resided in areas where the median household income was higher than in areas where the multiple movers resided. The multiple movers, on average, resided in areas with a higher unemployed population compared to the areas where the single movers resided. The multiple movers resided in areas where a higher percentage of the population had less than secondary education compared to the single movers.

Social Disorganization

On average, the multiple movers lived in areas where a higher percentage of the population were single parents compared to the single movers. The multiple movers resided in less residentially stable CCAs than the single movers - the percentage of population who moved in one year and five years was higher, on average, where the multiple movers resided compared to where the single movers resided.

Table 18. Community Characteristics by Type of Mover for each Diagnostic Group, Winnipeg Regional Health Authority Cohort

Category	Variable	Schizophrenia		Personality				Substance Abuse				Anxiety				Co-Occurring					
		Multiple Movers (N = 570)		Single Movers (N = 208)		Multiple Movers (N = 24)		Single Movers (N = 55)		Multiple Movers (N = 636)		Single Movers (N = 1,425)		Multiple Movers (N = 2,630)		Single Movers (N = 7,799)		Multiple Movers (N = 3,155)		Single Movers (N = 5,831)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Demographics																					
Marital Status	Divorced	9.2	1.9	9.1	2.2	9.1	2.0	8.0	2.1	8.9	2.1	8.2	2.2	8.3	2.2	7.8	2.2	8.8	2.1	8.2	2.2
	Separated	4.0	0.9	3.8	0.9	3.8	0.9	3.3	0.9	3.9	1.0	3.5	0.9	3.6	0.9	3.3	0.9	3.8	0.9	3.5	0.9
	Widowed	8.0	2.4	8.2	2.6	8.3	2.0	8.0	2.9	8.1	2.6	7.5	2.6	7.5	2.6	7.3	2.7	8.0	2.5	7.6	2.6
	Married	28.8	10.3	31.0	11.0	28.6	12.1	37.9	8.6	32.0	10.3	36.2	10.0	35.3	10.1	38.1	9.2	32.3	10.7	36.4	10.0
Social Isolation																					
	Single Parent	27.6	9.0	25.6	9.8	26.5	9.2	19.3	7.2	25.7	9.5	21.7	8.6	22.4	8.5	20.0	7.7	24.9	9.2	21.1	8.1
Socioeconomic																					
	Median Household Income	\$34,015	\$13,968	\$37,497	\$14,720	\$37,984	\$22,073	\$50,386	\$22,118	\$38,357	\$14,628	\$45,156	\$16,326	\$43,719	\$15,626	\$48,134	\$16,215	\$39,232	\$15,370	\$45,667	\$16,196
Employment	Unemployed	5.5	1.9	5.0	2.0	5.0	2.0	4.0	1.4	5.1	2.0	4.3	1.7	4.4	1.8	4.0	1.5	4.9	2.0	4.2	1.7
Education	Less than Grade 9	37.0	10.5	36.0	11.4	32.6	11.6	30.4	10.7	38.1	11.4	34.0	10.6	34.4	10.5	32.6	10.0	36.1	11.1	32.9	10.2
Social Disorganization																					
Mobility	Live Alone	21.2	11.6	19.7	11.1	24.3	13.9	15.1	8.6	17.3	9.7	15.1	9.4	15.8	10.2	13.9	9.1	18.3	11.0	15.7	10.1
	1 year	22.3	8.2	20.7	8.5	22.8	9.8	16.0	5.5	19.4	7.6	16.8	7.0	17.5	7.3	15.8	6.3	19.6	8.1	16.8	7.1
	5 year	52.3	12.8	50.4	12.8	54.3	15.6	43.8	10.0	48.0	11.5	44.7	11.2	45.8	11.8	43.2	10.6	48.7	12.6	44.9	11.7

Description of Rural RHA Residents

There were 37,591 individuals who resided in the rural RHAs of Manitoba for the entire six-year study period. This section describes the characteristics of the individuals in this cohort and the RHA districts in which they lived.

Individual-Level Characteristics

Type of Mental Disorders Diagnosis

The majority of the rural RHA residents had a single mental disorder diagnosis (68.7%); schizophrenia (0.89%), personality disorders (0.2%), substance abuse disorders (16.0%), and anxiety disorders (51.7%). There were 11,756 individuals with co-occurring mental disorder diagnoses (31.3%). The majority of the co-occurring group had two mental disorder diagnoses (88.6%); 10.4% had three, 0.9% had four, and 0.1% had five mental disorder diagnoses. In the co-occurring disorders group, 86.4% had an anxiety disorder diagnosis, 25.3% had a substance abuse diagnosis, 4.6% had a personality disorders diagnosis, and 4.9% had a schizophrenia diagnosis. The majority of the co-occurring group (91.3%) had some other mental disorder diagnosis (e.g., depression).

Demographic Characteristics

The demographic characteristics are presented in Table 19. The majority of individuals in the schizophrenia group are male (63.0%), while the majority of individuals in the anxiety disorders (63.6%) and co-occurring disorders (68.0%) groups are female. The substance abuse (53.6% male) and personality (52.5% male) disorders groups have almost an equal number of females and males.

On average, the substance abuse disorders group was the youngest ($M = 38.8$ years; $SD = 13.4$) and the schizophrenia group was the oldest ($M = 48.3$ years; $SD = 15.4$). The percentage of individuals 65 years and older in the substance abuse disorders group (5.6%) is less than half the percentage of individuals in the other groups. The schizophrenia group has a substantially smaller percentage of individuals who are less than 30 years old compared to the other groups. The mean age for the other groups are as follows: personality disorder 47.7 years ($SD = 19.2$), anxiety disorders 46.3 years ($SD = 16.6$), and co-occurring disorders 45.4 years ($SD = 15.9$). All of the groups, except schizophrenia, were more likely to be married than not married.

The groups were almost equally likely to have moved at least once during the Cohort Definition Period. The percentage of individuals who moved during this period ranged from 7.1% (anxiety disorders) to 9.8% (personality disorders).

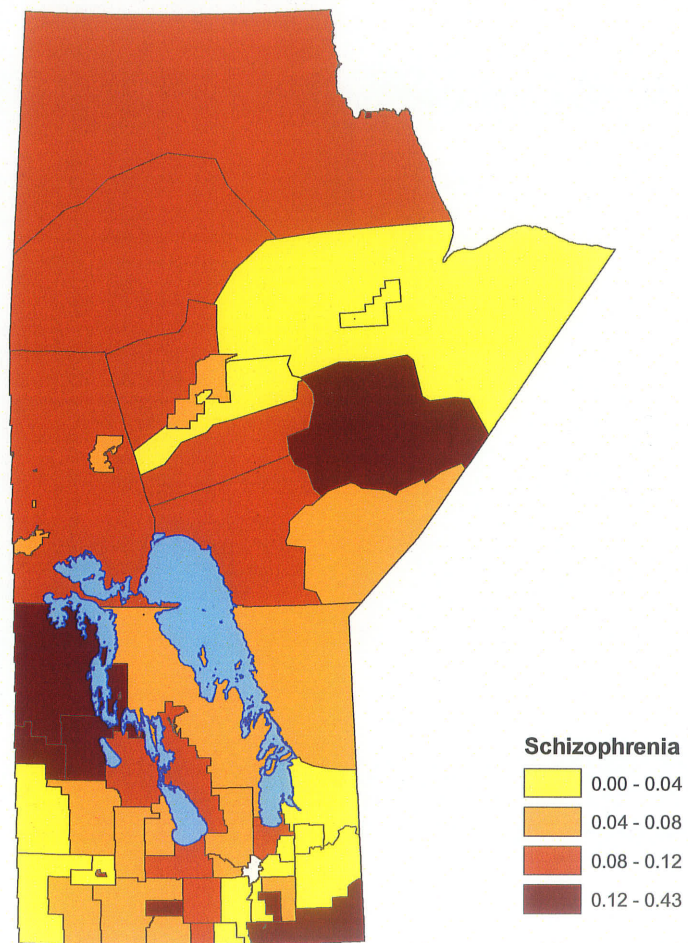
Geographic

The distribution of the diagnostic groups across the three RHA regions is presented in Table 19. The substance abuse disorders group has more than double the percentage of individuals residing in the northern RHAs than the other four groups. Overall, the largest percentage of the groups resided in the rural central RHAs, but also a substantial percentage of individuals resided in the rural south RHAs.

The percentage of the adult population that each group comprised in each RHA district is mapped in Figures 10 through 13. The percentage of the adult population with schizophrenia varied across the RHA districts, from 0.0% to 0.4%. Very few individuals in the personality group resided outside of the WRHA, so the data for this group are not mapped. The highest percentage of the adult population with substance abuse disorders in the cohort lived in the northern RHA districts (up to as much as 15.9% of the adult

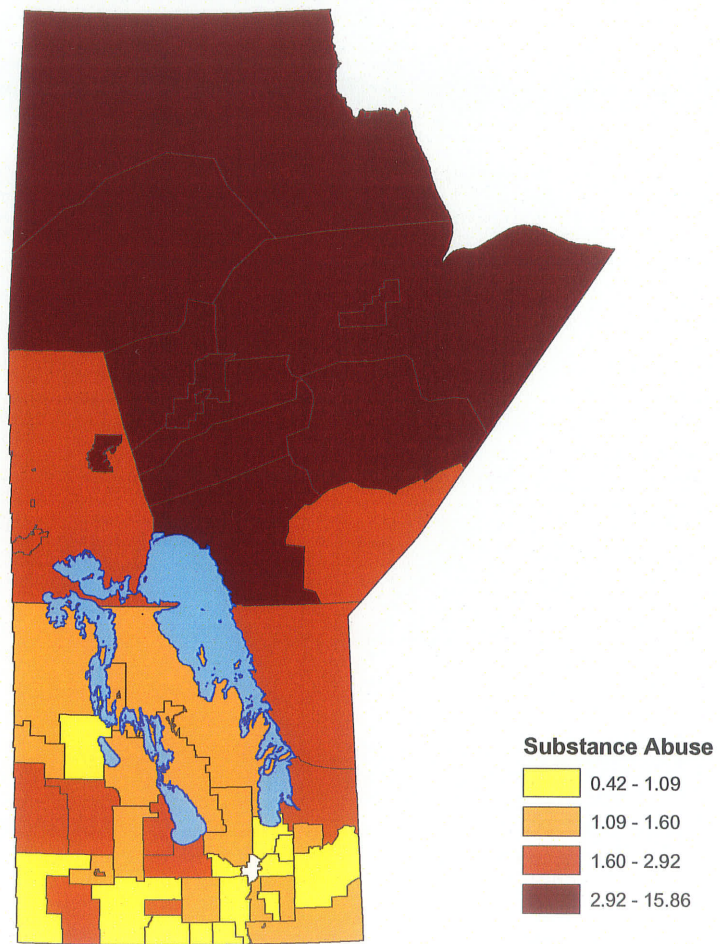
population in a RHA district). In general, anxiety disorders were more common than any other diagnosis (groups), ranging between 1.6% and 14.1% of the adult population. The southern RHA districts had a higher percentage of the population with anxiety disorders than the northern RHAs. The percentage of individuals in the adult population with co-occurring mental disorders was highest in the RHA districts surrounding the WRHA and in the northern RHA districts. The co-occurring disorders group comprised as much as 6.9% of the adult population in the RHA districts.

Figure 10. The Percentage of the Adult Population in the Schizophrenia Group, by Regional Health Authority District



Kilometers
0 50 100 200 300 400

Figure 11. The Percentage of the Adult Population in the Substance Abuse Disorders Group, by Regional Health Authority District



Kilometers
0 50 100 200 300 400

Figure 12. The Percentage of the Adult Population in the Anxiety Disorders Group, by Regional Health Authority District

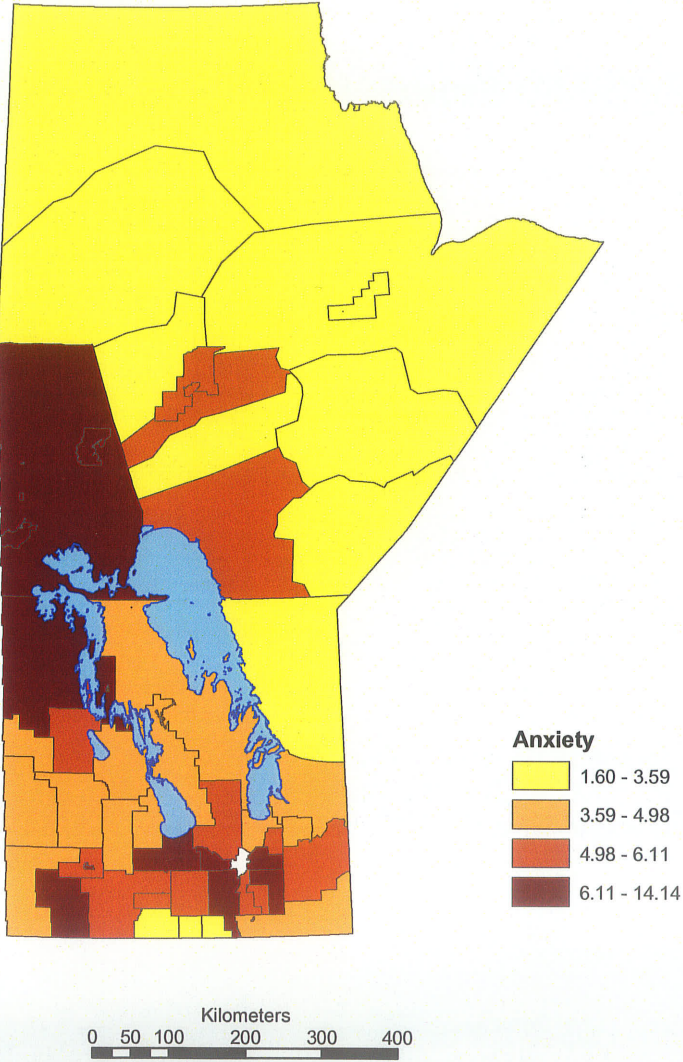
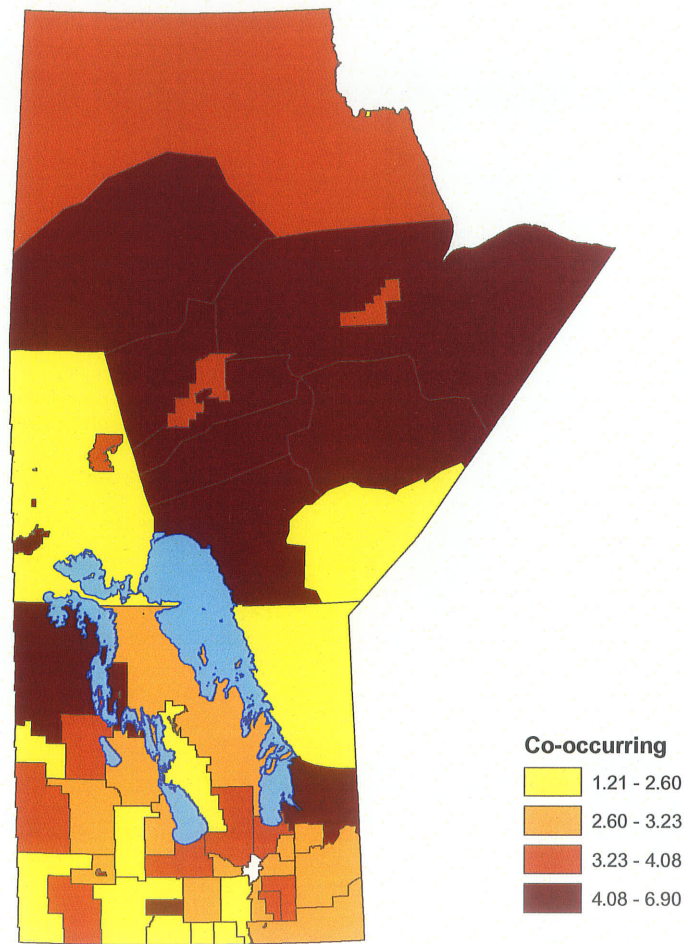


Figure 13. The Percentage of the Adult Population in the Co-occurring Disorders Group, by Regional Health Authority District



Kilometers
0 50 100 200 300 400

Socioeconomic

The distribution by income quintile is presented in Table 19. There is no consistent pattern in the distributions across the groups. For the schizophrenia group, as income quintile increases, the percentage of individuals decreases. There is little difference in the percentage of individuals in each of the income quintiles for the other four groups. The schizophrenia group was most likely to live areas in the poorest income quintile.

Table 19. Demographic, Geographic, and Socioeconomic Characteristics by Diagnostic Group, Rural Regional Health Authority Cohort

Variable	Category	Substance									
		Schizophrenia (<i>N</i> = 335)		Personality (<i>N</i> = 61)		Abuse (<i>N</i> = 6,012)		Anxiety (<i>N</i> = 19,427)		Co-Occurring (<i>N</i> = 11,756)	
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Sex	Male	211	63.0	32	52.5	3,220	53.6	7,077	36.4	3,765	32.0
	Female	124	37.0	29	47.5	2,792	46.4	12,350	63.6	7,991	68.0
Age	19 to 29	32	9.6	9	14.8	1,498	24.9	3,402	17.5	1,928	16.4
	30 to 44	118	35.2	21	34.4	2,532	42.1	6,285	32.4	4,331	36.8
	45 to 64	126	37.6	17	27.9	1,645	27.4	6,470	33.3	3,800	32.3
	65+	59	17.6	14	23.0	337	5.6	3,270	16.8	1,697	14.4
Marital Status	Not married	264	78.8	30	49.2	2,546	42.4	6,007	30.9	4,609	39.2
	Married	71	21.2	31	50.8	3,466	57.7	13,420	69.1	7,147	60.8
Mobility in Cohort Definition Period	Did not move	309	92.2	55	90.2	5,531	92.0	18,043	92.9	10,611	90.3
	Moved	26	7.8	6	9.8	481	8.0	1,384	7.1	1,145	9.7
Rural RHA Region	North	38	11.3	8	13.1	2,059	34.3	2,631	13.5	1,737	14.8
	Rural Central	163	48.7	32	52.5	2,213	36.8	9,653	49.7	5,822	49.5
	Rural South	134	40.0	21	34.4	1,740	28.9	7,143	36.8	4,197	35.7
Income Quintile	Q1 (poorest)	99	29.6	12	19.7	1,292	21.5	3,567	18.4	2,447	20.8
	Q2	91	27.2	9	14.8	1,294	21.5	3,860	19.9	2,359	20.1
	Q3	55	16.4	14	23.0	1,204	20.0	4,321	22.2	2,553	21.7
	Q4	57	17.0	14	23.0	1,001	16.7	3,757	19.3	2,244	19.1
	Q5 (wealthiest)	27	8.1	11	18.0	1,202	20.0	3,908	20.1	2,096	17.8

Level of Co-morbidity

The frequency distributions for ADGs for the five groups are presented in Table 20. In general, the co-occurring mental disorders group had the most ADGs ($M = 5.5$; SD

= 3.1). The schizophrenia ($M = 3.0$; $SD = 2.4$) and the personality disorders ($M = 3.0$; $SD = 3.0$; $SD = 2.1$) has the fewest ADGs in a one-year period. Only a small percentage of individuals in each group had no ADGs. The co-occurring disorders group had more than double the percentage of individuals with 10 or more ADGs (10.6%) than any other group.

Hospital Separations

The frequency distributions for hospital separations for the five groups are presented in Table 20. The majority of individuals did not have any hospital separations with a mental disorders diagnosis in the Observation Period. However, the schizophrenia (19.1%) and co-occurring (10.5%) groups were more likely to have a hospitalization with a mental disorders diagnosis than the other groups. The cell counts for the personality disorders group are too small to report (between one and five) and have been suppressed.

More individuals had a hospitalization with a non-mental disorders diagnosis than a mental disorders diagnosis. The schizophrenia group was least likely to be hospitalized with a non-mental disorders diagnosis (33.8%), while more than half (56.8%) of the co-occurring disorders group had at least one hospitalization with a non-mental disorders diagnosis (45.2%).

Overall, approximately half of the groups were hospitalized (with any diagnosis), except the co-occurring disorders group where approximately six in 10 were hospitalized. On average, the co-occurring disorders group had the highest number of hospitalizations ($M = 0.6$ per year), while the anxiety disorders group had on average the smallest number of hospitalizations ($M = 0.4$).

Table 20. Level of Co-morbidity and Health Service Use by Diagnostic Group, Rural

Regional Health Authority Cohort

Variable	Category	Substance									
		Schizophrenia (N = 335)		Personality (N = 61)		Abuse (N = 6,012)		Anxiety (N = 19,427)		Co-Occurring (N = 11,756)	
		N	%	N	%	N	%	N	%	N	%
ADGs	0	s	s	s	s	469	7.8	823	4.2	194	1.7
	1 to 2	138	41.2	24	39.3	1,916	31.9	4,927	25.4	1,767	15.0
	3 to 5	127	37.9	25	41.0	2,443	40.6	8,313	42.8	4,490	38.2
	6 to 9	38	11.3	s	s	1,027	17.1	4,575	23.6	4,057	34.5
	10 or more	s	s	0	0.0	157	2.6	789	4.1	1,248	10.6
Hospitalizations											
Mental Disorder Diagnoses	0	271	80.9	s	s	5,798	96.4	19,049	98.1	10,517	89.5
	1 or more	64	19.1	s	s	214	3.6	378	2.0	1,239	10.5
Non-Mental Disorder Diagnoses	0	222	66.3	32	52.5	3,084	51.3	9,569	49.3	5,079	43.2
	1 or more	113	33.73	29	47.54	2,928	48.7	9,858	50.75	6,677	56.8
All Diagnoses	0	183	54.6	31	50.8	3,005	50.0	9,452	48.7	4,617	39.3
	1 or more	152	45.37	30	49.18	3,007	50.01	9,975	51.35	7,139	60.73
Physician Visits											
Mental Disorder Diagnoses	0 to 4	141	42.1	44	72.1	5,521	91.8	16,404	84.4	6,460	54.95
	5 to 8	57	17.0	8	13.1	314	5.2	1,724	8.9	1,873	15.93
	9 to 12	28	8.4	s	s	90	1.5	617	3.2	1,076	9.15
	13 to 16	21	6.3	s	s	39	0.7	260	1.3	667	5.67
	17 to 20	18	5.4	s	s	20	0.3	161	0.8	395	3.36
	21 or more	70	20.9	s	s	28	0.5	261	1.3	1,285	10.93
Non-Mental Disorder Diagnoses	0 to 4	85	25.4	8	13.1	881	14.7	1,489	7.7	636	5.41
	5 to 8	47	14.0	s	s	857	14.3	1,765	9.1	787	6.69
	9 to 12	37	11.0	10	16.4	785	13.1	1,871	9.6	942	8.01
	13 to 16	39	11.6	s	s	620	10.3	1,774	9.1	937	7.97
	17 to 20	28	8.4	7	11.5	507	8.4	1,707	8.8	963	8.19
	21 or more	99	29.6	26	42.6	2,362	39.3	10,821	55.7	7,491	63.72
All Diagnoses	0 to 4	28	8.4	s	s	785	13.1	1,208	6.2	345	2.93
	5 to 8	36	10.8	s	s	798	13.3	1,494	7.7	458	3.9
	9 to 12	24	7.2	6	9.8	750	12.5	1,745	9.0	663	5.64
	13 to 16	34	10.2	6	9.8	628	10.5	1,706	8.8	748	6.36
	17 to 20	24	7.2	7	11.5	505	8.4	1,655	8.5	787	6.69
	21 or more	189	56.4	34	55.7	2,546	42.4	11,619	59.8	8,755	74.47

Note. 's' indicates data suppressed due to small numbers

Physician Visits

The frequency distributions of the number of physician visits during the Observation Period are presented in Table 20 and the average annual number of physician visits by diagnosis and physician type is reported in Table 21. The schizophrenia group

was most likely to have multiple physician visits with a mental disorders diagnosis in a year. In fact, over one fifth had more than 20 physician visits in the four-year Observation Period. On average the schizophrenia group had 3.3 physician visits per year with a mental disorder diagnosis. The substance abuse disorders group was least likely to have multiple physician visits during the Observation Period (91.8% had less than five visits). The substance abuse disorders group had on average 3.4 physician visits per year. The schizophrenia group averaged the most visits to GPs ($M = 2.6$ visits per year) and to psychiatrists ($M = 0.7$ visits per year) with a mental disorders diagnosis. The co-occurring disorders group also averaged more than one visit ($M = 1.6$ visits per year) to GPs. The other three groups averaged less than one visit per year to a GP with a mental disorders diagnosis. The schizophrenia and personality disorders groups on average had the most visits to psychiatrists.

The groups were more likely to have multiple physician visits with a non-mental disorders diagnosis than a mental disorders diagnosis. The co-occurring group was most likely to have many (i.e., more than 20) visits (69.8%), while the schizophrenia group was least likely (44.7%). In fact, the co-occurring disorders group had on average 9.4 physician visits per year with a non-mental disorders diagnosis and the schizophrenia group had on average 4.7 visits per year with a non-mental disorders diagnosis. All of the groups averaged more visits to GPs than specialists. The personality disorders group averaged the most visits per year ($M = 2.2$) to specialists with non-mental disorder diagnoses, and the co-occurring disorders group averaged the most visits per year ($M = 7.3$) to GPs.

Overall, the co-occurring disorders group averaged the highest number of physician visits per year ($M = 11.5$) with any diagnosis, while the substance abuse

disorders group averaged the smallest number of physician visits per year ($M = 6.0$). In fact, more than half of the groups had more than 20 visits per year.

Table 21. Average Annual Number of Hospital Separations and Physician Visits by Diagnostic Group, Rural Regional Health Authority Cohort

Variable	Category	Schizophrenia (N = 335)			Personality (N = 61)			Substance Abuse (N = 6,012)			Anxiety (N = 19,427)			Co-Occurring (N = 11,756)		
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Hospital Separations																
	Mental	0.1	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.3
	Non-mental	0.3	0.0	2.0	0.3	0.0	0.8	0.4	0.0	1.1	0.4	0.3	0.9	0.5	0.3	1.2
	All	0.4	0.0	2.0	0.4	0.0	0.9	0.4	0.3	1.1	0.4	0.3	0.9	0.6	0.3	1.2
Physician Visits																
Mental Disorder Diagnoses	GP	2.6	1.0	4.5	0.6	0.3	1.0	0.3	0.0	0.8	0.6	0.3	1.1	1.6	0.8	2.8
	Other	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Psychiatrist	0.7	0.0	1.8	0.6	0.0	2.5	0.0	0.0	0.2	0.0	0.0	0.5	0.5	0.0	2.2
	All	3.3	1.8	4.7	1.2	0.3	2.7	0.4	0.0	0.9	0.6	0.3	1.3	2.1	1.0	3.6
Non-Mental Disorder Diagnoses	GP	3.7	2.5	4.3	4.6	3.3	3.9	4.3	3.0	4.5	5.8	4.3	5.3	7.3	5.5	7.0
	Other	1.0	0.0	2.3	2.2	0.5	4.1	1.4	0.5	2.8	2.0	0.8	3.5	2.0	0.8	3.4
	Psychiatrist	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	All	4.7	3.0	5.3	6.8	4.8	6.7	5.6	4.0	6.0	7.7	5.8	7.0	9.4	7.0	8.4
All Diagnoses		8.0	6.0	7.0	8.0	5.8	6.9	6.0	4.3	6.1	8.3	6.5	7.3	11.5	9.0	9.6

Community-Level Characteristics

The community characteristics were assigned to individuals based on where they resided at baseline (i.e., June 2000). The location of residence at baseline for rural RHA residents was their RHA district. The community characteristics were divided into the following categories; demographic, social isolation, social deprivation, social disorganization, and health care provision. Eighteen of the RHA districts did not have anyone from the personality disorders group living there and no one from the schizophrenia group lived in four of the RHA districts. The descriptive statistics for community characteristics by diagnostic groups is reported in Table 22.

Demographic

There is little variation between the groups in terms of the marital status variables. On average, the groups lived in areas where approximately 5% of the population was divorced, approximately 2% was separated, approximately 7% was widowed, and approximately 55% was married.

Social Isolation

In general, the schizophrenia group on average was more likely to live in areas where a greater percent of the population lived alone ($M = 10.2\%$), while the substance abuse disorders group was on average more likely to live in areas where a smaller percent of the population lives alone ($M = 8.4\%$).

Socioeconomic

Social disorganization consists of three sets of variables; income, employment, and education. Overall, there is little difference between the five groups for median

household income. Although, the schizophrenia group on average lived in poorer RHA districts.

The substance abuse disorders on average lived in areas where a higher percentage of the population are unemployed ($M = 6.1\%$); on average the other four groups lived in areas where between 4 and 5% of the population were unemployed.

There is little variation between the groups in the percentage of residents who had less than secondary education (approximately 13 to 15% of the population).

Social Disorganization

On average, the substance abuse disorders group live in areas where a higher percentage of the population are single parents ($M = 17.3\%$), while on average, the anxiety and personality disorders groups live in areas where a smaller percentage of the population are single parents (less than 14%).

The groups on average lived in RHA districts where between 12 and 14% of the population moved within a year, and between 34 and 37% moved within a five year period. On average, the schizophrenia lived in the most residentially mobile RHA districts (one year mobility, $M = 13.2\%$; five year mobility, $M = 36.9\%$), while the personality disorders group on average lived in the least residentially mobile RHA districts (one year mobility, $M = 11.4\%$; five year mobility, $M = 34.1\%$).

Health Care Provision

There is little difference in the average rate of GPs and psychiatrists across the five groups. The groups on average lived in RHA districts where there were approximately 1.5 GPs per 1,000 adult population and approximately 0.1 psychiatrists per 1,000 adult population. The schizophrenia group on average lived in RHA districts with a

higher rate of specialists ($M = 1.0$ specialists per 1,000 population) compared to the rate of specialists for the other four groups.

Table 22. Community Characteristics by Diagnostic Group, Rural Regional Health Authority Cohort

Category	Variable	Schizophrenia (N = 335)		Personality (N = 61)		Substance Abuse (N = 6,012)		Anxiety (N = 19,427)		Co-Occurring (N = 11,756)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Demographics											
Marital Status	Divorced	5.4	2.1	5.1	1.7	5.1	1.8	5.2	1.6	5.2	1.7
	Separated	2.4	0.5	2.4	0.6	2.5	0.6	2.3	0.5	2.4	0.5
	Widowed	7.8	2.3	7.1	2.2	6.5	2.6	7.3	2.4	7.3	2.4
	Married	53.9	7.9	56.0	8.0	52.2	9.2	55.8	7.0	55.0	7.6
Social Isolation											
	Single Parent	14.7	6.6	13.8	7.6	17.3	9.3	13.4	6.1	14.1	6.9
Socioeconomic											
	Median Household										
Income	Income	\$37,908	\$8,247	\$41,271	\$9,320	\$40,453	\$10,888	\$40,823	\$9,248	\$40,113	\$9,399
Employment	Unemployed	4.5	2.9	4.3	3.1	6.1	4.6	4.3	2.7	4.6	3.2
Education	Less than grade 9	14.6	6.2	13.7	7.0	14.5	7.1	13.2	5.4	13.7	5.9
Social Disorganization											
	Live Alone	10.3	3.7	9.0	3.1	8.5	3.7	9.4	3.2	9.4	3.4
Mobility	1 year	13.2	4.6	11.4	4.1	12.9	4.9	12.0	4.1	12.2	4.3
	5 year	36.9	9.1	34.1	8.5	36.1	8.3	35.0	8.0	35.3	8.1
Health Care Provision											
	Family Physicians	1.6	0.6	1.6	0.8	1.7	1.0	1.5	0.7	1.5	0.7
	Psychiatrists	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
	Other Specialists	1.0	1.1	0.7	0.5	0.7	0.9	0.7	0.6	0.7	0.7

Residential Mobility

Residential mobility results are reported in Table 23. In the first 18 months of the Observation Period, June 2000 to December 2001, between 7.4% and 10.0% of the groups moved. The anxiety disorders group was the least residentially mobile and the co-occurring disorders group was the most residentially mobile. Over the full four-year Observation Period from June 2000 to June 2004, between 17.7% and 21.9% of individuals in the diagnosis groups moved. The anxiety disorder group was again the least residentially mobile, while the co-occurring group was the most residentially mobile. Eight moves were possible during the Observation Period; the maximum number of moves anyone made was five. The majority of the movers moved only once (81.7%) (single movers); 14.5% moved twice, and 3.8% moved three or more times. Among the movers, 86.3% of the schizophrenia, 84.5% of the anxiety, 80.8% of the substance abuse, and 78.2% of the co-occurring disorders groups moved only once.

Table 23. Type and Frequency of Moves by Diagnostic Groups, Rural Regional Health Authority Cohort

Variable	Category	Schizophrenia (N = 335)		Personality (N = 61)		Substance Abuse (N = 6,012)		Anxiety (N = 19,427)		Co-Occurring (N = 11,756)	
		N	%	N	%	N	%	N	%	N	%
Any Move	18 months	32	9.6	5	8.2	489	8.1	1,443	7.4	1,180	10.0
	4 years	73	21.8	13	21.3	1,144	19.0	3,444	17.7	2,574	21.9
Number of Moves (4 years)	0	262	78.2	48	78.7	4,868	81.0	15,983	82.3	9,182	78.1
	1	63	18.8	s	s	924	15.4	2,910	15.0	2,013	17.1
	2	s	s	s	s	182	3.0	431	2.2	431	3.7
	3+	s	s	0	0	38	0.64	103	0.53	130	1.11

Note. 's' indicates data suppressed due to small numbers

Description of Rural RHA Cohort Movers and Non-movers

The individual-level and community-level characteristics for rural RHA residents were examined by mover status. Mover status was defined as moved or did not move during the four-year Observation Period. There were only 13 individuals in the personality group who moved – too small to meaningfully compare their results to the non-movers and they were therefore excluded from this analysis.

Individual-Level Characteristics

Type of Mental Disorders Diagnosis

There were 7,248 movers and 30,343 non-movers in the rural RHA cohort. The schizophrenia (1.0%) and co-occurring disorders (35.5%) groups make up a larger percentage of the movers than the non-movers. The substance abuse (16.0%) and the anxiety disorders (52.7%) groups make up a larger percentage of the non-movers than the movers.

Demographic

The frequency distributions for the demographic characteristics by mover status are reported in Table 24. For each of the groups, the movers and non-movers had a similar male-female split. The movers were also more likely to be younger than the non-movers for the substance abuse, anxiety, and co-occurring disorders groups; the movers in the schizophrenia group were more likely to be older than the non-movers. The movers were more likely not to be married than the non-movers. The majority of the substance abuse and co-occurring movers were not married, while the majority of the non-movers were married. In all cases, the percentage of movers who also moved during the Cohort

Diagnosis Period was more than double the percentage of non-movers who also moved during the Cohort Definition Period.

Geographic

The percentages of movers and non-movers in each RHA region by group is presented in Table 24. For all the groups, a higher percentage of the movers resided in the rural south RHAs and a smaller percentage of the movers resided in the rural central RHAs compared to the non-movers. The movers in the substance abuse, anxiety, and co-occurring disorders groups were more likely to reside in the northern RHAs than the non-movers.

Socioeconomic

The percentage of movers and non-movers in each income quintile is reported in Table 24. Overall, the percentage of mover and non-movers in each income quintile is similar. A higher percentage of the movers in the schizophrenia group and a smaller percentage of movers in the anxiety disorders group are in the wealthiest income quintile (Q5) compared to the non-movers.

Table 24. Demographic, Geographic, and Socioeconomic Characteristics by Mover Status for each Diagnostic Group, Rural Regional Health Authority Cohort

Variable	Category	Schizophrenia		Personality				Substance Abuse				Anxiety				Co-Occurring					
		Mover		Non-Mover		Mover		Non-Mover		Mover		Non-Mover		Mover		Non-Mover		Mover		Non-Mover	
		(N = 73)	(N = 262)	(N = 13)	(N = 48)	(N = 1,144)	(N = 4,868)	(N = 3,444)	(N = 15,983)	(N = 2,574)	(N = 9,182)										
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Sex	Male	47	64.4	164	62.6	s	s	24	50.0	572	50.0	2,648	54.4	1,185	34.4	5,892	36.9	750	29.1	3,015	32.8
	Female	26	35.6	98	37.4	s	s	24	50.0	572	50.0	2,220	45.6	2,259	65.6	10,091	63.1	1,824	70.9	6,167	67.2
Age	19 to 29	6	8.2	26	9.9	s	s	7	14.6	414	36.2	1,084	22.3	1,026	29.8	2,376	14.9	642	24.9	1,286	14.0
	30 to 44	15	20.6	103	39.3	s	s	16	33.3	464	40.6	2,068	42.5	1,120	32.5	5,165	32.3	978	38.0	3,353	36.5
	45 to 64	36	49.3	90	34.4	s	s	13	27.1	215	18.8	1,430	29.4	823	23.9	5,647	35.3	624	24.2	3,176	34.6
	65+	16	21.9	43	16.4	s	s	12	25.0	51	4.5	286	5.9	475	13.8	2,795	17.5	330	12.8	1,367	14.9
Marital Status	Not married	62	84.9	202	77.1	6	46.2	24	50.0	625	54.6	1,921	39.5	1,497	43.5	4,510	28.2	1,290	50.1	3,319	36.2
	Married	11	15.1	60	22.9	7	53.9	24	50.0	519	45.4	2,947	60.5	1,947	56.5	11,473	71.8	1,284	49.9	5,863	63.9
Mobility in Cohort Definition Period	Did not move	63	86.3	246	93.9	s	s	s	s	962	84.1	4,569	93.9	2,929	85.1	15,114	94.6	2,068	80.3	8,543	93.0
Rural RHA Region	Moved	10	13.7	16	6.1	s	s	s	s	182	15.9	299	6.1	515	15.0	869	5.4	506	19.7	639	7.0
	North	7	9.59	31	11.8	s	s	7	14.6	431	37.7	1,628	33.4	490	14.2	2,141	13.4	387	15	1,350	14.7
Region	Rural Central	27	37	136	51.9	s	s	26	54.2	346	30.2	1,867	38.4	1,374	39.9	8,279	51.8	1,105	42.9	4,717	51.4
	Rural South	39	53.4	95	36.3	s	s	15	31.3	367	32.1	1,373	28.2	1,580	45.9	5,563	34.8	1,082	42	3,115	33.9
Income Quintile	Q1 (poorest)	20	27.4	79	30.2	s	s	9	18.8	219	19.1	1,073	22	736	21.4	2,831	17.7	624	24.2	1,823	19.9
	Q2	14	19.2	77	29.4	s	s	8	16.7	285	24.9	1,009	20.7	698	20.3	3,162	19.8	537	20.9	1,822	19.8
	Q3	18	24.7	37	14.1	s	s	13	27.1	178	15.6	1,026	21.1	688	20	3,633	22.7	473	18.4	2,080	22.7
	Q4	11	15.1	46	17.6	s	s	9	18.8	223	19.5	778	16	779	22.6	2,978	18.6	545	21.2	1,699	18.5
	Q5 (wealthiest)	9	12.3	18	6.87	s	s	8	16.7	230	20.1	972	20	535	15.5	3,373	21.1	386	15	1,710	18.6

Note. 's' indicates data suppressed due to small numbers

Level of Co-morbidity

The ADG frequency distributions for each group by mover status are presented in Table 25. The ADG distributions of the movers are similar to the distributions for the non-movers. There was a slight tendency for the movers to have more ADGs than the non-movers; the percentage of individuals with 6 or more ADGs is higher for the movers than the non-movers.

Hospitalizations

For all diagnosis groups but the schizophrenia group, a higher percentage of the movers had at least one hospitalization with a mental disorders diagnosis than the non-movers (see Table 25). A higher percentage of the movers had at least one hospitalization with a non-mental disorders diagnosis than the non-movers for all of the groups.

However, the mean number of hospitalizations with a non-mental disorders diagnosis or with any diagnosis was higher for the non-movers than the movers for the schizophrenia, substance abuse, and co-occurring disorders groups (see Table 26). The mean number of hospitalizations with a mental disorders diagnosis was higher for the movers compared to the non-movers in the substance abuse, anxiety, and co-occurring disorders groups.

Table 25. Level of Co-morbidity and Health Service Use by Mover Status for each Diagnostic Group, Rural Regional Health Authority Cohort

Variable	Category	Schizophrenia				Personality				Substance Abuse				Anxiety				Co-Occurring			
		Mover (N = 73)		Non-Mover (N = 262)		Mover (N = 13)		Non-Mover (N = 48)		Mover (N = 2,085)		Non-Mover (N = 3,960)		Mover (N = 3,444)		Non-Mover (N = 15,983)		Mover (N = 2,574)		Non-Mover (N = 9,182)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
ADGs	0	s	s	s	s	s	s	s	s	84	7.3	385	7.9	149	4.3	674	4.2	34	1.3	160	1.7
	1 to 2	s	s	s	s	s	s	s	s	358	31.3	1,558	32.0	849	24.7	4,078	25.5	349	13.6	1,418	15.4
	3 to 5	s	s	s	s	s	s	s	s	26	2.3	131	2.7	1,414	41.1	6,899	43.2	947	36.8	3,543	38.6
	6 to 9	s	s	s	s	s	s	s	s	469	41.0	1,974	40.6	860	25.0	3,715	23.2	948	36.8	3,109	33.9
	10 or more	s	s	s	s	s	s	s	s	207	18.1	820	16.8	172	5.0	617	3.9	296	11.5	952	10.4
Hospital Separations																					
Mental Disorder Diagnoses	0	61	83.6	210	80.2	13	100.0	s	s	1096	95.8	4,702	96.6	3,343	97.1	15,706	98.3	2,222	86.3	8,295	90.3
	1 or more	12	16.4	52	19.9	0	0.0	s	s	48	4.2	166	3.4	101	2.9	277	1.7	352	13.7	887	9.7
Non-Mental Disorder Diagnoses	0	45	61.6	177	67.6	7	53.9	25	52.1	558	48.8	2,526	51.9	1,570	45.6	7,999	50.1	1,035	40.2	4,044	44.0
	1 or more	28	38.4	85	32.5	6	46.15	23	47.9	586	51.2	2,342	48.1	1,874	54.4	7,984	50	1,539	59.8	5,138	56
All Diagnoses	0	37	50.7	146	55.7	7	53.9	24	50.0	540	47.2	2,465	50.6	1,545	44.9	7,907	49.5	892	34.7	3,725	40.6
	1 or more	36	49.3	116	44.3	6	46.15	24	50	604	52.8	2,403	49.4	1,899	55.1	8,076	50.5	1,682	65.4	5,457	59.4
Physician Visits																					
Mental Disorder Diagnoses	0 to 4	s	s	108	41.2	s	s	s	s	1,015	88.7	4,506	92.6	2,792	81.1	13,612	85.2	1,306	50.7	5,154	56.1
	5 to 8	s	s	45	17.2	s	s	s	s	82	7.2	232	4.8	355	10.3	1,369	8.6	424	16.5	1,449	15.8
	9 to 12	s	s	18	6.9	s	s	s	s	25	2.2	65	1.3	123	3.6	494	3.1	251	9.8	825	9.0
	13 to 16	s	s	18	6.9	s	s	s	s	7	0.6	32	0.7	63	1.8	197	1.2	161	6.3	506	5.5
	17 to 20	s	s	17	6.5	s	s	s	s	7	0.6	13	0.3	34	1.0	127	0.8	91	3.5	304	3.3
	21 or more	s	s	56	21.4	s	s	s	s	8	0.7	20	0.4	77	2.2	184	1.2	341	13.3	944	10.3
Non-Mental Disorder Diagnoses	0 to 4	s	s	71	27.1	s	s	s	s	125	10.9	756	15.5	228	6.6	1,261	7.9	116	4.5	520	5.7
	5 to 8	s	s	40	15.3	s	s	s	s	141	12.3	716	14.7	314	9.1	1,451	9.1	144	5.6	643	7.0
	9 to 12	s	s	28	10.7	s	s	s	s	165	14.4	620	12.7	348	10.1	1,523	9.5	194	7.5	748	8.2
	13 to 16	s	s	27	10.3	s	s	s	s	119	10.4	501	10.3	332	9.6	1,442	9.0	187	7.3	750	8.2
	17 to 20	s	s	25	9.5	s	s	s	s	124	10.8	383	7.9	272	7.9	1,435	9.0	215	8.4	748	8.2
	21 or more	s	s	71	27.1	s	s	s	s	470	41.1	1,892	38.9	1,950	56.6	8,871	55.5	1,718	66.7	5,773	62.9
All Diagnoses	0 to 4	s	s	22	8.4	s	s	s	s	106	9.3	679	14.0	192	5.6	1,016	6.4	55	2.1	290	3.2
	5 to 8	s	s	29	11.1	s	s	s	s	136	11.9	662	13.6	257	7.5	1,237	7.7	91	3.5	367	4.0
	9 to 12	s	s	21	8.0	s	s	s	s	151	13.2	599	12.3	318	9.2	1,427	8.9	122	4.7	541	5.9
	13 to 16	s	s	27	10.3	s	s	s	s	113	9.9	515	10.6	306	8.9	1,400	8.8	144	5.6	604	6.6
	17 to 20	s	s	19	7.3	s	s	s	s	117	10.2	388	8.0	277	8.0	1,378	8.6	157	6.1	630	6.9
	21 or more	s	s	144	55.0	s	s	s	s	521	45.5	2,025	41.6	2,094	60.8	9,525	59.6	2,005	77.9	6,750	73.5

Note. 's' indicates data suppressed due to small numbers

Physician Visits

The distribution of the diagnostic groups across the categories of physician visits with mental disorders, non-mental disorders, and all disorders were similar for the movers and non-movers (see Table 25). There was a slight tendency for the movers to have more visits with mental disorders diagnoses than the non-movers. A higher percentage of movers than non-movers had five or more physician visits for the substance abuse, anxiety, and co-occurring disorders groups. The movers in the schizophrenia group, on the other hand, were less likely to have multiple physician visits with a mental disorders diagnosis than non-movers during the Observation Period. The average annual number of physician visits for each group by type of diagnosis and physician by mover status is reported in Table 26. The non-movers ($M = 2.80$ visits per year) in the schizophrenia group averaged almost one more visit to GPs per year than the movers ($M = 2.00$ visits per year). A higher percentage of the movers in the schizophrenia, substance abuse, and anxiety disorders groups had nine or more physician visits and a higher percentage of the movers in the co-occurring disorders group had 17 or more physician visits for physical health reasons compared to the non-movers. The movers in the anxiety and co-occurring disorders groups averaged more visits per year to GPs with non-mental disorder diagnoses but fewer visits per year to specialists than the non-movers. The movers had on average more physician visits overall and more physician visits with a non-mental disorders diagnosis than the non-movers.

Table 26. Average Annual Number of Hospital Separations and Physician Visits by Mover Status for each Diagnostic Group,
Rural Regional Health Authority Cohort

Variable	Category	Schizophrenia						Personality						Substance Abuse						Anxiety						Co-Occurring								
		Mover (N = 73)			Non-Mover (N = 262)			Mover (N = 13)			Non-Mover (N = 48)			Mover (N = 2,085)			Non-Mover (N = 3,960)			Mover (N = 3,444)			Non-Mover (N = 15,983)			Mover (N = 2,574)			Non-Mover (N = 9,182)					
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Hospital Separations	Mental	0.1	0.0	0.3	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.3	0.1	0.0	0.0	0.2
	Non-Mental	0.3	0.0	0.5	0.4	0.0	2.2	0.1	0.0	0.2	0.4	0.0	0.9	0.4	0.3	0.7	0.4	0.0	1.1	0.4	0.3	0.7	0.4	0.0	0.9	0.5	0.3	0.9	0.5	0.3	0.9	0.5	0.3	0.5
	All	0.4	0.0	0.6	0.4	0.0	2.2	0.1	0.0	0.2	0.4	0.1	1.0	0.4	0.3	0.7	0.4	0.0	1.1	0.4	0.3	0.7	0.4	0.3	0.9	0.5	0.3	0.9	0.5	0.3	0.6	0.3	0.3	1.3
Physician Visits																																		
Mental	GP	2.0	0.8	3.0	2.8	1.0	4.9	0.6	0.3	1.0	0.6	0.3	1.0	0.4	0.0	0.8	0.3	0.0	0.8	0.7	0.3	1.3	0.5	0.3	1.1	1.8	1.0	2.9	1.6	0.8	2.8			
Disorder Diagnoses	Other	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	
	Psychiatrist	0.6	0.0	2.0	0.7	0.0	1.7	0.2	0.0	0.5	0.7	0.0	2.9	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.0	0.5	0.0	0.0	0.5	0.6	0.0	2.0	0.5	0.0	0.0	0.2	0.2	
	All	2.7	1.8	3.3	3.5	1.6	5.0	0.8	0.3	1.4	1.3	0.5	3.0	0.4	0.0	0.9	0.3	0.0	0.9	0.7	0.3	1.5	0.6	0.3	1.2	2.4	1.0	3.7	2.1	0.8	3.6			
Non-Mental	GP	4.1	2.8	4.0	3.6	2.1	4.3	4.2	2.5	3.8	4.7	3.3	4.0	4.6	3.5	5.0	4.2	2.8	4.4	6.0	4.5	5.5	5.7	4.3	5.2	8.0	6.0	8.2	7.1	5.3	6.6			
Disorder Diagnoses	Other	1.3	0.5	2.5	0.9	0.0	2.3	1.4	0.8	1.4	2.4	0.5	4.5	1.3	0.5	2.6	1.4	0.5	2.9	1.9	0.8	3.5	2.0	0.8	3.5	2.0	0.8	3.1	2.1	1.0	3.5			
	Psychiatrist	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	
	All	5.3	3.8	5.3	4.5	2.8	5.3	5.7	4.8	4.7	7.1	4.8	7.2	5.9	4.3	6.2	5.6	3.8	5.9	7.9	6.0	7.3	7.7	5.8	7.0	10.0	7.5	9.5	9.2	7.0	8.1			
All Diagnoses		8.0	6.5	6.4	8.0	5.5	7.1	6.4	5.0	4.5	8.5	6.3	7.4	6.4	4.8	6.4	5.9	4.0	6.1	8.6	6.5	7.7	8.3	6.3	7.2	12.4	9.5	10.9	11.2	9.0	9.2			

Community-Level Characteristics

Table 27 presents the means and standard deviations for the community characteristic variables for each of the five diagnostic groups for the movers and non-movers.

Demographic

In general, the non-movers on average lived in areas where the greater percentage of the population was married compared to the non-movers. In general, the movers lived in areas where a higher percentage of the population were divorced and separated compared to the non-movers.

Social Isolation

There is little difference (i.e., less than a percentage point) between the movers and non-movers in the average percentage of the population who lived alone.

Socioeconomic

For median household income, the movers on average lived in areas with higher incomes than the non-movers. On average, the movers resided in areas with a lower percentage of the population who were unemployed and a lower percentage of the population who had less than secondary education.

Social Disorganization

There is little difference between the movers and non-movers in the average percentage of the population who are single parents. Consistently across the groups, the movers on average lived in areas where a higher percent of the population moved in one-year and five-year periods.

Health Care Provision

On average, the movers resided in areas with a higher rate of GPs, psychiatrists, and specialists per capita than the non-movers.

Table 27. Community Characteristics by Mover Status for each Diagnostic Group, Rural Regional Health Authority Cohort

Category	Variable	Schizophrenia				Personality				Substance Abuse				Anxiety				Co-Occurring			
		Non-Mover (N = 262)		Mover (N = 73)		Non-Mover (N = 48)		Mover (N = 13)		Non-Mover (N = 4,868)		Mover (N = 1,144)		Non-Mover (N = 15,893)		Mover (N = 3,444)		Non-Mover (N = 9,182)		Mover (N = 2,574)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Demographic																					
Marital Status	Divorced	5.3	2.0	5.7	2.2	5.3	1.7	4.4	1.6	4.9	1.7	5.5	2.0	5.2	1.5	5.5	1.9	5.1	1.6	5.6	2.0
	Separated	2.4	0.5	2.4	0.6	2.5	0.6	2.2	0.6	2.4	0.6	2.6	0.6	2.3	0.5	2.4	0.6	2.3	0.5	2.4	0.6
	Widowed	7.8	2.3	7.7	2.3	7.3	2.3	6.4	2.1	6.6	2.6	6.2	2.7	7.3	2.4	7.2	2.3	7.3	2.4	7.3	2.4
	Married	53.9	7.9	53.9	8.0	55.4	7.9	58.1	8.5	52.3	9.4	51.7	8.5	56.0	6.9	54.9	7.6	55.3	7.5	54.1	7.7
Social Isolation																					
	Single Parent	14.8	6.8	14.4	5.7	14.0	7.1	12.9	9.5	17.4	9.6	17.2	7.8	13.3	6.1	14.0	5.8	14.0	7.1	14.6	6.1
Socioeconomic																					
	Median Household Income	\$37,556	\$8,152	\$39,174	\$8,517	\$41,037	\$9,617	\$42,135	\$8,427	\$39,824	\$10,771	\$43,125	\$10,983	\$40,719	\$9,348	\$41,307	\$8,756	\$39,947	\$9,470	\$40,704	\$9,119
Income	Unemployed	4.7	3.0	4.0	2.3	4.3	3.0	4.0	3.5	6.2	4.8	5.5	3.7	4.3	2.7	4.1	2.2	4.7	3.4	4.3	2.5
Education	Less than Grade 9	15.0	6.2	13.1	6.0	13.5	6.9	14.6	7.6	14.9	7.1	12.8	7.1	13.3	5.3	12.6	5.9	14.0	5.8	13.0	6.0
Social Disorganization																					
	Live alone	10.2	3.6	10.6	3.7	9.3	3.1	7.9	3.1	8.4	3.7	8.9	3.5	9.3	3.2	9.7	3.3	9.3	3.3	9.9	3.4
Mobility	1 year	12.9	4.6	14.2	4.6	10.9	4.2	13.5	3.1	12.3	4.7	15.2	5.2	11.6	3.9	13.8	4.5	11.7	4.1	13.9	4.6
	5 year	36.3	8.9	39.4	9.3	32.9	8.3	38.5	7.7	35.2	8.0	40.0	8.5	34.2	7.6	38.4	8.7	34.4	7.8	38.4	8.7
Health Care Provision																					
	Family Physicians	1.5	0.6	1.7	0.6	1.6	0.8	1.6	0.8	1.7	1.0	1.9	1.0	1.5	0.7	1.5	0.7	1.5	0.8	1.6	0.7
	Psychiatrists	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Other Physicians	0.9	1.2	1.1	0.7	0.6	0.5	0.9	0.5	0.7	1.0	0.9	0.9	0.7	0.6	0.9	0.7	0.7	0.7	0.9	0.7

Description of Rural RHA Cohort Multiple and Single Movers

There were 7,248 rural RHA residents who had at least one postal code change during the four-year Observation Period. Single movers had only one change in postal code during this time period, while the multiple movers had two or more changes in postal code. Less than one-fifth (18.3%) of the movers were classified as multiple movers. Among the multiple movers ($N = 1,327$), 79.4% had two changes in postal code, 17.0% had three changes in postal code, 3.1% had four changes in postal code, and 0.5% had 5 or more changes in postal code. There were only 13 individuals in the personality disorders group who moved and only 10 multiple movers in the schizophrenia group, making a discussion of the characteristics of the multiple and single movers for these two groups impossible due to suppression of the data (cell sizes between one and five).

Individual-Level Characteristics

Type of Mental Disorders Diagnosis

Overall, 81.7% of the rural-RHA movers were single movers. The schizophrenia group had the highest percentage of single movers (86.3%). The movers in the co-occurring group were the least likely to be single movers (78.2%). The percentage of single movers among the movers in the personality, substance abuse, and anxiety disorder groups is as follows: 84.6%, 80.8%, and 84.5%.

Demographic

The demographic characteristics of the multiple and single movers are presented in Table 28. The multiple movers were more likely to be female. The substance abuse

disorders multiple movers were more likely to be female, while substance abuse disorders single movers were more likely to be male.

For all three groups, the multiple and single movers age distributions were similar, although there was a slight tendency for the multiple movers to be younger than the single movers.

The multiple movers were less likely to be married. The single movers in the anxiety and co-occurring disorders groups were more likely to be married.

In all cases, the multiple movers were more likely to have moved during the Cohort Definition Period than the single movers. Among the multiple movers, the co-occurring disorders group was the most residentially mobile (29.2% moved), while the anxiety disorders group was the least residentially mobile (18.9% moved). Among the single movers, the co-occurring disorders group was the most residentially mobile (17.0% moved), while substance abuse disorders group was the least residentially mobile (14.0% moved).

Geographic

The percentage of multiple and single movers in each RHA region is presented in Table 28. The multiple movers were more likely to have resided in the northern RHAs and less likely to have resided in the rural central RHAs.

Socioeconomic

The distribution by income quintile for the multiple and single movers is reported in Table 28. In general, a higher percentage of the multiple movers are in the poorest income quintiles and a smaller percentage is in the wealthier income quintiles compared to the single movers.

Table 28. Demographic, Geographic, and Socioeconomic Characteristics by Type of Mover for each Diagnostic Group, Rural Regional Health Authority Cohort

Variable	Category	Substance Abuse				Anxiety				Co-Occurring			
		Multiple Movers (N = 220)		Single Movers (N = 924)		Multiple Movers (N = 534)		Single Movers (N = 2,910)		Multiple Movers (N = 561)		Single Movers (N = 2,013)	
		N	%	N	%	N	%	N	%	N	%	N	%
Sex	Male	86	39.1	486	52.6	156	29.2	1029	35.4	168	30.0	582	28.9
	Female	134	60.9	438	47.4	378	70.8	1881	64.6	393	70.1	1431	71.1
Age	19 to 29	s	s	314	34.0	220	41.2	806	27.7	215	38.3	427	21.2
	30 to 44	s	s	375	40.6	161	30.2	959	33.0	213	38.0	765	38.0
	45 to 64	s	s	189	20.5	107	20.0	716	24.6	91	16.2	533	26.5
	65+	s	s	46	5.0	46	8.6	429	14.7	42	7.5	288	14.3
Marital Status	Not married	139	63.2	486	52.6	298	55.8	1199	41.2	320	57.0	970	48.2
	Married	81	36.8	438	47.4	236	44.2	1711	58.8	241	43.0	1043	51.8
Mobility in Cohort	Did not move	167	75.9	795	86.0	433	81.1	2496	85.8	397	70.8	1671	83.0
Definition Period	Moved	53	24.1	129	14.0	101	18.9	414	14.2	164	29.2	342	17.0
Rural RHA	North	115	52.3	316	34.2	80	15.0	410	14.1	89	15.9	298	14.8
Region	Rural Central	49	22.3	297	32.1	187	35.0	1,187	40.8	226	40.3	879	43.7
	Rural South	56	25.5	311	33.7	267	50.0	1,313	45.1	246	43.9	836	41.5
Income Quintile	U1 (poorest)	53	24.1	166	18.0	140	26.2	596	20.5	162	28.9	462	23.0
	U2	56	25.5	229	24.8	120	22.5	578	19.9	127	22.6	410	20.4
	U3	34	15.5	144	15.6	107	20.0	581	20.0	111	19.8	362	18.0
	U4	30	13.6	193	20.9	96	18.0	683	23.5	94	16.8	451	22.4
	U5 (wealthiest)	45	20.5	185	20.0	69	12.9	466	16.0	65	11.6	321	15.9

Note. 's' indicates data suppressed due to small numbers

Level of Co-morbidity

The frequency distribution of ADGs for each diagnostic group by type of mover is reported in Table 29. The distributions of ADGs for the multiple and single movers are similar. For all three groups, the multiple movers were more likely to have more ADGs than the single movers.

Hospital Separations

The multiple movers were more likely to have at least one hospital separation with mental disorders, non-mental disorders, or any disorders diagnosis than the single movers. There was little difference in the average annual number of hospital separations for mental, non-mental, and all diagnoses between the multiple and single movers (see Table 30).

Table 29. Level of Co-morbidity and Health Service Use by Type of Mover for each Diagnostic Group, Rural Regional Health Authority Cohort

Variable	Category	Substance Abuse				Anxiety				Co-Occurring			
		Multiple Movers (N = 220)		Single Movers (N = 924)		Multiple Movers (N = 534)		Single Movers (N = 2,910)		Multiple Movers (N = 561)		Single Movers (N = 2,013)	
		N	%	N	%	N	%	N	%	N	%	N	%
ADGs	0	18	8.2	66	7.1	26	4.9	123	4.2	7	1.3	27	1.3
	1 to 2	57	25.9	301	32.6	117	21.9	732	25.2	70	12.5	279	13.9
	3 to 5	85	38.6	384	41.6	205	38.4	1209	41.6	196	34.9	751	37.3
	6 to 9	52	23.6	155	16.8	157	29.4	703	24.2	211	37.6	737	36.6
	10 or more	8	3.6	18	2.0	29	5.4	143	4.9	77	13.7	219	10.9
Hospitalizations													
Mental Disorder Diagnoses	0	211	95.9	885	95.8	511	95.7	2832	97.3	470	83.8	1752	87.0
	1 or more	9	4.1	39	4.2	23	4.3	78	2.7	91	16.2	261	13.0
Non-Mental Disorder Diagnoses	0	93	42.3	465	50.3	233	43.6	1337	46.0	205	36.5	830	41.2
	1 or more	127	57.7	459	49.7	301	56.4	1573	54.1	356	63.5	1183	58.8
All Diagnoses	0	89	40.5	451	48.8	228	42.7	1317	45.3	169	30.1	723	35.9
	1 or more	131	59.6	473	51.2	306	57.3	1593	54.8	392	69.9	1290	64.1
Physician Visits													
Mental Disorder Diagnoses	0 to 4	s	s	s	s	395	74.0	2397	82.4	262	46.7	1044	51.9
	5 to 8	s	s	s	s	70	13.1	285	9.8	99	17.7	325	16.2
	9 to 12	s	s	s	s	29	5.4	94	3.2	52	9.3	199	9.9
	13 to 16	s	s	s	s	18	3.4	45	1.6	41	7.3	120	6.0
	17 to 20	s	s	s	s	9	1.7	25	0.9	24	4.3	67	3.3
	21 or more	s	s	s	s	13	2.4	64	2.2	83	14.8	258	12.8
Non-Mental Disorder Diagnoses	0 to 4	17	7.7	108	11.7	38	7.1	190	6.5	24	4.3	92	4.6
	5 to 8	25	11.4	116	12.6	56	10.5	258	8.9	21	3.7	123	6.1
	9 to 12	33	15.0	132	14.3	47	8.8	301	10.3	41	7.3	153	7.6
	13 to 16	22	10.0	97	10.5	40	7.5	292	10.0	30	5.4	157	7.8
	17 to 20	27	12.3	97	10.5	45	8.4	227	7.8	42	7.5	173	8.6
	21 or more	96	43.6	374	40.5	308	57.7	1642	56.4	403	71.8	1315	65.3
All Diagnoses	0 to 4	14	6.4	92	10.0	32	6.0	160	5.5	10	1.8	45	2.2
	5 to 8	24	10.9	112	12.1	50	9.4	207	7.1	20	3.6	71	3.5
	9 to 12	31	14.1	120	13.0	42	7.9	276	9.5	12	2.1	110	5.5
	13 to 16	19	8.6	94	10.2	32	6.0	274	9.4	30	5.4	114	5.7
	17 to 20	23	10.5	94	10.2	42	7.9	235	8.1	30	5.4	127	6.3
	21 or more	109	49.6	412	44.6	336	62.9	1758	60.4	459	81.8	1546	76.8

Note. 's' indicates data suppressed due to small numbers

Physician Visits

For all diagnosis groups, the multiple movers had more physician visits with mental disorders, non-mental disorders, and all disorders diagnoses than the single movers. The multiple movers had on average more GP visits with mental disorders and non-mental disorders diagnoses than single movers (see Table 30). For the anxiety and

co-occurring disorders groups, single movers averaged more specialist visits for non-mental disorders diagnoses than multiple movers.

Table 30. Average Annual Number of Hospital Separations and Physician Visits by Type of Mover for each Diagnostic Group, Rural Regional Health Authority Cohort

Variable	Category	Substance Abuse						Anxiety						Co-Occurring					
		Multiple Movers (N = 220)			Single Movers (N = 924)			Multiple Movers (N = 534)			Single Movers (N = 2,910)			Multiple Movers (N = 561)			Single Movers (N = 2,013)		
		Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Hospital Separations																			
	Mental	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.0	0.3
	Non-mental	0.5	0.3	0.9	0.3	0.0	0.7	0.4	0.3	0.8	0.4	0.3	0.6	0.5	0.3	0.8	0.5	0.3	0.9
	All	0.5	0.3	0.9	0.3	0.3	0.7	0.4	0.3	0.8	0.4	0.3	0.7	0.6	0.3	0.9	0.5	0.3	1.0
Physician Visits																			
	GP	0.5	0.3	0.9	0.4	0.0	0.8	0.8	0.3	1.3	0.6	0.3	1.3	2.2	1.0	3.5	1.7	0.8	2.7
	Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
	Psychiatrist	0.0	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.5	0.1	0.0	0.5	0.6	0.0	2.0	0.5	0.0	2.0
	All	0.6	0.3	1.0	0.4	0.0	0.9	0.9	0.3	1.5	0.7	0.3	1.5	2.8	1.3	4.1	2.3	1.0	3.6
	GP	5.2	3.5	4.6	4.5	3.4	5.1	6.4	4.8	5.7	5.9	4.5	5.4	8.5	6.5	7.6	7.9	5.8	8.3
	Other	1.4	0.5	3.1	1.3	0.5	2.4	1.8	0.8	3.0	1.9	0.8	3.6	1.8	1.0	2.9	2.0	0.8	3.1
	Psychiatrist	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	All	6.5	4.6	6.0	5.8	4.3	6.2	8.3	6.3	7.5	7.8	6.0	7.3	10.3	8.3	8.7	9.9	7.3	9.7
All Diagnoses		7.1	5.0	6.4	6.2	4.5	6.4	9.2	7.0	8.0	8.5	6.5	7.7	13.1	10.3	10.4	12.2	9.3	11.0

Community-Level Characteristics

Table 31 presents the means and standard deviations for the community characteristics by type of mover for each of the five diagnostic groups. The data for the personality disorders group is suppressed due to small numbers (between one and five).

Demographic

The multiple movers, on average, resided in areas where a higher percentage of the population were divorced, separated, and widowed (except the substance abuse disorders group), and smaller percentage of the population were married compared to the single movers.

Social Isolation

On average, the multiple movers lived in areas where a higher percentage of the population lived alone (except the substance abuse disorders group).

Socioeconomic

On average, the single movers resided in areas where the median household income was higher (except the substance abuse disorders group) compared to areas where the multiple movers resided. The multiple movers, on average, resided in areas with a higher unemployed population (except the schizophrenia group) compared to the areas where the single movers resided. The multiple movers in the schizophrenia and substance abuse disorders groups resided in areas where a higher percentage of the population had less than secondary education compared to the single movers.

Social Disorganization

On average, the multiple movers lived in areas where a higher percentage of the population were single parents compared to the single movers. The multiple movers resided in less residentially stable RHA districts than the single movers - the percentage

of population who moved in one year and five years was higher, on average, where the multiple movers resided compared to where the single movers resided.

Health Care Provision

The multiple movers resided in areas with a higher rate of psychiatrists (except the substance abuse disorders group) compared to areas where the single movers resided.

Table 31. Community Characteristics by Type of Mover for each Diagnostic Group, Rural Regional Health Authority Cohort

Category	Variable	Schizophrenia		Substance Abuse				Anxiety		Co-Occurring							
		Multiple Movers (N = 10)		Single Movers (N = 63)		Multiple Movers (N = 220)		Single Movers (N = 924)		Multiple Movers (N = 534)		Single Movers (N = 2,910)		Multiple Movers (N = 561)		Single Movers (N = 2,013)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Demographic																	
Marital Status	Divorced	6.2	2.5	5.6	2.2	5.6	2.0	5.5	2.0	5.9	2.0	5.4	1.9	5.8	2.0	5.5	1.9
	Separated	2.5	0.6	2.4	0.6	2.7	0.6	2.5	0.6	2.5	0.6	2.4	0.6	2.5	0.6	2.4	0.6
	Widowed	8.4	1.6	7.6	2.3	5.7	2.6	6.3	2.7	7.5	2.3	7.1	2.3	7.4	2.4	7.2	2.4
	Married	52.1	8.5	54.1	7.9	49.1	8.6	52.4	8.3	53.0	7.9	55.2	7.5	52.8	8.1	54.5	7.6
Social Isolation																	
	Single Parent	15.1	5.1	14.3	5.8	19.9	8.5	16.6	7.4	15.3	6.2	13.7	5.7	15.6	6.5	14.3	5.9
Socioeconomic																	
	Median Household																
Income	Income	\$36,373	\$4,818	\$39,619	\$8,911	\$43,566	\$11,975	\$43,020	\$10,738	\$40,079	\$9,122	\$41,532	\$8,670	\$40,028	\$9,323	\$40,892	\$9,055
Employment	Unemployed	3.9	1.3	4.0	2.4	6.6	4.6	5.2	3.5	4.3	2.3	4.0	2.1	4.5	2.9	4.2	2.3
Education	Less than Grade 9	13.7	6.3	13.0	6.0	13.0	8.0	12.7	6.8	12.2	6.0	12.6	5.8	13.0	6.3	13.0	5.9
Social Disorganization																	
Mobility	Live alone	12.0	3.2	10.4	3.8	8.3	3.6	9.1	3.5	10.4	3.5	9.6	3.3	10.2	3.6	9.8	3.4
	1 year	15.8	3.7	13.9	4.7	15.9	5.4	15.1	5.2	14.4	4.9	13.7	4.4	14.4	4.9	13.7	4.5
	5 year	43.0	8.1	38.8	9.4	41.0	8.4	39.8	8.6	39.4	9.3	38.2	8.6	39.3	9.0	38.2	8.6
Health Care Provision																	
	Family Physicians	1.7	0.5	1.7	0.7	2.1	1.0	1.8	1.0	1.6	0.7	1.5	0.7	1.6	0.8	1.6	0.7
	Psychiatrists	1.3	0.7	1.0	0.7	0.9	0.9	0.9	0.9	1.1	0.9	0.9	0.7	1.0	0.7	0.9	0.7
	Other Physicians	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1

Logistic Regression Analysis Results

The first set of logistic regression models test the association between the individual and community characteristics and the binary outcome variable, moved/did not move, during the first 18 months of the Observation Period, and the full four-year Observation Period, for the WRHA and rural RHA cohorts. Another set of models to test the association of intra-urban directional mobility and the individual and community level characteristics. The last set of models examine the association between the individual and community level characteristics and the frequency of mobility (i.e., frequent/infrequent). Again, these analyses were conducted separately for the WRHA cohort and the rural RHA cohort.

The models presented for each outcome variable are the population-average (i.e., marginal) model and the best-fitting hierarchical (i.e., subject-specific) model. The best-fitting hierarchical model was chosen based on the AIC criterion; the smaller the AIC value, the better the model fit.

There was a high degree of collinearity among the community characteristics, as reported in Appendix B. Therefore, one variable from each of the social disorganization, social isolation, and socioeconomic categories were selected to include in the models. The variables chosen from each category showed the smallest degree of inter-correlation (as measured by the Spearman-Brown Correlation Coefficient), and therefore measured different aspects of neighbourhoods.

Regression Models for the WRHA Cohort Movers and Non-Movers

Residential Mobility during the 18-month Observation Period

The odds ratios (ORs) and their 95% confidence intervals for population-average model and the subject-specific model with the binary outcome variable moved/did not move during the 18-month Observation Period are presented in Table 32. Preliminary analyses revealed the Hosmer-Lemeshow test was significant for the population-average model ($\chi^2 = 19.91$, $p = 0.01$), indicating that the model was not an acceptable fit to the data according to this criterion. The percentage change in the deviance between the model with the intercept only and the model with the intercept and the individual-level covariates is 9.3%.

Examination of the individual regression coefficients revealed that all of the ORs were statistically significant except for the coefficient for personality disorders and sex. Individuals with a single diagnosis of schizophrenia (OR = 0.82), substance abuse (OR = 0.91), and anxiety (OR = 0.79) disorders were significantly less likely to move than individuals with co-occurring mental disorders. The magnitude of the ORs decreased as the age increased. Individuals in the youngest age category, 19 and 29 years, were 3.3 times more likely to move than individuals over 65 years old, while individuals between 30 and 44 years old (OR = 2.03) and between the ages of 45 and 64 years (OR = 1.18) were also significantly more likely to move than individuals 65 years and older. Married individuals were less likely to move (OR = 0.68) than individuals who were not married. Moving in the Cohort Definition Period was significantly associated with moving in the 18-month Observation Period. Individuals who moved in the Cohort Definition Period were almost 2 times more likely to move in the 18-month Observation Period than

individuals who did not move during the Cohort Definition Period. Individuals residing in the poorest income quintile (Q1) were 2.4 times more likely to move than individuals residing in the most affluent income quintile (Q5). The magnitude of the ORs decreased as income quintile increased; that is, compared to the wealthiest income quintile, the odds of moving decreased as income increased. However, individuals in the second wealthiest income quintile (Q4) were still 1.1 times more likely to move than individuals in the wealthiest income quintile (Q5). Being hospitalized at least once (OR = 1.22) and having many physician visits (10 or more) (OR = 1.19) in the FY 00/01 were significantly associated with moving during the 18-month Observation Period.

The best-fitting subject-specific model included two community characteristics and a random intercept: percentage of individuals who lived alone and the percentage of individuals who were unemployed. The AIC decreased from 54492.0 for the population-average model to 54421.0 for the subject-specific model. The percent change in the model deviance with the addition of the two community-level characteristics and the random intercept was 0.14%. The variance parameter estimate for the random intercept is 0.01 (SE = 0.00) and is statistically significant (p-value = 0.02). There was some change in the values of the ORs and 95% confidence intervals for the individual-level variables. Specifically, the OR for the youngest age group (19 to 29 years) decreased from 3.34 to 2.85, the OR for the second youngest age group (30 to 44 years) decreased from 2.03 to 1.83, the OR for the poorest income quintile decreased from 2.44 to 1.96, and the OR for 10 or more physician visits in the FY 00/01 increased from 1.19 to 1.75. Sex was not significantly associated with mobility in the population-average model, but sex was significant in the subject-specific model. Males are less likely to move than females. In the subject-specific model, all of the regression coefficients were significantly except for

personality disorders diagnosis. Both community-level determinants were significantly associated with mobility in the 18-month Observation Period. The likelihood of moving increased as the percentage of individuals who lived alone increased and as the percentage of individuals who are unemployed increased. That is, individuals living in areas with higher social isolation are more likely to move than individuals who live in areas with lower social isolation. And, individuals living in areas where more individuals are unemployed are more likely to move than individual who live in areas where fewer individuals are unemployed.

Table 32. Odds Ratios (and 95% Confidence Intervals) of Moving in the Winnipeg Regional Health Authority in the 18-month Observation Period

Determinant	Variable	Category	OR	95% Confidence Limits			95% Confidence Limits		
				OR	Lower	Upper	OR	Lower	Upper
Individual	Type of Diagnosis	Schizophrenia	0.82	0.68	0.99	0.79	0.66	0.95	
		Personality	1.40	1.00	1.98	1.35	0.97	1.88	
		Substance Abuse	0.91	0.84	0.99	0.89	0.83	0.96	
		Anxiety	0.79	0.75	0.83	0.79	0.76	0.83	
	Sex	Co-occurring							
		Male	0.97	0.93	1.01	0.95	0.91	0.99	
	Age	Female							
		19 to 29	3.34	3.05	3.65	2.85	2.54	3.18	
		30 to 44	2.03	1.86	2.20	1.83	1.67	2.00	
		45 to 64	1.18	1.08	1.28	1.13	1.03	1.23	
	Marital Status	65+							
		Married	0.68	0.64	0.71	0.71	0.67	0.74	
	Mobility in Cohort Definition Period	Other							
		Moved	1.94	1.85	2.04	1.80	1.68	1.93	
	Income Quintile	Did not move							
		Q1 (poorest)	2.44	2.27	2.63	1.96	1.78	2.16	
		Q2	1.64	1.52	1.77	1.50	1.37	1.64	
		Q3	1.36	1.26	1.47	1.28	1.18	1.40	
		Q4	1.10	1.01	1.20	1.09	1.00	1.19	
	Hospital Separations	Q5 (wealthiest)							
1 or more		1.22	1.16	1.29	1.25	1.18	1.32		
Physician Visits	0								
	10 or more	1.19	1.14	1.25	1.75	1.16	2.66		
Community	9 or less								
	Live Alone				1.01	1.00	1.01		
	Unemployed				1.05	1.03	1.07		
Random Intercept Variance (SE)						0.01 (0.00)			

Residential Mobility during the 4-year Observation Period

The odds ratios (ORs) and their 95% confidence intervals for the population-average model and the subject-specific model with the binary outcome variable moved/did not move during the four-year Observation Period are presented in Table 33. Preliminary analyses revealed that the Hosmer-Lemeshow test was not significant for the population-average model ($\chi^2 = 18.36, p = 0.02$), which suggests that the model was an

acceptable fit to the data. The percentage change in the deviance between the model with the intercept only and the model with the intercept and the individual-level covariates is 10.7%.

Examination of the individual regression coefficients revealed that all of the ORs were statistically significant except for the OR for personality disorder diagnosis. Individuals with a single diagnosis of schizophrenia (OR = 0.78), substance abuse (OR = 0.89), and anxiety disorders (OR = 0.77) were significantly less likely to move than individuals with co-occurring mental disorders. The odds of moving were higher for males (OR = 1.06) than for females. The odds of moving were higher for younger individuals than for individuals over 65 years old. The magnitude of the ORs for the age groups decreased as age increased. Individuals between the ages of 19 and 29 were almost 3.7 times more likely to move than individuals over 65 years old. The odds of moving in the Observation Period were higher for individuals who moved in the Cohort Definition Period (OR = 1.93) than for individuals who did not move in the Cohort Definition Period. Individuals residing in poorer areas were more likely to move than individuals residing in the most affluent areas (Q5). Individuals in the poorest income quintile (Q1) were almost 2.5 times more likely to move than individuals in the wealthiest income quintile (Q5). The magnitude of the ORs increased as income quintile decreased. Being hospitalized at least once and having many physician visits (i.e., 21 or more) during the four-year Observation Period were significantly associated with moving. Individuals who were hospitalized at least once were almost 1.3 times more likely to move and individuals who saw physicians more than 20 times were 1.1 times more likely to move.

The best-fit subject-specific model included two community characteristics; percentage of individuals who moved in one year and the percentage of individuals who were unemployed. The AIC criterion decreased from 75037.0 for the population-average model to 74845.0 with the addition of two community characteristics and a random intercept. The parameter estimate of the variance for the random intercept is 0.01 (SE = 0.00) and it is statistically significant (p-value = 0.01). However, the ORs for the individual-level characteristics and their 95% CIs were similar in the two models. In the subject-specific model, all of the individual-level variables were significant except for a personality disorders diagnosis and being between the ages of 45 and 64 years. The coefficient for the percentage of individuals who moved in one year, a community characteristic, was also significant (OR = 1.02). Individuals who resided in more residentially mobile neighbourhoods were more likely to move than individuals who resided in less residentially mobile neighbourhoods. The percent change in the model deviance with the addition of the two community level characteristics and the random intercept was 0.26%.

Table 33. Odds Ratios (and 95% Confidence Intervals) of Moving in the Winnipeg Regional Health Authority in the Four-Year Observation Period

Determinant	Variable	Category	OR	95% Confidence Limits			95% Confidence Limits		
				OR	OR	OR	OR	OR	OR
Individual	Type of Diagnosis	Schizophrenia	0.78	0.67	0.91	0.75	0.65	0.87	
		Personality	1.07	0.78	1.47	1.05	0.77	1.43	
		Substance Abuse	0.89	0.83	0.94	0.89	0.83	0.94	
		Anxiety	0.77	0.74	0.80	0.79	0.76	0.82	
		Co-occurring	Ref	-	-	Ref	-	-	
	Sex	Male	1.06	1.02	1.10	1.04	1.00	1.07	
		Female	Ref	-	-	Ref	-	-	
	Age	19 to 29	3.67	3.43	3.93	3.25	3.02	3.49	
		30 to 44	1.94	1.82	2.06	1.80	1.69	1.92	
		45 to 64	1.08	1.02	1.15	1.06	0.99	1.12	
		65+	Ref	-	-	Ref	-	-	
	Marital Status	Married	0.66	0.64	0.69	0.70	0.67	0.72	
		Other	Ref	-	-	Ref	-	-	
	Mobility in Cohort	Moved	1.93	1.85	2.02	1.81	1.73	1.89	
	Definition Period	Did not move	Ref	-	-	Ref	-	-	
	Income Quintile	Q1 (poorest)	2.49	2.35	2.64	2.07	1.92	2.22	
		Q2	1.66	1.56	1.76	1.57	1.46	1.68	
		Q3	1.34	1.26	1.42	1.31	1.22	1.40	
		Q4	1.09	1.02	1.16	1.11	1.04	1.18	
		Q5 (wealthiest)	Ref	-	-	Ref	-	-	
Hospital Separations	1 or more	1.29	1.24	1.34	1.29	1.24	1.33		
	0	Ref	-	-	Ref	-	-		
Physician Visits	21 or more	1.11	1.06	1.15	1.46	1.30	1.63		
	20 or less	Ref	-	-	Ref	-	-		
Community	One Year Mobility				1.02	1.01	1.02		
	Unemployed				1.02	1.00	1.04		
Random Intercept Variance (SE)						0.01 (0.00)			

Regression Models for the Rural RHA Cohort Movers and non-Movers

The rural RHA models do not include individuals with a single diagnosis of personality disorders or schizophrenia because the number of cases was too small for analysis. Also, the two oldest age categories, 45 to 64 years and 65+ years, were combined because of smaller number of cases in these age groups.

Residential Mobility in the 18-month Observation Period

The odds ratios (ORs) and their 95% confidence intervals for the population-average model and the best-fitting subject-specific model with the binary outcome variable moved/did not move during the 18-month Observation Period are presented in Table 34. The Hosmer-Lemeshow test was significant for the population-average model ($\chi^2 = 12.82$, $p = 0.12$), indicating that the model was an acceptable fit to the data according to this criterion. The percentage change in the deviance between the model with the intercept only and the model with the intercept and the individual-level covariates is 4.9%.

Examination of the individual regression coefficients revealed that all of the ORs were statistically significant except for number of hospital separations. Individuals with a single diagnosis of a substance abuse disorder (OR = 0.83) and a single diagnosis of anxiety disorder (OR = 0.82) were significantly less likely to move than individuals with co-occurring mental disorders. Males were significantly less likely to move than females (OR = 0.85). The odds of moving decreased as age increased. Individuals between the ages of 19 and 29 were 2.1 times more likely to move than individuals over 45 years old. The 30 to 44 years age group were also significantly more likely to move than the 45 and older age group (OR = 1.37). Being married was associated with a decreased odds of moving (OR = 0.64). Moving in the Cohort Definition Period was associated with moving in the Observation Period; individuals who moved during the Cohort Definition Period were almost 2.5 times more likely to move in the Observation Period than individuals who did not move during the Cohort Definition Period. Compared to the wealthiest income quintile, individuals in each of the other four income quintiles were more likely to

move. The magnitude of the ORs was similar across the income quintiles. Having many physician visits (10 or more) (OR = 1.34) was significantly associated with moving.

The best-fitting subject-specific model included three community characteristics: percentage of individuals who moved in one year, the percentage of individuals who are unemployed, and the percentage of individuals who lived alone. The AIC criterion decreased from 20357.0 for the population-average model to 19679.0 for the subject-specific model with the addition of the three community characteristics. However, the percent change in the model deviance with the addition of the two community level characteristics and the random intercept was 3.5%. The parameter estimate of the variance for the random intercept is 0.13 (SE = 0.04) and it is statistically significant (p-value < 0.01). There was some change in the values of the ORs and 95% confidence intervals for the individual-level variables when the community-level variables and the random intercept were added. The ORs for the four income quintile variables increased; the ORs for Q1, Q2, Q3, and Q4 for the population-average model were 1.31, 1.22, 1.19, and 1.33 respectively and for the subject-specific model they were 1.70, 1.49, 1.47, and 1.56. The OR for mobility during the Cohort Definition Period decreased from 2.48 for the population-average model to 2.01 for the subject-specific model. The coefficient for physician visits became significant in the opposite direction. Individuals with more than 10 or more visits were less likely to move than individuals who had 9 visits or less. The regression coefficients for all of the individual-level variables were significantly significant. Two community determinants were significantly associated with moving; percentage of the population that moved in one year and percentage of the population who were unemployed. Individuals who resided in more residentially mobile neighbourhoods were more likely to move than individuals who resided in less

residentially mobile neighbourhoods (OR = 1.09). Individuals who lived in areas where a higher percentage of the population was unemployed were less likely to move than individuals who resided in areas where a smaller percentage of individuals were unemployed (OR = 0.92).

Table 34. Odds Ratios (and 95% Confidence Intervals) of Moving in Rural Regional Health Authorities in the 18-month Observation Period

Determinant	Variable	Category	OR	95% Confidence Limits			OR	95% Confidence Limits	
Individual	Type of Diagnosis	Substance Abuse	0.83	0.74	0.93	0.79	0.69	0.90	
		Anxiety	0.82	0.75	0.89	0.76	0.70	0.83	
		Co-occurring	-	-	-	-	-	-	
	Sex	Male	0.85	0.79	0.92	0.82	0.75	0.89	
		Female	-	-	-	-	-	-	
	Age	19 to 29	2.10	1.89	2.33	2.24	1.94	2.58	
		30 to 44	1.37	1.25	1.50	1.37	1.23	1.52	
		45+	-	-	-	-	-	-	
	Marital Status	Married	0.64	0.59	0.70	0.65	0.59	0.72	
		Other	-	-	-	-	-	-	
	Mobility in Cohort	Moved	2.48	2.24	2.75	2.01	1.74	2.32	
	Definition Period	Did not move	-	-	-	-	-	-	
	Income Quintile	Q1 (poorest)	1.31	1.16	1.49	1.70	1.43	2.03	
		Q2	1.22	1.08	1.38	1.49	1.26	1.75	
		Q3	1.19	1.05	1.35	1.47	1.24	1.73	
		Q4	1.33	1.17	1.50	1.56	1.33	1.82	
		Q5 (wealthiest)	-	-	-	-	-	-	
Hospital Separations	1 or more	1.09	1.00	1.19	1.30	1.19	1.43		
	0	-	-	-	-	-	-		
Physician Visits	10 or more	1.34	1.23	1.46	0.34	0.13	0.92		
	9 or less	-	-	-	-	-	-		
Community	One Year Mobility				1.09	1.06	1.12		
	Unemployed				0.92	0.89	0.95		
	Live Alone				1.00	0.96	1.04		
Random Intercept Variance (SE)						0.13 (0.04)			

Residential Mobility during the 4-year Observation Period

The odds ratios (ORs) and their 95% confidence intervals for the population-average model and the subject-specific model with the binary outcome variable moved/did not move during the four-year Observation Period are presented in Table 35. The Hosmer-Lemeshow test was not significant for the population-average model ($\chi^2 = 3.15, p = 0.93$), indicating an acceptable model fit to these data. The percentage change in the deviance between the model with the intercept only and the model with the intercept and the individual-level covariates is 5.0%.

Examination of the individual regression coefficients revealed that all of the ORs were statistically significant except for the OR for the third income quintile. Individuals with a single diagnosis of a substance abuse disorder (OR = 0.87) and a single diagnosis of an anxiety disorder (OR = 0.86) were significantly less likely to move than individuals with co-occurring mental disorders. Males were significantly less likely to move than females (OR = 0.92). The magnitude of the ORs decreased as age increased. Individuals between the ages of 19 and 29 were 2.1 times more likely to move than individuals over 45 years old. The 30 to 44 years age group were also significantly more likely to move than the 45 and older age group (OR = 1.36). Being married was associated with a decreased odds of moving (OR = 0.67). Moving in the Cohort Definition Period was significantly associated with moving in the Observation Period. Individuals who moved during the Cohort Definition Period were almost 2.6 times more likely to move in the Observation Period than individuals who did not move during the Cohort Definition Period. Individuals residing in areas assigned to Q1, Q2, and Q4 were significantly more likely to move than individuals residing in the most affluent areas (Q5). The magnitude of the ORs increased as income increased; that is, compared to individuals in the wealthiest

income quintile, the odds of moving for individuals in the next most wealthy income quintile (Q4) were greater than the odds of moving for individuals in the poorest income quintile (Q1). Being hospitalized at least once (OR = 1.16) and having many physician visits (21 or more) (OR = 1.29) were significantly associated with moving.

The best-fitting subject-specific model included two community characteristics: percentage of individuals who moved in one year and the percentage of individuals who lived alone. The AIC criterion decreased from 34657.0 for the population-average model to 32850.0 for the subject-specific model with the addition of the two community characteristics and the random intercept. However, the percent change in the model deviance with the addition of the two community-level characteristics and the random intercept was 5.2%. The parameter estimate of the variance for the random intercept was 0.24 (SE = 0.05) and it was statistically significant (p-value < 0.01). There was little change between the population-average and subject-specific models in the magnitude of the ORs and the 95% confidence intervals for all the individual-level variables. All of the individual-level variables that were significant in the population-average model were significant in the subject-specific model. Both community determinants were significantly associated with moving. Individuals who resided in more residentially mobile neighbourhoods were more likely to move than individuals who resided in less residentially mobile neighbourhoods (OR = 1.07). And individuals who lived in areas where a higher percentage of the population lived alone were more likely to move than individuals who resided in less socially isolated areas (OR = 1.04).

Table 35. Odds Ratios (and 95% Confidence Intervals) of Moving in Rural Regional Health Authorities in the Four-Year Observation Period

Determinant	Variable	Category	OR	95% Confidence Limits		OR	95% Confidence Limits	
Individual	Type of Diagnosis	Substance abuse	0.87	0.80	0.94	0.91	0.83	1.00
		Anxiety	0.86	0.81	0.92	0.85	0.80	0.91
		Co-occurring	Ref	-	-	Ref	-	-
	Sex	Male	0.92	0.87	0.98	0.91	0.86	0.97
		Female	Ref	-	-	Ref	-	-
	Age	19 to 29	2.10	1.94	2.26	2.14	1.97	2.32
		30 to 44	1.36	1.27	1.45	1.37	1.28	1.46
		45+	Ref	-	-	Ref	-	-
	Marital Status	Married	0.67	0.64	0.71	0.67	0.63	0.71
		Other	Ref	-	-	Ref	-	-
	Mobility in Cohort	Moved	2.58	2.38	2.80	1.97	1.81	2.15
	Definition Period	Did not move	Ref	-	-	Ref	-	-
	Income Quintile	Q1 (poorest)	1.17	1.08	1.28	1.33	1.18	1.49
		Q2	1.20	1.10	1.31	1.30	1.17	1.45
		Q3	0.98	0.90	1.07	1.11	0.99	1.24
		Q4	1.43	1.31	1.55	1.42	1.28	1.57
		Q5 (wealthiest)	Ref	-	-	Ref	-	-
	Hospital Separations	1 or more	1.16	1.09	1.22	1.25	1.18	1.33
	Physician Visits	0	Ref	-	-	Ref	-	-
21 or more		1.29	1.21	1.37	1.21	1.14	1.30	
Community	One Year Mobility				1.07	1.03	1.10	
	Live Alone				1.04	1.00	1.09	
Random Intercept Variance (SE)						0.24 (0.05)		

Regression Model for Directional Mobility: Inner Core to Suburbs

The odds ratios (ORs) and their 95% confidence intervals for the population-average and subject-specific models in which the associations between individual-level and community-level characteristics and the binary outcome moved to the suburbs from the inner core/did not move to the suburbs were examined. The results are reported in Table 36. The Hosmer-Lemeshow test was significant for the population-average model ($\chi^2 = 22.91, p < 0.01$), indicating an unacceptable fitting model according to this criterion.

The percentage change in the deviance between the model with the intercept only and the model with the intercept and the individual-level covariates is 3.0%.

There was a significant association between some of the individual-level explanatory variables and the outcome variable. Individuals with a diagnosis of schizophrenia were significantly less likely to move from the inner core to the suburbs (OR = 22.91) than individuals with co-occurring mental disorder diagnoses. Males were significantly less likely to move to the suburbs than females (OR = 0.87). The magnitude of the ORs decreased as age increased. Individuals 19 to 29 years old were 2.5 times and individuals 30 to 44 were 1.4 times more likely to move than individuals 65 years and older. Being married was associated with increased odds of moving to the suburbs compared to not being married (OR = 1.12). Being hospitalized at least once was associated with an increased odds of moving to the suburbs (OR = 1.24), while having more than 21 physician visits during the Observation Period was associated with decreased odds of moving (OR = 0.79).

The best-fit subject-specific model included the percentage of individuals who moved in one year and the percentage of individuals who were unemployed in addition to a random intercept. The AIC criterion decreased from 15382.0 for the population-average model to 15290.0 for the subject-specific model. However, the percent change in the model deviance with the addition of the two community level characteristics and the random intercept was 0.6%. The parameter estimate of the variance for the random intercept was 0.05 (SE = 0.02) and it was statistically significant (p-value = 0.01). When the community-level variables and the random intercept were added to the model, the coefficient for marital status became insignificant and the coefficient for physician visits became significant in the opposite direction. Individuals with more than 20 visits were 1.6

times more likely to move than individuals who had 20 visits or less. None of the community characteristics were significant.

Table 36. Odds Ratios (and 95% Confidence Intervals) of Moving from the Inner Core to the Suburbs in the Four-Year Observation Period

Determinant	Variable	Category	OR	95% Confidence		OR	95% Confidence	
				Limits			Limits	
Individual	Type of Diagnosis	Schizophrenia	0.53	0.36	0.79	0.57	0.38	0.85
		Substance Abuse	0.93	0.80	1.08	0.97	0.83	1.13
		Anxiety	1.02	0.93	1.11	1.04	0.95	1.14
	Sex	Co-occurring	Ref	-	-	Ref	-	-
		Male	0.87	0.79	0.94	0.90	0.83	0.99
	Age	Female	Ref	-	-	Ref	-	-
		19 to 29	2.54	2.16	2.98	2.60	2.20	3.08
		30 to 44	1.43	1.23	1.66	1.50	1.28	1.75
		45 to 64	0.87	0.74	1.02	0.90	0.76	1.06
	Marital Status	65+	Ref	-	-	Ref	-	-
		Married	1.12	1.02	1.22	1.10	1.00	1.21
	Mobility in Cohort	Other	Ref	-	-	Ref	-	-
		Moved	1.05	0.95	1.16	1.06	0.96	1.17
	Definition Period	Did not move	Ref	-	-	Ref	-	-
	Income Quintile	Q1 (poorest)	1.05	0.69	1.60	1.08	0.70	1.68
		Q2	1.14	0.74	1.75	1.11	0.71	1.73
		Q3	1.22	0.79	1.88	1.13	0.72	1.77
		Q4	1.00	0.61	1.62	0.89	0.53	1.48
		Q5 (wealthiest)	Ref	-	-	Ref	-	-
	Hospital Separations	1 or more	1.24	1.14	1.36	1.17	1.07	1.28
0		Ref	-	-	Ref	-	-	
Physician Visits	21 or more	0.79	0.72	0.87	1.61	1.20	2.16	
	20 or less	Ref	-	-	Ref	-	-	
Community	One Year Mobility				0.99	0.97	1.01	
	Unemployed				0.95	0.88	1.02	
Random Intercept Variance (SE)						0.05 (0.02)		

Regression Model for Directional Mobility: Suburbs to Inner Core

The odds ratios (ORs) and their 95% confidence intervals for the population-average and subject-specific models in which the associations between individual-level and community-level characteristics and the binary outcome moved to the inner core from the suburbs/did not move to the inner core from the suburbs during the Observation

Period were examined. The results are reported in Table 37. The Hosmer-Lemeshow test was not significant for the population-average model ($\chi^2 = 13.73$, $p = 0.09$), indicating an acceptable model fit. The percentage change in the deviance between the model with the intercept only and the model with the intercept and the individual-level covariates is 9.8%.

There was a significant association between most of the individual-level explanatory variables and the binary outcome variable. Individuals with a single diagnosis of an anxiety disorder (OR = 0.61) and a single diagnosis of a substance abuse disorder (OR = 0.83) disorder were significantly less likely to move from the suburbs to the inner core than individuals with co-occurring mental disorder diagnoses. Males were significantly more likely to move to the inner core than females (OR = 1.27). Being married was associated with a decreased odds of moving to the inner core (OR = 0.43) from the suburbs. Moving at least once during the Cohort Definition Period was associated with an increased odds of moving to the inner core (OR=1.68) from the suburbs. Residing in poorer income quintiles (Q1-Q4) was associated with increased odds of moving from the suburbs to the inner core compared to residing in the wealthiest income quintile (Q5). The ORs decreased as income increased. Individuals residing in the poorest income quintile (Q1) were 3.0 times more likely to move than individuals residing in the wealthiest income quintile (Q5). Individuals 19 to 29 were 2.7 times and individuals 30 to 44 were 1.7 times more likely to move from the suburbs to the inner core than individuals 65 years and older. Being hospitalized at least once (OR = 1.17) and having more than 20 physician visits (OR = 1.11) was associated with an increased likelihood of moving from the suburbs to the inner core.

The best-fit subject-specific model included two community characteristics; percentage of individuals who moved in one year and the percentage of individuals who were unemployed. The AIC criterion decreased from 17768.0 for the population-average model to 17655.0 for the subject-specific model. However, the percent change in the model deviance with the addition of the two community level characteristics and the random intercept was 0.7%. The parameter estimate of the variance for the random intercept was 0.09 (SE = 0.03) and it was statistically significant (p-value < 0.01). There was little change in the values of the ORs and 95% confidence intervals for the individual-level variables when the community-level variables and the random intercept were added to the model. The coefficients for both community determinants were not statistically significant.

Table 37. Odds Ratios (and 95% Confidence Intervals) of Moving from the Suburbs to the Inner Core in the Four-Year Observation Period

Determinant	Variable	Category	OR	95% Confidence Limits		OR	95% Confidence Limits	
Individual	Type of Diagnosis	Schizophrenia	1.07	0.74	1.53	1.05	0.72	1.52
		Substance Abuse	0.83	0.71	0.96	0.81	0.70	0.95
		Anxiety	0.61	0.56	0.67	0.61	0.55	0.67
		Co-occurring	Ref	-	-	Ref	-	-
	Sex	Male	1.27	1.17	1.39	1.26	1.16	1.38
		Female	Ref	-	-	Ref	-	-
	Age	19 to 29	2.68	2.25	3.18	2.63	2.19	3.15
		30 to 44	1.68	1.42	1.98	1.67	1.41	1.98
		45 to 64	1.18	1.00	1.40	1.18	0.99	1.41
		65+	Ref	-	-	Ref	-	-
	Marital Status	Married	0.43	0.39	0.47	0.43	0.38	0.47
		Other	Ref	-	-	Ref	-	-
	Mobility in Cohort	Moved	1.68	1.52	1.84	1.66	1.50	1.84
	Definition Period	Did not move	Ref	-	-	Ref	-	-
	Income Quintile	Q1 (poorest)	2.95	2.55	3.41	2.73	2.27	3.27
		Q2	2.41	2.10	2.77	2.17	1.84	2.57
		Q3	1.64	1.43	1.88	1.51	1.29	1.77
		Q4	1.21	1.06	1.40	1.13	0.97	1.32
		Q5 (wealthiest)	Ref	-	-	Ref	-	-
	Hospital Separations	1 or more	1.17	1.07	1.27	1.20	1.10	1.31
0		Ref	-	-	Ref	-	-	
Physician Visits	21 or more	1.11	1.00	1.22	1.08	0.57	2.05	
	20 or less	Ref	-	-	Ref	-	-	
Community	One Year Mobility				1.00	0.98	1.03	
	Unemployed				0.98	0.87	1.09	
Random Intercept Variance (SE)						0.09 (0.03)		

Regression Model for WRHA Cohort Multiple and Single Movers

The odds ratios (ORs) and their 95% confidence intervals for the models examining the association between the individual and community determinants and the binary outcome variable moved more than once/moved once during the four-year Observation Period for the WRHA cohort are presented in Table 38. The Hosmer-Lemeshow test was significant for the population-average model ($\chi^2 = 30.10, p < 0.01$),

indicating an unacceptable fitting model according to this criterion. Individuals with a single diagnosis of schizophrenia and a single diagnosis of personality disorders are not included in these analyses because there were few individuals in these groups. The percentage change in the deviance between the model with the intercept only and the model with the intercept and the individual-level covariates is 7.3%.

Individuals with a single diagnosis of an anxiety disorder (OR = 0.75) were significantly less likely to move more than once. The ORs for the age categories decreased as age increased. Individuals 19 to 29 were 2.3 times, individuals 30 to 44 were 1.7 times, and individuals 45 to 64 were 1.3 times more likely to move more than once than individuals 65 years and older. Being married was associated with a decreased odds of moving more than once (OR = 0.72). Moving at least twice during the Cohort Definition Period was associated with an increased odds of moving frequently (OR=2.00). Residing in poorer income quintiles (Q1-Q4) was associated with increased odds of moving more than once compared to residing in the wealthiest income quintile (Q5). The ORs decreased as income increased. Individuals residing in the poorest income quintile were 2.1 times more likely to move more than once than individuals residing in the wealthiest income quintile. Being hospitalized at least once (OR = 1.21) and having more than 20 physician visits (OR = 1.49) was associated with an increased likelihood of moving more than once.

The best-fitting subject-specific model included two community characteristics; percentage of individuals who lived alone and the percentage of individuals who were unemployed. The AIC criterion decreased from 24301.0 for the population-average model to 24258.0 for the subject-specific model. However, the percent change in the model deviance with the addition of the two community level characteristics and the random

intercept was 0.2%. The parameter estimate of the variance for the random intercept was 0.01 (SE = 0.01) and it was not statistically significant (p-value = 0.39). There was little change in the values of the ORs and 95% confidence intervals for the individual-level variables when the community-level variables and the random intercept were added. Having a single diagnosis of a substance abuse disorder was associated with a decreased odds of moving more than once (OR = 0.89) in the subject-specific model. The percentage of individuals who were unemployed was significantly associated with moving more than once, while the percentage of individuals who lived alone was not statistically significant. Individuals who resided in neighbourhoods with a high unemployed population were more likely to move more than once compared to individuals who resided in neighbourhoods with a smaller unemployed population (OR = 1.10).

Table 38. Odds Ratios (and 95% Confidence Intervals) of Moving More than Once in the Four-Year Observation Period, Winnipeg Regional Health Authority Cohort

Determinant	Variable	Category	OR	95% Confidence Limits		OR	95% Confidence Limits	
Individual	Type of Diagnosis	Substance Abuse	0.92	0.82	1.02	0.89	0.80	0.99
		Anxiety	0.75	0.70	0.80	0.77	0.71	0.83
		Co-occurring	Ref	-	-	Ref	-	-
	Sex	Male	1.03	0.97	1.10	0.97	0.91	1.03
		Female	Ref	-	-	Ref	-	-
	Age	19 to 29	2.27	1.98	2.60	1.88	1.59	2.22
		30 to 44	1.72	1.50	1.96	1.52	1.32	1.75
		45 to 64	1.28	1.11	1.47	1.22	1.06	1.40
		65+	Ref	-	-	Ref	-	-
	Marital Status	Married	0.72	0.67	0.77	0.77	0.71	0.83
		Other	Ref	-	-	Ref	-	-
	Mobility in Cohort	Moved	2.01	1.88	2.14	1.78	1.56	2.02
	Definition Period	Did not move	Ref	-	-	Ref	-	-
	Income Quintile	Q1 (poorest)	2.06	1.83	2.31	1.61	1.40	1.86
		Q2	1.53	1.36	1.72	1.41	1.24	1.61
		Q3	1.34	1.18	1.52	1.29	1.14	1.47
		Q4	1.20	1.05	1.37	1.28	1.12	1.47
		Q5 (wealthiest)	Ref	-	-	Ref	-	-
	Hospital Separations	1 or more	1.21	1.13	1.29	1.24	1.15	1.33
		0	Ref	-	-	Ref	-	-
Physician Visits	21 or more	1.49	1.38	1.61	2.16	1.00	4.67	
	20 or less	Ref	-	-	Ref	-	-	
Community	Live Alone				1.00	1.00	1.01	
	Unemployed				1.10	1.06	1.13	
Random Intercept Variance (SE)						0.01 (0.01)		

Regression Model for Rural RHA Cohort Multiple and Single Movers

The odds ratios (ORs) and their 95% confidence intervals for the models examining the association between the individual and community determinants and the binary outcome variable moved more than once/moved once during the four-year Observation Period for the rural RHA cohort are presented in Table 39. The Hosmer-Lemeshow test was non-significant for the population-average model ($\chi^2 = 4.84$, $p =$

0.77), indicating an acceptable fitting model. Individuals with a single diagnosis of schizophrenia and a single diagnosis of a personality disorder are not included in the analyses because there were few individuals in these groups. The percentage change in the deviance between the model with the intercept only and the model with the intercept and the individual-level covariates is 4.0%.

Individuals with a single diagnosis of an anxiety disorder (OR = 0.71) were significantly less likely to move more than once. The ORs for the age categories decreased as age increased. Individuals 19 to 29 were 2.2 times and individuals 30 to 44 were 1.5 times more likely to move more than once than individuals 65 years and older. Being married was associated with decreased odds of moving more than once (OR = 0.81). Moving at least once during the Cohort Definition Period was associated with increased odds of moving more than once (OR = 1.45). Residing in poorest income quintile (Q1) was significantly associated with increased odds of moving more than once compared to residing in the wealthiest income quintile (Q5) (OR = 1.35). Having more than 20 physician visits (OR = 1.34) was associated with an increased likelihood of moving frequently.

The best-fitting subject-specific model included two community characteristics and a random intercept: the percentage of individuals who lived alone and the percentage of individuals who were unemployed. The AIC criterion decreased from 6585.6 for the population-average model to 6543.5 for the subject-specific model. However, the percent change in the model deviance with the addition of the two community level characteristics and the random intercept was 0.7%. The parameter estimate of the variance for the random intercept was 0.08 (SE = 0.03) and it was statistically significant (p-value = 0.01). There was little change in the values of the ORs and 95% confidence

intervals for the individual-level variables when the community-level variables and the random intercept were added. Having a single diagnosis of a substance abuse disorder was associated with decreased odds of moving more than once (OR = 0.79) in the subject-specific model. The percentage of the population who were unemployed was significantly associated with moving more than once, while the percentage of the population who lived alone was not significantly associated with moving more than once. Individuals who resided in neighbourhoods with a high unemployed population were more likely to move more than once compared to individuals who resided in neighbourhoods with a smaller unemployed population (OR = 1.05).

Table 39. Odds Ratios (and 95% Confidence Intervals) of Moving Frequently in the Four-Year Observation Period, Rural Regional Health Authority Cohort

Determinant	Variable	Category	OR	95% Confidence Limits		OR	95% Confidence Limits	
Individual	Type of Diagnosis	Substance Abuse	0.89	0.74	1.07	0.79	0.65	0.97
		Anxiety	0.71	0.62	0.81	0.73	0.63	0.84
		Co-occurring	Ref	-	-	Ref	-	-
	Sex	Male	0.93	0.81	1.07	0.93	0.81	1.07
		Female	Ref	-	-	Ref	-	-
	Age	19 to 29	2.23	1.88	2.65	2.19	1.83	2.62
		30 to 44	1.51	1.28	1.77	1.49	1.26	1.76
		45+	Ref	-	-	Ref	-	-
	Marital Status	Married	0.81	0.71	0.92	0.85	0.75	0.98
		Other	Ref	-	-	Ref	-	-
	Mobility in Cohort	Moved	1.45	1.25	1.68	1.37	1.17	1.60
	Definition Period	Did not move	Ref	-	-	Ref	-	-
	Income Quintile	Q1 (poorest)	1.35	1.11	1.66	1.31	1.03	1.67
		Q2	1.18	0.96	1.45	1.14	0.90	1.45
		Q3	1.17	0.95	1.45	1.11	0.87	1.42
		Q4	0.89	0.71	1.10	0.94	0.74	1.20
		Q5 (wealthiest)	Ref	-	-	Ref	-	-
	Hospital Separations	1 or more	1.12	0.98	1.28	1.11	0.96	1.27
	Physician Visits	0	Ref	-	-	Ref	-	-
21 or more		1.34	1.16	1.55	1.34	1.15	1.56	
Community	20 or less	Ref	-	-	Ref	-	-	
	Unemployed				1.05	1.02	1.09	
	Live Alone				1.02	0.98	1.06	
Random Intercept Variance (SE)						0.08 (0.03)		

Summary of Logistic Regression Models

Hierarchical logistic regression was performed on four outcome measures, any move in an 18-month Observation Period (degree), any move in the four-year Observation Period (degree), moves between the inner core and suburbs (direction), and frequency of mobility. Below are summaries of the results for the subject-specific models for each outcome variable.

Table 40 summarizes the results for the models with the binary outcome variable moved/did move during the 18-month Observation Period for both the WRHA and rural RHA cohorts. The results for the WRHA and rural RHA cohorts are similar; individuals with a single diagnosis of substance abuse disorder and a single diagnosis of anxiety disorder were less likely to move than individuals with multiple mental disorder diagnoses. Married individuals were less likely to move than not married individuals. Younger individuals, individuals who moved during the Cohort Definition Period, and individuals with at least one hospital separation were more likely to move. The odds of moving decreased as income increased. Many physician visits were associated with increased odds of moving for the WRHA cohort, but decreased odds of moving for the rural RHA cohort. The community-level variable, the percentage of the population who are unemployed, was associated with increased odds of moving for the WRHA cohort, but decreased odds of moving for the rural RHA cohort.

Table 40. Summary of Results for the Subject-Specific Models for Outcome Variable Any Move in the 18-month Observation Period

Determinant	Variable	Category	Cohort	
			WRHA	Rural RHA
Individual	Type of Diagnosis	Schizophrenia	↓	-
		Personality	*	-
		Substance Abuse	↓	↓
		Anxiety	↓	↓
		Sex	Male	↓
	Age	Young to Old	↓	↓
	Marital Status	Married	↓	↓
	Mobility in Cohort			
	Definition Period	Moved	↑	↑
	Income Quintile	Poor to Wealthy	↓	↓
	Hospital Separations	1 or more	↑	↑
	Physician Visits	10 or more	↑	↓
	Community	One Year Mobility		-
Unemployed			↑	↓
Live Alone			↑	*

↑ means more likely to move

↓ means less likely to move

- means variable was not included in the model

* means that the variable was not statistically significant

Table 41 summarizes the results for the models with the binary outcome variable moved/did move during the four-year Observation Period for both the WRHA and rural RHA cohorts. The results for the WRHA and rural RHA cohorts are similar; individuals with a single diagnosis of substance abuse disorder and a single diagnosis of anxiety disorder were less likely to move as were married individuals. Younger individuals, individuals who moved during the Cohort Definition Period, individuals with at least one hospital separation and those with many physician visits were more likely to move. The odds of moving decreased as income increased. Males were less likely to move for only

the rural RHA cohort model. Individuals who live in residentially unstable neighbourhoods were more likely to move. Individuals in the rural RHA cohort who live in neighbourhoods where a high percentage of individuals lived alone were more likely to move.

Table 41. Summary of Results for the Subject-Specific Models with Outcome Variable Any Move in the Four-Year Observation Period

Determinant	Variable	Category	Cohort	
			WRHA	Rural RHA
Individual	Type of Diagnosis	Schizophrenia	↓	-
		Personality	*	-
		Substance Abuse	↓	↓
		Anxiety	↓	↓
	Sex	Male	*	↓
	Age	Young to Old	↓	↓
	Marital Status	Married	↓	↓
	Mobility in Cohort			
	Definition Period	Moved	↑	↑
	Income Quintile	Poor to Wealthy	↓	↓
	Hospital Separations	1 or more	↑	↑
	Physician Visits	21 or more	↑	↑
	Community	One Year Mobility		↑
Unemployed			*	-
Live Alone			-	↑

↑ means more likely to move

↓ means less likely to move

- means variable was not included in the model

* means that the variable was not statistically significant

Table 42 summarizes the results for the intra-urban directional residential mobility models (move from the inner core to the suburbs and vice versa). There were few significant individual-level variables in the model with the binary outcome variable moved from the inner core to the suburbs/did not move to the suburbs. For both outcome

variables, younger adults and individuals with at least one hospital separation were more likely to move. Males were less likely to move from the inner core to the suburbs but more likely to move from the suburbs to the inner core. Individuals with a single diagnosis of schizophrenia were less likely to move from the inner core to the suburbs, while individuals with a single diagnosis of substance abuse disorder and individuals with a single diagnosis of anxiety disorder were less likely to move from the suburbs to the inner core. Income quintile was not significantly associated with moving from the inner core to the suburbs, but individuals residing in poorer income quintiles were more likely to move from the suburbs to the inner core. None of the community-level variables were associated with directional mobility.

Table 42. Summary of Results for the Subject-Specific Directional Mobility Models, Winnipeg Regional Health Authority Cohort

Determinant	Variable	Category	Inner Core to Suburbs	Suburbs to Inner Core	
Individual	Type of Diagnosis	Schizophrenia	↓	*	
		Substance Abuse	*	↓	
		Anxiety	*	↓	
	Sex	Male		↓	↑
	Age	Young to Old	↓	↓	
	Marital Status	Married	*	*	
	Mobility in Cohort				
	Definition Period	Moved	*	↑	
	Income Quintile	Poor to Wealthy	*	↓	
	Hospital Separations	1 or more	↑	↑	
Physician Visits	21 or more	↑	*		
Community	One Year Mobility		*	*	
	Unemployed		*	*	

↑ means more likely to move

↓ means less likely to move

* means that the variable was not statistically significant

Table 43 summarizes the results for the models with the binary outcome variable moved more than once/moved once during the four-year Observation Period for both the WRHA and rural RHA cohorts. Individuals with a single diagnosis of substance abuse disorder and a single diagnosis of anxiety disorder were less likely to move more than once as were married individuals. Younger individuals, individuals who moved during the Cohort Definition Period, individuals residing in poorer income areas for the WRHA cohort, and individuals with many physician visits were more likely to move. One community-level characteristic, percentage of the population who were unemployed, was significantly associated with moving more than once for both cohorts, while one community-level characteristic, percentage of the population that lived alone, was not significantly associated with moving more than once for both cohorts. Individuals with at least one hospital separation were more likely to move for the WRHA cohort, but hospital separations was not significantly associated with moving more than once for the rural RHA cohort.

Table 43. Summary of Results for the Subject-Specific Frequency of Mobility Models

Determinant	Variable	Category	Cohort		
			WRHA	Rural RHA	
Individual	Type of Diagnosis	Substance Abuse	↓	↓	
		Anxiety	↓	↓	
	Sex	Male	*	*	
		Age	Young to Old	↓	↓
	Marital Status	Married	↓	↓	
	Mobility in Cohort	Definition Period	Moved	↑	↑
	Income Quintile	Poor to Wealthy	↓	*	
	Hospital Separations	1 or more	↑	*	
	Physician Visits	21 or more	↑	↑	
	Community	Live Alone		*	*
Unemployed			↑	↑	

↑ means more likely to move

↓ means less likely to move

* means that the variable was not statistically significant

Chapter 5: Discussion and Conclusions

Summary of the Research

The purpose of this research was to examine the characteristics of individuals and their environments that were associated with residential mobility among persons with diagnosed mental disorders. Population-based health administrative data was used to select a cohort of individuals who had diagnosed schizophrenia, substance abuse, personality, and/or anxiety disorders within a two year period in the province of Manitoba. The cohort was divided into groups based on the number and type of mental disorder diagnosis. Four groups were composed of individuals with a single mental disorders diagnosis, and one group was composed of individuals with multiple mental disorder diagnoses. The cohort was then stratified based on location of residence during the six-year study period. An urban cohort resided in the WRHA for the full study period and a rural cohort resided outside the WRHA for the full study period. Each cohort was described in terms of the characteristics of individuals and their environments. A history of residential location was created from semi-annual records of six-digit residential postal code. Residential mobility was then defined at various geographic scales, including any change in postal code, RHA district, RHA, region, community centre area, and intra-urban area. The primary focus of the research was on the degree, direction, and frequency of residential mobility as evidenced by changes in the six-digit postal code. The explanatory variables that were included in the analyses included mental disorder, socio-demographic, health service utilization, and level of co-morbidity. Community characteristics included demographic, socioeconomic, social isolation, social disorganization, and health care provision characteristics of small geographic areas. The

analyses were conducted using hierarchical logistic modeling, which accounted for the clustering of individuals within geographic areas.

The majority of the cohort had a single mental disorder diagnosis, primarily anxiety disorders. However, about one third of the cohort had multiple mental disorders diagnoses. Multiple mental illness diagnoses are common (Bauer et al., 2005; Kessler et al., 1994). In the National Comorbidity Study, the majority of mentally ill individuals had two or more mental disorders in the previous 12 months and over their lifetime (Kessler et al., 1994). The majority of individuals in the co-occurring disorders group had only two mental disorder diagnoses. Anxiety disorders and other disorders (e.g., depression) were the most common diagnoses. However, almost one-quarter had a substance abuse disorders diagnosis. Substance abuse disorders are the most common co-occurring mental illness, particular among individuals with schizophrenia (Green, 2005). In Jones et al's (2004) study, 27% of individuals with schizophrenia, major depression, and bipolar disorder had a substance abuse disorder.

Generally, the urban and rural cohorts had similar socio-demographic and health service use characteristics; although, there were some notable differences. There were proportionately more individuals in the substance abuse disorders group in the rural cohort than in the urban cohort. The individuals in the rural cohort were older than those in the urban cohort, except for in the substance abuse group. All individuals in the rural cohort were more likely to be married than individuals in the urban cohort.

Individuals in the rural substance abuse, anxiety, and co-occurring disorders groups were more likely to be hospitalized with a mental disorders diagnosis than individuals in the urban groups, while individuals in the rural schizophrenia group was less likely to be hospitalized than individuals in the urban schizophrenia group. This may

reflect differential access to mental health services in urban than in rural Manitoba. The individuals in the rural personality, anxiety, substance abuse, and co-occurring disorders groups were more likely, and the individuals in the schizophrenia group was less likely, to be hospitalized with a non-mental disorders diagnosis than the corresponding urban mental disorders diagnosis groups.

All of the individuals in the rural cohort were less likely to visit physicians with a non-mental disorders diagnosis than the individuals in the urban cohort. The individuals in the rural cohort had, on average, more visits to family physicians and fewer visits to other specialists with a non-mental disorders diagnosis and fewer visits to any physician for a mental health reason than the individuals in the urban cohort. This again may reflect differential access to health services in Manitoba based on urban/rural residence.

Approximately half the cohort was hospitalized over the four-year Observation Period; most of the time with a diagnosis for a physical disorder. This is consistent with the literature that in general, individuals with mental illness are in poorer health than the general population. Martens et al. (2004) found that a cohort with at least one of five mental disorder diagnoses visited physicians twice as often as a cohort with no mental illness. Co-morbid physical illnesses are common (Ceilley, Douaihy, & Salloum, 2005; Chafetz, White, Collins-Bride, & Nickens, 2005; Jones et al., 2004; Martens et al., 2004).

There was geographic variation in the distribution of both the urban and rural cohorts. Different spatial patterns of the diagnosis groups within the WRHA are consistent with previous literature on the distribution of individuals with mental illness in urban settings. The majority of the schizophrenia group resided in the inner core, while the majority of the other groups resided in the suburbs. The schizophrenia group was geographically concentrated in the inner city, a pattern consistent with that found in other

studies (Eaton, 1974; Faris et al., 1967; Hare, 1956). The co-occurring disorders and substance abuse disorders groups were also spatially concentrated - the co-occurring disorders group in the inner city and the substance abuse disorders group in the North End. However, the distribution of the co-occurring disorders group was more diffuse than the schizophrenia group. The anxiety disorders group displayed a completely different geographic pattern - the inverse of the schizophrenia group, such that the anxiety disorders group represented the greatest proportion of the adult population in the suburbs, particularly in the eastern areas of the city (i.e., Transcona). This is a slight departure from the literature, as both Faris and Dunham (1967) and Hare (1956) found that affective disorders were randomly distributed across urban areas.

On average, the schizophrenia group resided in the most socio-economically disadvantaged, socially disorganized, and socially isolating neighbourhoods. The personality, substance abuse, and co-occurring disorders groups tended to live in more disadvantaged and socially disorganized neighbourhoods than the anxiety disorders groups.

These observations are consistent with ecological studies that examined the relationship between rates of psychiatric illness and areal-level characteristics. For example, rates of schizophrenia have been found to be positively correlated with area-level unemployment (Giggs, 1973; Loffler et al., 1999), residential mobility (Giggs, 1973; Loffler et al., 1999), and social isolation (Giggs, 1973; Hare, 1956; Loffler et al., 1999). Goldner et al. (2003) found that contact prevalence of schizophrenia was correlated with percentage of low income individuals, but not with unemployment rate. Others have observed that individuals with schizophrenia are concentrated in economically depressed

urban areas (Dauncey et al., 1993; DeVerteuil et al., 2006; Lapouse, Monk, & Terris, 1956).

There was also geographic variation in the distribution of the diagnostic groups outside the WRHA; however, the pattern was not consistent or as clear as within the WRHA. The majority of the rural cohort resided in the southern RHA districts. The substance abuse disorders group was concentrated in the north as was the co-occurring disorders group, although, the co-occurring disorders group also represented a high proportion of the adult population in a few southern RHA districts. The anxiety disorders group was again distributed differently; this group was geographically concentrated in the south, particularly in RHA districts surrounding the WRHA. There was no geographic pattern for the schizophrenia group; they appeared to be randomly distributed across the rural RHA districts.

The substance abuse and co-occurring disorders group tended to reside in economically disadvantaged and residentially unstable areas, while the anxiety disorders group tended to reside in more affluent and residentially stable areas. On average, though, the schizophrenia group resided in the most socio-economically disadvantaged, socially disorganized, and socially isolating areas. These observations are consistent with the income gradients for the schizophrenia and co-occurring disorders groups (more people resided in poor areas than wealthy areas), and the lack of an income gradient for the anxiety disorders group.

Researchers have theorized that the geographic distribution of individuals with mental illness can be partly explained by residential mobility. For instance, in the mental illness literature, the social drift hypothesis postulates that individuals with severe mental illness are downwardly socially mobile and move into disadvantaged neighborhoods

because of low-cost housing and closer proximity to health and social services. Similarly, other researchers have found that unhealthy individuals move into disadvantaged areas, while healthy individuals move into advantaged areas. These theories were the impetus of this study.

Overall, a substantial number of the study cohort moved; 16.2% in an 18-month period and 32.3% in a four-year period. According to the 2001 Census, 11.7% and 32.7% of Manitobans reported having a different address in the province within the one-year and five-year period prior to the date of the Census, respectively (Statistics Canada, 2004). The Census statistics are based on the entire population, whereas this study only included ages 19 years old and older. Although the time periods are slightly different, it appears that the individuals in the cohort were more residentially mobile than the Manitoba population.

Overall, the rural cohort was substantially less residentially mobile than the urban cohort. Thus, the hypothesis that rural residents would be less mobile than urban residents was supported. The degree of residential mobility varied by diagnostic group, as hypothesized, and the rank order of the least to the most mobile varied between urban and rural cohort. The urban anxiety disorders group was the least and the personality disorders group was the most residentially mobile. The rural anxiety disorders group was also the least residentially mobile, but the rural co-occurring disorders group was the most residentially mobile. However, after controlling for individual and community-level characteristics, the schizophrenia, substance abuse, and anxiety disorders groups were less likely to move than the co-occurring disorders group in the urban cohort. Therefore, the hypothesis that individuals with the most severe types of disorders would be more mobile than individuals with less severe types of mental disorders was not supported.

The individual-level characteristics associated with moving in the 18-month and four-year Observation Period was similar for the urban and rural cohorts. Moving was significantly associated with age, marital status, income quintile, number of physician visits, and number of hospitalizations for both cohorts. Younger individuals were more likely to move. Married individuals were less likely to move. For the urban cohort, individuals who lived in income quintiles Q1, Q2, Q3, and Q4 were less likely to move than individuals who live in the wealthiest income quintile. Similarly, among the rural dwellers, individuals who lived in poorer areas were more likely to move than individuals who resided in wealthier areas (although Q3 was not significant for mobility in the four-year period). Individuals who had moved in the recent past were more likely to move than individuals who had not moved recently. Having at least one hospital separation and/or more than 20 visits (in a four year period) were associated with a higher odds of at least one change of address in the 18-month and four-year periods. Males in the rural cohort were less likely to move than females.

One community-level characteristic in the urban models and two community-level characteristics in the rural models were associated with moving. For the urban models, the percentage of individuals unemployed and the percentage of individuals who moved in a one-year period were associated with mobility in the 18-month and four-year periods respectively. The percentage of individual unemployed and the percentage of individuals who moved in one year were significantly associated with moving in the 18-month period for the rural cohort. Rural residents who resided in areas with higher unemployment and higher residential turn-over were more likely to move in the 18-month period than individuals who lived in residentially stable neighbourhoods and in areas with lower unemployed. The percentage of individual who lived alone and the percentage of

individuals who moved in one year were significantly associated with moving in the four-year period among the rural residents. Individuals who resided in areas where more individuals lived alone and areas with higher residential turn-over were more likely to move in the four-year period than individuals who lived in residentially stable neighbourhoods and in areas where fewer individuals lived alone.

The urban cohort was classified according to residence in the inner core, outer core, and suburbs, based on where they resided at the beginning of the Observation Period. Residential mobility was examined for the inner core and suburb dwellers. The inner core dwellers were substantially more residentially mobile than the suburb dwellers, which is consistent with the literature (South et al., 1997). Both cohorts were more likely to move within their area of residence than out of it, which is what South et al. (1997) also found. However, 12.8% of the inner core dwellers moved to the suburbs and 6.5% of the suburb-dwellers moved to the inner core. After controlling for the individual and community-level determinants of mobility, the schizophrenia group was significantly less likely to move from the inner core to the suburbs compared to the co-occurring disorders group, while the substance abuse and anxiety disorders groups were significantly less likely to move from the suburbs to the inner core. The hypothesis that individuals with less severe types of mental disorders would be more likely to move from the inner core to the suburbs was partly supported; individuals with schizophrenia, a severe type of mental disorder, were unlikely to move from the inner core to the suburbs, but there was no association between moving from the inner core to the suburbs and less severe types of mental disorders. The hypothesis that individuals with more severe types of mental disorders would be more likely to move from the suburbs to the inner core was partly supported; individuals with anxiety and substance abuse disorders, less severe types of

mental disorders, were less likely to move from the suburbs to the inner core however there was no association between moving from the suburbs to the inner core for individuals with schizophrenia, a severe type of mental disorder.

The characteristics associated with mobility differed according to the direction of the move. Being male was associated with higher odds of moving from the suburbs to the inner core, but lower odds of moving from the inner core to the suburbs. The two youngest age groups had higher odds of moving regardless of the direction. Individuals who were hospitalized at least once and had more than 20 physician visits were more likely to move in either direction than individuals who were not hospitalized and had fewer than 21 physician visits. Income quintile, marital status, and prior residential mobility were also associated with moving from the suburbs to the inner core. Married individuals were less likely to move the suburbs to the inner core. Individuals in the poorest three income quintiles (Q1-Q3) were more likely to move from the suburbs to the inner core than individuals in the wealthiest income quintile (Q5). Individuals who moved recently were more likely to move from the suburbs to the inner core. None of the community-level characteristics were associated with directional mobility.

Most individuals who moved during the Observation Period only moved once. However, there were as many as eight changes in postal code among the urban cohort and six changes in postal code among the rural cohort in the Observation Period. A higher percentage of the urban cohort moved multiple times compared to the rural cohort. Individuals with one change of postal code were classified as single movers and individuals with more than one change of postal code were classified as multiple movers. Overall, 23.1% of the urban cohort was classified as single movers and 9.8% were classified as multiple movers. In addition, 15.8% and 3.5% of the rural cohort was

classified as single and multiple movers respectively. For both cohorts, the highest percentages of multiple movers were in the co-occurring disorders group. Among the urban cohort, individuals in the anxiety disorders group were most likely to be single movers and among the rural cohort, the schizophrenia group was most likely to be single movers. After controlling for the individual and community-level determinants, the substance abuse and anxiety disorders movers were less likely to move two or more times compared to the co-occurring disorders movers. Therefore, the hypothesis that individuals with the most severe forms of mental disorders would move more often than individuals with less severe forms of mental disorders was not supported.

Age, marital status, prior residential mobility, income quintile, number of hospitalizations and number of physician visits was significantly associated with moving two or more times. Being married was associated with a lower odds of moving frequently than not being married. Individuals who had a recent move (in the Cohort Definition Period) were more likely to move frequently than individuals who did not have a recent move. Having more than 20 physician visits was associated with an increased odds of moving frequently. Among the urban cohort, individuals residing in income quintiles areas Q1 to Q4 were more likely to move two or more times than individuals residing in the wealthiest income quintile (Q5), while only individuals residing in the poorest income quintile were more likely to move than individuals residing in the wealthiest income quintile among the rural dwellers. Thus, individuals residing in lower income areas are more likely to move than individuals residing in more affluent areas. Being hospitalized at least once was associated with an increased odds of moving frequently for the urban cohort. Younger individuals had an increased odds of moving frequently compared to older individuals.

The percentage of the population unemployed was significantly associated with frequent residential mobility for both the urban and rural cohorts. Individuals residing in areas where a higher percentage of the population was unemployed were more likely to move two or more times in a four-year period than individuals residing in areas where a smaller percentage of the population was unemployed.

Hierarchical logistic regression was performed to take into account the clustering of individuals within areas (CCAs or RHA districts). This was done by including a random intercept in the models. The random intercept was significant in some models, however, the variance of the random intercept was small (no more than 0.24). This suggests the clustering of individuals within areas did not account for much of the variation in the data.

Also, the percentage change in the model deviance between the population-average and subject-specific models was small for all of the models (no more than 6%). Many of the individual-level variables were significantly associated with residential mobility, while the community-level variables were not always significantly associated with residential mobility. Thus, the community-level characteristics contributed less to explaining the variation in residential mobility than the individual-level characteristics. This is consistent with larger literature that has found that community-level variables are less strongly associated with various health outcomes than individual-level variables (Pickett et al., 2001; Veugelers et al., 2001). This finding supports the study hypothesis that individual and community-level factors would be associated with residential mobility, but compared to the individual-level factors, the community-level factors would be weakly associated with residential mobility.

Study Limitations

There are limitations to this research. One of the underlying assumptions of this research is that the cohort is representative of all individuals in the province of Manitoba that have schizophrenia, anxiety, personality, and substance abuse disorders. However, since the cohort was created based on contact with the health care system that resulted in the specific diagnostic codes recorded in the physician billing claims and hospital discharge abstracts databases, it does not capture all individuals with these mental disorders (Deyo et al., 1994). Individuals with a mental disorder who did not have contact with these services and no diagnoses recorded in their administrative records are not captured.

Mental health consumers may seek help from alternative mental health services, such as crisis, counseling, peer support, leisure, skill building, and housing services, which are not captured in administrative data. In a cross-sectional study, Rhodes, Lin, and Mustard (2002) linked self-reported use of mental health care, as reported on the National Population Health Survey (NPHS), to physician reimbursement claims in the Ontario Health Insurance Program and inpatient discharge data. They found that the administrative data captured approximately half of self-reported use of mental health services (and vice versa). The authors speculated that the differences occurred because of recall bias in the self reports, the few mental health services captured by administrative data, and the differences in perceived and evaluated need by providers and consumers. Thus, while this study will not capture all mental health service use, it will capture two components of the system that account for a substantial portion of use.

Also, other researchers have demonstrated that not everyone with a mental disorder actually receives professional treatment; the percentage of people that do is fairly low. In a national survey, Grant et al. (2004) found that only 26%, 12%, 6%, and 13% of people with mood, anxiety, alcohol use, and drug use disorders in the previous 12 months respectively sought treatment and only 17% of individuals with co-occurring anxiety and substance abuse disorders in the previous 12 months sought treatment. Similarly, in another national survey, only 21% and 42% of individuals with any 12 month and lifetime mental illness respectively received professional help, while only 12% and 26% received help from mental health specialists for any disorder in the previous 12 months and any lifetime disorder respectively. However, Watson, Heppner, Roos, Reid, and Katz (2005) found that the majority of Winnipeg-dwelling adults with a mental illness saw a family physician at least once.

In summary, only individuals with diagnosed mental disorders are captured in the administrative data. In general, individuals with more severe mental illness are more likely to have contact with the health care system for their mental disorder than individuals with less severe forms of mental illness. There will only be a bias in the study results if individuals who do not have physician-diagnosed mental illness (during the Cohort Definition Period) move with a different frequency and in different directions than the study cohort. However, there is no literature to suggest that this is the case.

Only a single diagnosis is recorded for each physician visit in the physician billing claims database. This poses a problem if individuals are receiving care for more than one condition, say both a physical ailment and mental illness or for co-morbid mental illness(es) (Deyo et al., 1994; Martens et al., 2004; Mustard, Derksen, & Tataryn, 1996). Unless the physician codes the visit as a visit with a mental disorders diagnosis, it will not

be included in the data. Also, when there is ambiguity in the diagnosis, physicians may arbitrarily assign a diagnosis (Deyo et al., 1994), deliberately choosing not report a mental illness (“down-code”) because of stigmatization and intolerance of the mentally ill (Holley, 1998; Mustard et al., 1996; Stuart, 2000) and instead record a non-specific health condition (Mustard et al., 1996). Physicians may also “up-code”, which would lead to an overrepresentation of mental health disorders in the data (Holley, 1998). Also, ‘rule out’ physician visits, visits that disconfirm a diagnosis, may get recorded with a mental disorders diagnosis, and hence individuals that do not have the mental disorder are included in the cohort. These scenarios influence the accuracy of the administrative data and have the potential to bias the results which suggest differences in the mobility of individuals with different mental disorders. Thus, if individuals are misdiagnosed, they will be assigned to the wrong diagnostic group.

Previous research suggests that more severe forms of mental illness are more likely to be coded correctly in administrative data than less severe forms of mental illness. Rawson et al. (1997) checked the reliability of schizophrenia and depressive disorders diagnoses using hospital administrative data in Saskatchewan by comparing it to other data sources, including hospital medical charts, physician billing claims, and prescription data. The level of agreement between the data sources for the primary diagnosis, particularly at the three-digit ICD-9 code level, was lower depressive diagnoses than schizophrenia diagnoses. They concluded that the use of (Saskatchewan) hospital administrative data will lead to valid results for specific chronic psychiatric illnesses, like schizophrenia, and less so for nonspecific psychiatric diagnoses, like depressive disorders.

Another limitation is related to postal codes/municipal code information contained in the Registry. This and previous research has demonstrated that individuals with mental illness are residentially mobile, having many address changes. In this study, accurate residential information is fundamental. It is not known how reliably individuals with mental illness report address changes (and how reliably health care providers report address changes). There are likely moves that are not reported to Manitoba Health and consequently are not captured in the administrative data; however, this is only a problem if the consistency with which postal codes are reported to Manitoba Health varies by diagnostic group (there is no literature on this to determine whether this is an issue). Roos and Nichol (1999) note it may take up to 24 months or more before the database reflects the change in residential information. However, using the MCHP Population Registry to track location of residence over time, Lix et al. (2006b) demonstrated that individuals with a diagnosis of schizophrenia had a higher degree of residential mobility than the general population, after controlling for differences in the number of contacts with the health system. This finding is consistent with the literature, and provides evidence that the registry is a valid means to monitor residential mobility among mental health service recipients. Moreover, Roos et al. (1999) have demonstrated the validity of using administrative data for monitoring movement of individuals over time within the province.

Another limitation is that moves within postal codes will not be detected. A postal code within the WRHA occupies a very small area, typically one side of a residential block or a medium-sized apartment building. Outside the WRHA, postal codes cover larger geographic areas. As of 2001, there were approximately 19,000 postal codes in

Winnipeg and 6,000 in the remainder of the province. This could account for the differences in mobility observed between the WRHA and rural RHA cohorts.

Despite these limitations, there are many advantages to using administrative data to conduct population-based studies of mobility. Firstly, the amount of data contained in administrative databases means that statistical power to detect small effects is high (Mortensen, 1995). Since the databases contain individual-level information over time, multiple databases can be linked to create medical histories (Mortensen, 1995). Additionally, the data is not affected by recall bias, and data collection is not influenced by the patient, the physician, or the researcher (Deyo et al., 1994; Mortensen, 1995). Lastly, since there is no primary data collection, analysis of administrative data is generally cost effective and timely (Holley, 1998).

Policy Implications of the Research

This research is important from a policy perspective. In order to provide the most equitable distribution of health and social services, it is important to know how the need for services is distributed (i.e., where people live). Residential mobility partly accounts for the concentration of individuals with mental illness in disadvantaged areas. The movement of people into and out of areas can distort the area's level of need and lead to the mal-distribution of resources. For instance, individuals moving into an area (as well as newly diagnosed individuals) add to the workload of service providers, such as community mental health workers. Also, low prevalence rural areas may not have the resources available to meet the needs of in-flowing individuals. Decisions of where to allocate psychiatric resources (i.e., number of beds, funding) should be based on a needs assessment. Needs assessment algorithms for the allocation of psychiatric services, like

the allocation of resources for HIV/AIDS in the US (which are currently based on the location of residence at time of diagnosis), should factor in residential mobility (Cohn et al., 1994).

Breslow et al. (1998) found a relationship between residential mobility and county of residence; such that those who moved were more likely to be those who had been accessing psychiatric emergency services outside of their county of origin than those who had been accessing services within their county of origin. Similarly, Lamont et al. (2000) found that the odds of moving were significantly higher for individuals who were hospitalized in areas outside of their catchment area. Dembling et al. (2002) noted that counties with a state psychiatric hospital had a net increase in the psychiatric patient population. Additionally, both Dembling et al. (2002) and DeVerteuil et al. (2006) observed that individuals with severe mental illness (SMI) move in the opposite direction of the general population; that is, individuals with SMI tended to move into inner city, low income, yet service rich areas, while the general population tended to move into higher income, suburban neighbourhoods. Thus, service-related factors may induce residential mobility. Policy makers and service providers need to be aware of the amount and direction of residential mobility, because “By ignoring migration effects we run the risk of promoting policies that unintentionally induce SMI migration through the placement of health and human service resources” (Dembling et al., 2002). One of the goals of mental health reform in Manitoba was to have services as close to home as possible (Manitoba Health, 2002). The success of this goal would mean a reduction in residential mobility (particular rural-to-urban migration) among individuals with mental illness, as the need to move to access services would be eliminated.

The location of services is part of a larger social and built environment, an environment that individuals accessing these services must live in and cope with. The location of services may have the unintended effect of drawing people to live in stigmatized and disadvantaged neighbourhoods, which could expose them to high-risk behavior (e.g., drug abuse, smoking) and negatively impact their health.

Moving can be a stressful life event (Magdol, 2000; Raviv, Keinan, Abazon, & Raviv, 1990). Moving may disrupt employment, education, and social support networks and “may lead to increased social isolation and lack of support” (Abood et al., 2002). Skelton (2002) writes, “for marginalized populations, mobility can be a particular source of stress and an inhibitor of the development of support networks, hindering achievement, undermining confidence and perpetuating individuals’ isolation and welfare dependency” (p. 129).

The stress of moving may contribute to ill health. In Magdol’s (2002) study using National Survey data, movers had higher depression scores than non-movers. She found that moving adversely affected women’s mental health, but not men’s, and this finding held after controlling for sex differences in exposure to stressors and sex differences in response to stress. Butler et al. (1973) similarly concluded that moving negatively affected the mental health of females more than males. An informant in Warfa et al.’s study (2005) reported, “When you move to a new place, you lose the person with whom you used to talk or you lose your relatives and friends. It will make you worry a lot and you get a lot of anxiety” (p. 9) and third informant said, “For some people, moving places makes them ill but for others they were already ill and it will make things much worse for them” (p. 9). This study demonstrated that individuals with mental illness are residentially mobile; some of the moves may be unwanted and unnecessary. Thus, efforts need to be

taken to minimize unwanted and unnecessary residential mobility because the stress associated with moving, for already vulnerable individuals, may worsen their symptoms, negatively affect their level of functioning, and contribute to a relapse.

Frequent residential mobility has the potential to create discontinuities in the receipt of health care. Continuous care enables the physician and patient to determine which therapies (e.g., anti-psychotic medication) work and do not work, as well as allows them to develop a relationship a relationship of trust. Moving may prevent individuals from continuing with the same health care provider(s). Thus, they may have to connect with a new health care provider, which can be a difficult thing to do. It may also be difficult to receive the same quality of care as provided by previous health care providers. If an individual's health care records do not accompany him/her to the new health care provider, he/she may have to start from scratch. Often, mental health care recipients' do not remember the names of the many medications they have been prescribed. Residential mobility, therefore, creates a challenge for health care providers and patients alike. The results of this research suggest that Manitoba, like other Canadian Provinces, should consider implementing the electronic health record to help ensure continuous care. An electronic health record is a "secure lifetime record of an individual's key health information available to authorized health professionals electronically" (Alberta Government, 2006).

This study found that individuals with mental disorders are vary in their residentially mobility. Stable housing is "essential to the effective management of their illness" (Social Planning Council of Winnipeg, 2001). Individuals with mental illness may live in substandard housing and lack the financial resources and community supports necessary to secure and maintain adequate housing (Goodwin & Lyons, 2001; Trainor,

Morrell-Bellai, Ballantyne, & Boydell, 1993). In Manitoba, many adults who have a mental illness rely on Employment and Income Assistance (EIA) as their main source of income, of which \$285 per month is allotted to shelter and utilities (Reynolds, 2002). Based on the Canadian Mental Health Association's statistics, in 2000, the average rent for bachelor suite in the core area of Winnipeg was \$327 per month, while the average rent for a one-bedroom apartment was \$463 per month.

Review of Best Practices in Mental Health Reform (1997), Health Canada's landmark document, is the framework for current mental health reform in Canada, including housing policy (Health Canada, 2003). Currently, Canada is the only developed country that does not have a national housing policy. The WRHA recently evaluated residential care in the Winnipeg Health Region. The WRHA report concluded that the "present mental health residential care service system is not consistent with model proposed in the *Best Practice Guidelines* (1997), nor does it align with contemporary models ... The existing model does not meet the residential requirements of mental health consumers, and has not kept pace financially to ensure quality services ... and needs to be significantly and substantially reorganized" (Winnipeg Regional Health Authority, 2002). Thus, more funding for housing and housing resources and an increase in EIA would likely reduce unwanted and unnecessary residential mobility and contribute to a higher quality of life for individuals with mental illness. Additionally, support services need to be in place, such as mental health or case workers, to help individuals find and maintain a residence (assist with money management and daily chores, provide 24 hour crisis intervention, etc.).

This study found that individual-level and community-level variables were associated with residential mobility. If a goal of policy makers and service providers is to

reduce residential mobility among individuals with mental disorders then initiatives could target at-risk individuals and/or areas. This study identified that individuals with multiple mental illness diagnoses are at most risk of moving often. Also, younger individuals and individuals who have a lot of contact with the health care system are most likely to move. Although, community-level variables were only weakly associated with residential mobility, area-based initiatives may reduce residential mobility among the mentally ill. Weich et al. (2003a) writes “the absence of statistically significant ‘area effects’ does not mean that area-based initiatives are unlikely to prove effective ... certainly deprived persons tend to be clustered in deprived places, whether or not place itself contributes to this phenomenon” (p. 736). The community-level variable, the percentage of individuals who moved in one-year, was significant in many of the models – individuals who lived in residentially unstable neighbourhoods were more likely to move. Thus, areas with high levels of residential turn-over could be targeted - implementing initiatives to reduce overall (unwanted) neighbourhood-level mobility would likely reduce residential mobility among individuals with mental disorders.

Directions for Future Research

Further research with this dataset could be undertaken to identify individuals who ‘definitely’ had a particular diagnosis (strict definition) and compare their residential mobility with individuals who ‘probably’ had a particular diagnosis (liberal definition). These definitions could be created based on the number of contacts with the health care system that resulted in the specific ICD-9-CM mental disorder diagnostic code. As well, data on the type of physician who recorded a diagnosis might also be used to distinguish between those who definitely or probably had a mental disorder. Psychiatrists are the

most qualified physicians to diagnosis mental disorders, so a mental illness diagnosis by a psychiatrist may be more accurate than a diagnosis by a family physician.

In this study, there were four groups with a single diagnosis and a fifth group with more than one mental disorder diagnosis. The cohort could be partitioned into groups with a single disorder (i.e., schizophrenia) and groups with that same disorder diagnosis and at least one other co-occurring disorder diagnosis (i.e., schizophrenia and a substance abuse disorder).

One of the criteria for inclusion in the cohort was continuous residence in the Manitoba from April 1998 to June 2004. Previous research has demonstrated that the general population is more likely to move a short distance than a long distance (Magdol, 2000; Rogerson & Han, 2002). Further research could examine the frequency with which people with mental illness move into or out of Manitoba (compared to the general population), and the characteristics that distinguish the intra-provincial movers from the inter-provincial movers.

There is some evidence to suggest that individuals with mental illness move to be closer to health services (Breslow et al., 1998; Dembling et al., 2002). However, administrative data have not previously been used to examine the relationship between mobility and proximity to health services. Using administrative data, it is possible to determine where individuals live in relation to where they access health care services using the postal code of the physician billing address or acute care facility. However, it is important to recognize that a physician's billing address does not always correspond to the location from which services are provided, which may result in some bias in study results.

One of the goals of Manitoba mental health reform was to provide mental health services “as close to home as possible (i.e., where they live, learn, work and play)” (Manitoba Health, 2002). Mental health reform in the past 10 years has included closing two provincial mental health centres, reducing the number of psychiatric acute care beds in Winnipeg while simultaneously increasing the number of psychiatric beds in rural Manitoba, and increasing the number of community-based services. If one reason that individuals move is because of access to mental health services, then there should be fewer people moving today than 10 years ago when mental health services were concentrated in Winnipeg. One of the advantages of linked administrative data is that longitudinal health services and residential location profiles can be created. Thus, one can examine residential mobility over time to determine if there has been a decrease in residential mobility as a result of regionalizing mental health services and increasing the number of community-based services.

There are many reasons why individuals with mental illness move, including access to more affordable and/or desirable housing, accessibility to health and social services, employment or education opportunities, marriage, to be closer to family and/or friends, and stigma and lack of understanding among landlords and fellow tenants. Researchers have conducted qualitative research on residential mobility of immigrants/refugees and single mothers (Skelton, 2002; Warfa et al., 2005), but the review of literature for the current study did not identify any qualitative research on residential mobility among individuals with mental illness. Conducting interviews or a community survey would shed insight on why individuals with mental illness move, whether moving was intended and desirable or unintended and undesirable, how moving intersects with resources (e.g., health, housing, employment), and how moving affects

quality of life. Interviews or a community survey would also serve as a validity check for the results obtained using administrative data.

Abood et al. (2002) found that there were significant differences in residential mobility after the onset of illness (first diagnosis), but not before the onset of illness between individuals with bipolar affective disorder and individuals with other psychiatric illnesses (not including schizophrenia). Lix et al. (2006b) and Lix et al. (2006a) did not find differences in residential mobility among individuals newly and previously diagnosed with schizophrenia. Abood et al. (2002) obtained their information from self-reports. Using administrative data, one could examine residential mobility pre and post first diagnosis and over the course of illness to answer such questions as: Is the onset of illness related to increased/decreased residential mobility?

One of the concerns with residential mobility is that it can create discontinuities in the receipt of health care. By using administrative data, one could determine if individuals with diagnoses for mental disorders access the same health services before and after moving (particularly for those residing and moving within the city of Winnipeg).

Social selection is one theory to explain the geographic distribution of mental illness, particularly the concentration of individuals with severe mental illness in disadvantaged and socially disorganized neighbourhoods in the inner city. The role of social causation, the other main theory, to explain this geographic concentration could be examined using administrative data. For example, one could define a cohort of individuals who live in a particular area of the city (inner city) and follow them over time to see if they are more likely to develop a mental illness than individuals who live in another area of the city (suburbs).

Future research could also be carried out to test the association between other community-level variables and residential mobility. This study examined the association between residential mobility and a few specific community-level characteristics. Because there was a high degree of collinearity between the community-level variables only selected ones were chosen to include in the models. The Statistics Canada census contains many community-level variables, including features of the built environment, such as the percentage of houses in need of major repairs and the percentage of houses built before 1946. Galea et al. (2005) found that individuals residing in physically run-down neighbourhoods were more likely to report depressive disorders. It is possible that a neighbourhood with decrepit and deteriorating buildings may 'push' (drive) able-bodied people out and may contribute to the stress of individuals living there (leading to poorer health). Also, an index of deprivation could be created from community-level variables, as has been done in studies on small area variation in mental health service use (Holley, 1998; Stuart, 2000; Thornicroft, 1991), and the relationship between the index of deprivation and residential mobility could be tested. Also, linking crime data to place of residence may reveal an association with residential mobility. Individuals may move out ('pushed out') of crime-ridden neighbourhoods because they fear for their safety (and their families).

Conclusions

In this study, administrative data were used to define a cohort of individuals with different types of mental illnesses. The longitudinal nature of the data allowed a residential history to be created. Residence location was available at various geographic scales, including six-digit postal code, RHA district, intra-urban area, and RHA.

Residential mobility was defined according to the degree, frequency, and direction of residential moves.

After controlling for individual-level and community-level characteristics, individuals with co-occurring disorders were more residentially mobile and moved more often than individuals with a single diagnosis. The schizophrenia group was significantly less likely to move from the inner core to the suburbs, while the substance abuse and anxiety disorders group were significantly less likely to move from the suburbs to the inner core compared to the co-occurring disorders group. Community-level characteristics were significantly associated with residential mobility, however contributed little additional explained variation. The individual-level characteristics accounted for more of the variation. The administrative data available in Manitoba is a powerful data resource to examine the association between health and residential mobility. Future research should build on this study to examine the individual-level and community-level characteristics associated with residential mobility among groups with other health conditions.

References

- Abood, Z., Sharkey, A., Webb, M., Kelly, A., & Gill, M. (2002). Are patients with bipolar affective disorder socially disadvantaged? A comparison with a control group. *Bipolar Disorders, 4*, 243-248.
- Alberta Government (2006). *Alberta Netcare: Electronic health record*. Retrieved August 1, 2006, from Alberta Netcare Web site: <http://www.albertanetcare.ca/>
- Almog, M., Curtis, S., Copeland, A., & Congdon, P. (2004). Geographical variation in acute psychiatric admissions within New York City 1990-2000: growing inequalities in service use? *Social Science and Medicine, 59*, 361-376.
- Appleby, L. & Desai, P. (1987). Residential instability: A perspective on system imbalance. *American Journal of Orthopsychiatry, 57*, 515-524.
- Bauer, M. S., Altshuler, L., Evans, D. R., Beresford, T., Williford, W. O., & Hauger, R. (2005). Prevalence and distinct correlates of anxiety, substance, and combined comorbidity in a multi-site public sector sample with bipolar disorder. *Journal of Affective Disorders, 85*, 301-315.
- Breslow, R. E., Klinger, B. I., & Erickson, B. J. (1998). County drift: a type of geographic mobility of chronic psychiatric patients. *General Hospital Psychiatry, 20*, 44-47.
- Buehler, J. W., Frey, R. L., & Chu, S. Y. (1995). The migration of persons with AIDS: data from 12 states, 1985 to 1992. AIDS Mortality Project Group. *American Journal of Public Health, 85*, 1552-1555.
- Buszewicz, M. & Phelah, M. (1994). Schizophrenia and the environment. *British Journal of Hospital Medicine, 52*, 149-154.

- Butler, E. W., McAllister, R. J., & Kaiser, E. J. (1973). The effects of voluntary and involuntary residential mobility on females and males. *Journal of Marriage and the Family*, 35, 219-227.
- Canadian Mental Health Association (2006). *FAQs*. Retrieved November 13, 2003, from Canadian Mental Health Association Web site:
http://www.cmha.ca/bins/content_page.asp?cid=4-40&lang=1#mentalillness
- Ceilley, J. W., Douaihy, A. B., & Salloum, I. M. (2005). Prevalence and Impact of Medical Disorders in Hospitalized Psychiatric Patients with Comorbid Substance Use Disorders. *Addictive Disorders and Their Treatment*, 4, 65-70.
- Chafetz, L. & Goldfinger, S. M. (1984). Residential instability in a psychiatric emergency setting. *Psychiatric Quarterly*, 56, 20-34.
- Chafetz, L., White, M. C., Collins-Bride, G., & Nickens, J. (2005). The poor general health of the severely mentally ill: Impact of schizophrenic diagnosis. *Community Mental Health Journal*, 41, 169-184.
- Chesteen, H. E., Jr., Bergeron, V., & Addison, W. P. (1970). Geographical mobility and mental disorder. *Hospital and Community Psychiatry*, 21, 31-34.
- Cohn, S. E., Klein, J. D., Mohr, J. E., van der Horst, C. M., & Weber, D. J. (1994). The geography of AIDS: patterns of urban and rural migration. *Southern Medical Journal*, 87, 599-606.
- Costello, E. J., Compton, S. N., Keeler, G., & Angold, A. (2003). Relationships between poverty and psychopathology: a natural experiment. *Journal of the American Medical Association*, 290, 2023-2029.

- Crowder, K. D. & South, S. J. (2005). Race, class, and changing patterns of migration between poor and nonpoor neighbourhoods. *American Journal of Sociology, 110*, 1715-1763.
- Datta, G. D., Subramanian, S. V., Colditz, G. A., Kawachi, I., Palmer, J. R., & Rosenberg, L. (2006). Individual, neighborhood, and state-level predictors of smoking among US Black women: A multilevel analysis. *Social Science and Medicine, 63*, 1034-1044.
- Dauncey, K., Giggs, J., Baker, K., & Harrison, G. (1993). Schizophrenia in Nottingham: lifelong residential mobility of a cohort. *British Journal of Psychiatry, 163*, 613-619.
- Dear, M. & Wolch, J. (1987). *Landscapes of despair - from deinstitutionalization to homelessness*. Cambridge: Polity Press.
- Dembling, B. P., Rovnyak, V., Mackey, S., & Blank, M. (2002). Effect of geographic migration on SMI prevalence estimates. *Mental Health Services Research, 4*, 7-12.
- DeVerteuil, G., Hinds, A., Lix, L., Walker, J., Robinson, R., & Roos, L. L. (2006). Mental health and the city: Intra-urban mobility among individuals with schizophrenia. *Health and Place*.
- Deyo, R. A., Taylor, V. M., Diehr, P., Conrad, D., Cherkin, D. C., Ciol, M. et al. (1994). Analysis of automated administrative and survey databases to study patterns and outcomes of care. *Spine, 19*, 2083S-2091S.
- Dohrenwend, B. P., Levay, I., ShROUT, P. E., Schwartz, S., Naveh, G., Link, B. G. et al. (1992). Socioeconomic status and psychiatric disorders: the causation-selection issue. *Science, 255*, 946-952.

- Drukker, M., Driessen, G., Krabbendam, L., & Van, O. J. (2004). The wider social environment and mental health service use. *Acta Psychiatrica Scandinavica*, *110*, 119-129.
- Drukker, M., Kaplan, C., & Van, O. J. (2005). Residential instability in socioeconomically deprived neighbourhoods, good or bad? *Health and Place*, *11*, 121-129.
- Eaton, W. W. (1974). Residence, social class, and schizophrenia. *Journal of Health and Social Behavior*, *15*, 289-299.
- Elmore, K. (2005). The migratory experiences of people with HIV/AIDS (PWHAs) in Wilmington, North Carolina. *Health and Place*.
- Faris, R. E. L. & Dunham, W. (1967). *Mental disorders in urban areas: An ecological study of schizophrenia and other psychoses*. Chicago: University of Chicago Press.
- Fauth, R. C., Leventhal, T., & Brooks-Gunn, J. (2004). Short-term effects of moving from public housing in poor to middle-class neighborhoods on low-income, minority adults' outcomes. *Social Science and Medicine*, *59*, 2271-2284.
- Fell, D. B., Dodds, L., & King, W. D. (2004). Residential mobility during pregnancy. *Paediatric Perinatal Epidemiology*, *18*, 408-414.
- Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2004). *Applied Longitudinal Analysis*. Boston: John Wiley & Sons, Inc.
- Fone, D. L. & Dunstan, F. (2006). Mental health, places and people: a multilevel analysis of economic inactivity and social deprivation. *Health and Place*, *12*, 332-344.

- Fox, J. W. (1990). Social class, mental illness, and social mobility: the social selection-drift hypothesis for serious mental illness. *Journal of Health and Social Behavior*, 31, 344-353.
- Frey, W. H. (1985). Mover destination selectivity and the changing suburbanization of metropolitan whites and blacks. *Demography*, 22, 223-243.
- Galea, S., Ahern, J., Rudenstine, S., Wallace, Z., & Vlahov, D. (2005). Urban built environment and depression: a multilevel analysis. *Journal of Epidemiology and Community Health*, 59, 822-827.
- Giggs, J. A. (1973). The distribution of schizophrenics in Nottingham. *Transactions of the Institute of British Geographers*, 59, 55-76.
- Gober, P., McHugh, K. E., & Reid, N. (1991). Phoenix in flux: household instability, residential mobility, and neighbourhood change. *Annals of the Association of American Geographers*, 81, 80-88.
- Goldner, E. M., Jones, W., & Waraich, P. (2003). Using administrative data to analyze the prevalence and distribution of schizophrenic disorders. *Psychiatric Services*, 54, 1017-1021.
- Goodwin, R. & Lyons, J. S. (2001). An emergency housing program as an alternative to inpatient treatment for persons with severe mental illness. *Psychiatric Services*, 52, 92-95.
- Grant, B. F., Stinson, F. S., Dawson, D. A., Chou, P., Dufour, M. C., Compton, W. et al. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders. *Archives of General Psychiatry*, 61, 807-816.
- Green, A. I. (2005). Schizophrenia and comorbid substance use disorder: effects of antipsychotics. *Journal of Clinical Psychiatry*, 66 Suppl 6, 21-26.

- Hare, E. H. (1956). Mental illness and social conditions in Bristol. *Journal of Mental Science, 102*, 349-357.
- Health Canada (2003). *Review of Best Practices in Mental Health Reform*. Retrieved November 11, 2003, from Health Canada Web site: http://www.hc-sc.gc.ca/hppb/mentalhealth/pubs/bp_review/e_revpr.html
- Henderson, C., ez Roux, A. V., Jacobs, D. R., Jr., Kiefe, C. I., West, D., & Williams, D. R. (2005). Neighbourhood characteristics, individual level socioeconomic factors, and depressive symptoms in young adults: the CARDIA study. *Journal of Epidemiology and Community Health, 59*, 322-328.
- Hogg, R. S., Whitehead, J., Ricketts, M., Heath, K. V., Ng, E., Lalonde, P. et al. (1997). Patterns of geographic mobility of persons with AIDS in Canada from time of AIDS index diagnosis to death. *Clinical and Investigative Medicine, 20*, 77-83.
- Holley, H. L. (1998). Geography and mental health: a review. *Social Psychiatry Psychiatric Epidemiology, 33*, 535-542.
- Hosmer, D. W. & Lemeshow, S. (1989). *Applied Logistic Regression*. New York: John Wiley & Sons.
- Johnson, J. G., Cohen, P., Dohrenwend, B. P., Link, B. G., & Brook, J. S. (1999). A longitudinal investigation of social causation and social selection processes involved in the association between socioeconomic status and psychiatric disorders. *Journal of Abnormal Psychology, 108*, 490-499.
- Jones, D. R., Macias, C., Barreira, P. J., Fisher, W. H., Hargreaves, W. A., & Harding, C. M. (2004). Prevalence, severity, and co-occurrence of chronic physical health problems of persons with serious mental illness. *Psychiatric Services, 55*, 1250-1257.

- Kan, K. (1999). Expected and unexpected residential mobility. *Journal of Urban Economics*, 45, 72-96.
- Kessler, R. C., McGonagle, K. A., Zhao, S., Nelson, C. B., Hughes, M., Eshleman, S. et al. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. *Archives of General Psychiatry*, 51, 8-19.
- Lamont, A., Ukoumunne, O. C., Tyrer, P., Thornicroft, G., Patel, R., & Slaughter, J. (2000). The geographical mobility of severely mentally ill residents in London. *Social Psychiatry and Psychiatric Epidemiology*, 35, 164-169.
- Lapouse, R., Monk, M. A., & Terris, M. (1956). The drift hypothesis and socioeconomic differentials in schizophrenia. *American Journal of Public Health*, 46, 978-986.
- Larson, A., Bell, M., & Young, A. F. (2004). Clarifying the relationships between health and residential mobility. *Social Science and Medicine*, 59, 2149-2160.
- Lesage, A. D. & Tansella, M. (1989). Mobility of schizophrenic patients, non-psychotic patients and the general population in a case register area. *Social Psychiatry and Psychiatric Epidemiology*, 24, 271-274.
- Leventhal, T. & Brooks-Gunn, J. (2003). Moving to opportunity: an experimental study of neighborhood effects on mental health. *American Journal of Public Health*, 93, 1576-1582.
- Lichtermann, D., Ekelund, J., Pukkala, E., Tanskanen, A., & Lonnqvist, J. (2001). Incidence of cancer among persons with schizophrenia and their relatives. *Archives of General Psychiatry*, 58, 573-578.

- Lix, L. M., DeVerteuil, G., Walker, J., Robinson, J. R., Hinds, A., & Roos, L. L. (2006a). Residential mobility of individuals with severe mental illness: A comparison of frequent and infrequent movers. *Social Psychiatry and Psychiatric Epidemiology*.
- Lix, L. M., Hinds, A., DeVerteuil, G., Renee, R. J., Walker, J., & Roos, L. L. (2006b). Residential Mobility and Severe Mental Illness: A Population-based Analysis. *Administration and Policy in Mental Health*, 33, 160-171.
- Loffler, W. & Hafner, H. (1999). Ecological pattern of first admitted schizophrenics in two German cities over 25 years. *Social Science and Medicine*, 49, 93-108.
- London, A. S., Wilmoth, J. M., & Fleishman, J. A. (2004). Moving for care: findings from the US HIV Cost and Utilization Study. *AIDS Care*, 16, 858-875.
- Magdol, L. (2002). Is moving gendered? The effects of residential mobility on the psychological well-being of men and women. *Sex Roles*, 47, 553-560.
- Magdol, L. (2000). The people you know: The impact of residential mobility on mothers' social network ties. *Journal of Social and Personal Relationships*, 17, 183-204.
- Manitoba Centre for Health Policy (2003a). *Office of the public trustees and MCHP data*. Retrieved August 25, 2006, from Manitoba Centre for Health Policy Concept Dictionary: www.cpe.umanitoba.ca/concept/dict/public_trustees.html
- Manitoba Centre for Health Policy (2001). *Winnipeg Area Definitions*. Retrieved July 14, 2006, from Manitoba Centre for Health Policy Concept Dictionary: <http://www.umanitoba.ca/centres/mchp/concept/concept.frame.shtml>
- Manitoba Centre for Health Policy (2004). *Manitoba Regional Health Authorities - Districts*. Retrieved July 14, 2006, from Manitoba Centre for Health Policy Concept Dictionary: <https://www.cpe.umanitoba.ca/concept/concept.frame.shtml>

- Manitoba Centre for Health Policy (2003b). *Manitoba Regional Health Authorities*.
August 8, 2004, from Manitoba Centre for Health Policy Concept Dictionary:
<http://www.umanitoba.ca/centres/mchp/concept/concept.frame.shtml>
- Manitoba Health (2004). *Manitoba Health Population Report*. Retrieved August 12,
2005, from Manitoba Health Web site:
<http://www.gov.mb.ca/health/population/2004/pop2004.pdf>
- Manitoba Health (2002). *Mental Health Renewal: Vision, goals, and objectives*. Retrieved
October 23, 2003, from Manitoba Health Web site:
<http://www.gov.mb.ca/health/mb/renewal.html>
- Martens, P., Fransoo, R., McKeen, N., *The Need to Know Team*, Burland, E., Jebamani,
L. et al. (2004). *Patterns of regional mental illness disorder diagnoses and service
use in Manitoba: A population-based study*. Manitoba Centre for Health Policy.
- Martens, P., Fransoo, R., *The Need to Know Team*, Burland, E., Jebamani, L., Burchill,
C. et al. (2003). *The Manitoba RHA Indicators Atlas: Population-based
comparisons of health and health care use*. Manitoba Centre for Health Policy.
- Massey, D. S., Gross, A. B., & Shibuya, K. (1994). Migration, segregation, and the
geographic concentration of poverty. *American Sociological Review*, 59, 425-445.
- McLemore, R., Aass, C., & Keilhofer, P. (1975). *The changing Canadian inner-city*
Ottawa, ON.
- McNaught, A. S., Jeffreys, S. E., Harvey, C. A., Quayle, A. S., King, M. B., & Bird, A. S.
(1997). The Hampstead Schizophrenia Survey 1991. II: Incidence and migration
in inner London. *British Journal of Psychiatry*, 170, 307-311.

- Mezey, A. G. & Evans, E. (1970). Psychiatric admissions from North London related to demographic and ecological characteristics. *British Journal of Psychiatry*, *117*, 187-193.
- Milligan, C. (1996). Service dependent ghetto formation - a transferable concept? *Health and Place*, *2*, 199-211.
- Moorin, R. E., Holman, C. D., Garfield, C., & Brameld, K. J. (2006). Health related migration: evidence of reduced "urban-drift". *Health and Place*, *12*, 131-140.
- Mortensen, P. B. (1995). The untapped potential of case registers and record-linkage studies in psychiatric epidemiology. *Epidemiologic Reviews*, *17*, 205-209.
- Mustard, C. A., Derksen, S., & Tataryn, D. (1996). Intensive use of mental health care. *Canadian Journal of Psychiatry*, *41*, 93-101.
- Norman, P., Boyle, P., & Rees, P. (2005). Selective migration, health and deprivation: a longitudinal analysis. *Social Science and Medicine*, *60*, 2755-2771.
- O'Campo, P. (2003). Invited commentary: Advancing theory and methods for multilevel models of residential neighborhoods and health. *American Journal of Epidemiology*, *157*, 9-13.
- Pickett, K. E. & Pearl, M. (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *Journal of Epidemiology and Community Health*, *55*, 111-122.
- Pope, H. G., Jr., Ionescu-Pioggia, M., & Yurgelun-Todd, D. (1983). Migration and manic-depressive illness. *Comprehensive Psychiatry*, *24*, 158-165.
- Preti, A. & Miotto, P. (2000). Increase in first admissions for schizophrenia and other major psychoses in Italy. *Psychiatry Research*, *94*, 139-152.

- Rahav, M., Goodman, A. B., Popper, M., & Lin, S. P. (1986). Distribution of treated mental illness in the neighborhoods of Jerusalem. *American Journal of Psychiatry*, *143*, 1249-1254.
- Ram, B., Norris, M., & Skof, K. (1989). *The inner city in transition* Ottawa, ON: Minister of Supply and Services Canada.
- Raviv, A., Keinan, G., Abazon, Y., & Raviv, A. (1990). Moving as a stressful life event for adolescents. *Journal of Community Psychology*, *18*, 130-140.
- Rawson, N. S., Malcolm, E., & D'Arcy, C. (1997). Reliability of the recording of schizophrenia and depressive disorder in the Saskatchewan health care datafiles. *Social Psychiatry and Psychiatric Epidemiology*, *32*, 191-199.
- Reijneveld, S. A. & Schene, A. H. (1998). Higher prevalence of mental disorders in socioeconomically deprived urban areas in The Netherlands: community or personal disadvantage? *Journal of Epidemiology and Community Health*, *52*, 2-7.
- Reynolds, L. (2002). *A place of filth, poverty: Mentally ill find housing a handicap*. Retrieved October 23, 2003, from Co-operative Housing Federation of Canada Web site: http://www.chcf.ca/eng/docs/docs_046.htm
- Rhodes, A. E., Lin, E., & Mustard, C. A. (2002). Self-reported use of mental health services versus administrative records: should we care? *International Journal of Methods in Psychiatric Research*, *11*, 125-133.
- Ritsher, J. E., Warner, V., Johnson, J. G., & Dohrenwend, B. P. (2001). Inter-generational longitudinal study of social class and depression: a test of social causation and social selection models. *British Journal of Psychiatry Supplement*, *40*, s84-s90.

- Rodgers, B. & Mann, S. L. (1993). Re-thinking the analysis of intergenerational social mobility: a comment on John W. Fox's "Social class, mental illness, and social mobility". *Journal of Health and Social Behavior*, 34, 165-172.
- Rogerson, P. A. & Han, D. (2002). The effects of migration on the detection of geographic differences in disease risk. *Social Science and Medicine*, 55, 1817-1828.
- Roos, L. L., Magoon, J., Gupta, S., Chateau, D., & Veugelers, P. J. (2004). Socioeconomic determinants of mortality in two Canadian provinces: multilevel modelling and neighborhood context. *Social Science and Medicine*, 59, 1435-1447.
- Roos, L. L. & Nicol, J. P. (1999). A research registry: uses, development, and accuracy. *Journal of Clinical Epidemiology*, 52, 39-47.
- Ross, N. A., Tremblay, S. S., & Graham, K. (2004). Neighbourhood influences on health in Montreal, Canada. *Social Science and Medicine*, 59, 1485-1494.
- SAS Institute, I. (1999). *SAS/STAT user's guide, Version 8*. Cary, NC: SAS Institute, Inc.
- Shaw, G. M. & Malcoe, L. H. (1992). Residential mobility during pregnancy for mothers of infants with or without congenital cardiac anomalies: a reprint. *Archives in Environmental Health*, 47, 236-238.
- Shern, D. & Dilts, S. L. (1987). The concentration of severely disturbed CMI in a core urban area. *Administration in Mental Health*, 15, 18-28.
- Silver, E., Mulvey, E. P., & Swanson, J. W. (2002). Neighbourhood structural characteristics and mental disorder: Faris and Dunham revisited. *Social Science and Medicine*, 55, 1457-1470.

- Skelton, I. (2002). Residential mobility of aboriginal single mothers in Winnipeg: An exploratory study of chronic moving. *Journal of Housing and the Built Environment, 17*, 127-144.
- Snijders, T. & Bosker, R. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. London: Sage.
- Social Planning Council of Winnipeg (2001). *A community plan on homelessness and housing in Winnipeg* Social Planning Council of Winnipeg.
- South, S. J. & Crowder, K. D. (1998a). Avenues and barriers to residential mobility among single mothers. *Journal of Marriage and the Family, 60*, 866-877.
- South, S. J. & Crowder, K. D. (1998b). Leaving the 'Hood: Residential mobility between Black, White, and integrated neighbourhoods. *American Sociological Review, 63*, 17-26.
- South, S. J. & Crowder, K. D. (1997). Residential mobility between cities and suburbs: race, suburbanization, and back-to-the-city moves. *Demography, 34*, 525-538.
- Statistics Canada (2004). *Canadians on the move: Highlight tables, 2001 Census*. Retrieved August 1, 2006, from Statistics Canada Web site:
<http://www12.statcan.ca/english/census01/products/highlight/mobility/>
- Statistics Canada (2003). *Reference maps*. Retrieved July 12, 2006, from Statistics Canada Web site:
http://geodepot.statcan.ca/Diss/Maps/ReferenceMaps/small_e.cfm
- Stuart, H. (2000). Access to physician treatment for a mental disorder: a regional analysis. *Social Psychiatry and Psychiatric Epidemiology, 35*, 61-70.

- Sundquist, K. & Ahlen, H. (2006). Neighbourhood income and mental health: A multilevel follow-up study of psychiatric hospital admissions among 4.5 million women and men. *Health and Place, 12*, 594-602.
- Sundquist, K. & Frank, G. (2004). Urbanization and hospital admission rates for alcohol and drug abuse: a follow-up study of 4.5 million women and men in Sweden. *Addiction, 99*, 1298-1305.
- Thornicroft, G. (1991). Social deprivation and rates of treated mental disorder. Developing statistical models to predict psychiatric service utilisation. *British Journal of Psychiatry, 158*, 475-484.
- Timms, D. (1998). Gender, social mobility and psychiatric diagnoses. *Social Science and Medicine, 46*, 1235-1247.
- Trainor, J. N., Morrell-Bellai, T. L., Ballantyne, R., & Boydell, K. M. (1993). Housing for people with mental illnesses: a comparison of models and an examination of the growth of alternative housing in Canada. *Canadian Journal of Psychiatry, 38*, 494-501.
- Turner, R. J. & Wagenfeld, M. O. (1967). Occupational mobility and schizophrenia: an assessment of the social causation and social selection hypotheses. *American Sociological Review, 32*, 104-113.
- van Lenthe, F. J., Martikainen, P., & Mackenbach, J. P. (2005). Neighbourhood inequalities in health and health-related behaviour: Results of selective migration? *Health and Place.*
- Verheij, R. A., van de Mheen, H. D., de Bakker, D. H., Groenewegen, P. P., & Mackenbach, J. P. (1998). Urban-rural variations in health in The Netherlands:

- does selective migration play a part? *Journal of Epidemiology and Community Health*, 52, 487-493.
- Veugelers, P. J., Yip, A. M., & Kephart, G. (2001). Proximate and contextual socioeconomic determinants of mortality: multilevel approaches in a setting with universal health care coverage. *American Journal of Epidemiology*, 154, 725-732.
- Wainwright, N. W. & Surtees, P. G. (2004). Area and individual circumstances and mood disorder prevalence. *British Journal of Psychiatry*, 185, 227-232.
- Warfa, N., Bhui, K., Craig, T., Curtis, S., Mohamud, S., Stansfeld, S. et al. (2005). Post-migration geographical mobility, mental health and health service utilisation among Somali refugees in the UK: A qualitative study. *Health and Place*.
- Watson, D. E., Heppner, P., Roos, N. P., Reid, R. J., & Katz, A. (2005). Population-based use of mental health services and patterns of delivery among family physicians, 1992 to 2001. *Canadian Journal of Psychiatry*, 50, 398-406.
- Weich, S., Holt, G., Twigg, L., Jones, K., & Lewis, G. (2003a). Geographic variation in the prevalence of common mental disorders in Britain: A multi-level investigation. *American Journal of Epidemiology*, 157, 730-737.
- Weich, S., Twigg, L., Holt, G., Lewis, G., & Jones, K. (2003b). Contextual risk factors for the common mental disorders in Britain: a multilevel investigation of the effects of place. *Journal of Epidemiology and Community Health*, 57, 616-621.
- Weich, S., Twigg, L., Lewis, G., & Jones, K. (2005). Geographical variation in rates of common mental disorders in Britain: prospective cohort study. *British Journal of Psychiatry*, 187, 29-34.
- Winnipeg Regional Health Authority (2002). *Evaluation report on adult mental health residential care in Winnipeg*. Winnipeg: Winnipeg Regional Health Authority.

- Wood, E., Yip, B., Gataric, N., Montaner, J. S., O'Shaughnessy, M. V., Schechter, M. T. et al. (2000). Determinants of geographic mobility among participants in a population-based HIV/AIDS drug treatment program. *Health and Place*, 6, 33-40.
- Youssef, H. A., Scully, P. J., Kinsella, A., & Waddington, J. L. (1999). Geographical variation in rate of schizophrenia in rural Ireland by place at birth vs place at onset. *Schizophrenia Research*, 37, 233-243.

Appendix A: Other Definitions of Residential Mobility

The residential mobility of the cohort was also examined according to the following definitions of mobility (no inferential analyses were performed on these mobility definitions):

- Municipality move – defined as a change in postal code in the Observation Period corresponding to a move to a different municipality. The WRHA was treated as a single municipality.
- RHA district moves – defined as a change in postal code in the Observation Period corresponding to a move to a different RHA district. The WRHA was treated as a single RHA district.
- RHA moves – defined as a change in postal code in the Observation Period corresponding to a move to a different RHA.
- Region move - a change in postal code in the Observation Period corresponding to a move between the WRHA and rural RHAs.
- Single region move – one change in region of residence during the Observation Period, either from the WRHA to a rural RHA or from a rural RHA to the WRHA, identifying single region movers. Single region movers are a subset of region movers (the other region movers are multiple region movers (see below)). The following definitions are different ways of describing single region moves.
 - Rural RHA to WRHA move – a change in postal code in the Observation Period corresponding to a move from a rural RHA (non-Winnipeg) to the WRHA.

- Rural RHA to inner core move – a change in postal code in the Observation Period corresponding to a move from a rural RHA (non-Winnipeg) at baseline to the inner core of the WRHA at end point.
- Rural RHA to outer core move – a change in postal code in the Observation Period corresponding to a move from a rural RHA (non-Winnipeg) at baseline to the outer core of the WRHA at end point.
- Rural RHA to suburb move – a change in postal code in the Observation Period corresponding to a move from a rural RHA (non-Winnipeg) at baseline to the suburbs of the WRHA at end point.
- WRHA to rural RHA move – a change in postal code in the Observation Period corresponding to a move from the WRHA to a rural RHA
- Inner core to rural RHA move – a change in postal code in the Observation Period corresponding to a move from the Winnipeg inner core to a rural RHA.
- Outer core to rural RHA move – a change in postal code in the Observation Period corresponding to a move from the Winnipeg outer core to a rural RHA.
- Suburb to rural RHA move – a change in postal code in the Observation Period corresponding to a move from the Winnipeg suburbs to a rural RHA.
- Multiple region moves – two or more changes in region of residence (WRHA and rural RHAs) during the Observation Period, identifying multiple region movers. Multiple region movers return to their initial region of residence at least once.

Multiple region movers are a subset of region movers (the other region movers are single region movers).

The following are other definitions of intra-urban residential mobility:

- CCA move – a change in postal code in the Observation Period corresponding to a move among the 75 Winnipeg CCAs.
- Area move – a change in postal code in the Observation Period corresponding to a move among the Winnipeg intra-urban areas (i.e., inner core, outer core, and suburbs). Single area movers and multiple area movers are subsets of area movers.
 - Single area move - one change in intra-urban area of residence during the Observation Period.
 - Multiple area moves – two or more changes in intra-urban area of residence in the Observation Period.

Results for Other Definitions of Residential Mobility

Overall, 20.2% of the cohort moved to a different municipality during the Observation Period (see Table 44); this ranged between 18.5% of the anxiety disorders group to 24.5% of the personality disorders group. Overall, 8.8% of the cohort moved to a different RHA district during the Observation Period (the WRHA was considered one RHA district). The substance abuse disorders group was the most residentially mobile (11.6% moved to a different RHA district), and the schizophrenia group was the least residentially mobile (only 6.0% moved to a different RHA district). Overall, 7.4 % of the cohort moved to a different RHA during the Observation Period. Again, the substance abuse disorders group was the most residentially mobile (9.4% moved to a different RHA) and the schizophrenia group was the least residentially mobile (5.2%).

Table 44. Residential Mobility by Diagnostic Group for the Study Cohort

Variable	Schizophrenia (N = 1,271)		Personality (N = 275)		Substance Abuse (N = 13,285)		Anxiety (N = 36,322)		Co-Occurring (N = 39,366)	
	N	%	N	%	N	%	N	%	N	%
	RHA Move	66	5.2	23	8.4	1,245	9.4	3,762	6.3	3,297
RHA District Move	76	6.0	24	8.7	1,545	11.6	4,486	7.5	3,886	9.9
Municipality Move	243	19.1	70	25.5	2,483	18.7	11,083	18.5	9,144	23.2

Region Residential Mobility

There were 9,165 individuals who changed their region of residence (i.e., moved between the rural RHAs and the WRHA) during the six-year study period, and 6,419 of these individuals changed their region of residence during the four-year Observation Period (or 5.6% of the entire cohort). Individuals who changed regions during the Observation Period are referred to from here on in as region movers. The personality disorders group had the largest percentage of region movers (7.6%) and the schizophrenia had the smallest percentage of region movers (4.2%) (see Table 45).

Among the region movers, there were 3,157 individuals who resided in a rural RHA at baseline and 3,262 individuals resided in the WRHA at baseline. The majority of the region movers (87.2%) changed their region of residence only once during the Observation Period; specifically, 2,705 individuals moved from a rural RHA into the WRHA and 2,660 individuals moved from the WRHA into a rural RHA. These individuals were classified as single region movers. The personality disorders group had the highest percentage of rural RHA to WRHA single region movers (3.3%) and WRHA to rural RHA single region movers (2.9%). The schizophrenia group had the smallest percentage of rural RHA to WRHA single region movers (2.0%) and WRHA to rural RHA single region movers (1.8%) (see Table 45).

The rural RHA to WRHA single region movers were more likely to reside in the suburbs (54.4%) than the inner core (41.3%) or the outer core (4.3%) by the end of the Observation Period. There were up to as many as seven changes postal code among the rural RHA to WRHA single region movers, thus it was possible that these individuals did move directly to one of three intra-urban areas that they were residing in by the end of the Observation Period.

The WRHA to rural RHA single region movers were more likely to be residing in the suburbs (57.82%) than the inner core (38.05%) or the outer core (4.14%) at baseline. There was a maximum of eight postal codes changes among the WRHA to rural RHA single region movers, thus it was possible they changed areas within the WRHA before moving out of the WRHA.

Residential mobility from rural RHAs to the three intra-urban areas of the WRHA and from the three intra-urban areas of the WRHA to rural RHAs was examined by diagnosis for the single region movers. Because of small numbers for some of the diagnostic groups, individuals with a single diagnosis were combined with individuals who had co-occurring mental disorder diagnoses. For example, individuals with a single diagnosis of schizophrenia (schizophrenia group) were combined with individuals who had a diagnosis of schizophrenia plus another mental disorder diagnosis (originally part of the co-occurring disorders group). Because individuals in the original co-occurring disorders group had at least two different mental disorder diagnoses (at least one diagnosis of schizophrenia, anxiety, substance abuse, and personality disorders; the second mental disorders diagnosis was one of these four mental disorders or some other mental disorder diagnosis), the four groups were not mutually exclusive.

Rural RHA to WRHA single region movers with a diagnosis of schizophrenia ($N = 90$), personality disorders ($N = 92$), and substance abuse disorders ($N = 727$) were more likely to move to the inner core (schizophrenia 77.8%; personality disorders 56.5%; substance abuse disorders 53.8%) than to the suburbs (schizophrenia 17.8%; personality disorders 32.6%; substance abuse disorders 43.2%). Individuals with a diagnosis of an anxiety disorder ($N = 2,101$) exhibited the opposite pattern; they were more likely to move to the suburbs (58.2%) than to the inner core (37.3%).

A similar pattern was observed among the WRHA to rural RHA single region movers. WRHA to rural RHA single region movers with a diagnosis of schizophrenia ($N = 64$), personality disorders ($N = 76$), and substance abuse disorders ($N = 657$) were more likely to reside in the inner core at baseline (schizophrenia 60.9%; personality disorders 51.3%; substance abuse disorders 55.86%) than the suburbs (schizophrenia 35.9%; personality disorders 42.1%; substance abuse disorders 41.9%). On the other hand, individuals with a diagnosis of an anxiety disorder ($N = 2,125$) were more likely to reside in the suburbs (60.9%) than the inner core (34.5%) at baseline.

There were 1,054 individuals who were classified as multiple region movers - sometime during the Observation Period they returned to their baseline region of residence. Specifically, 42.9% of the multiple region movers resided in a rural RHA at baseline and 57.1% of the multiple region movers resided in the WRHA at baseline. The majority of the multiple region movers (87.4%) resided in the same region of residence at the beginning and end of the Observation Period. There were as many as five changes in region of residence during the Observation Period. The majority of the multiple region movers (84.5%) moved twice.

Table 45. Region Residential Mobility by Diagnostic Group for the Study Cohort

Variable	Substance									
	Schizophrenia (N = 1,271)		Personality (N = 275)		Abuse (N = 13,285)		Anxiety (N = 36,322)		Co-Occurring (N = 39,366)	
	N	%	N	%	N	%	N	%	N	%
Region Move	53	4.2	21	7.6	910	6.9	2,839	4.7	2,596	6.6
Rural RHAs to WRHA	26	2.1	9	3.3	396	3.0	1,198	2.0	1,140	2.9
WRHA to Rural RHAs	23	1.8	8	2.9	367	2.8	1,303	2.2	1,028	2.6

Urban Residential Mobility

Other definitions of urban residential mobility were examined - specifically moves across the 75 CCAs and the three urban areas (inner core, outer core, suburbs) - and are presented in Table 46. As mentioned in the Results section, 32.8% of the WRHA cohort moved during the Observation Period. Overall, 28.2% of individuals moved to a different CCA during the Observation Period, ranging from 24.7% of individuals in the anxiety disorders group to 38.1% of individuals in the personality disorders group. Overall, 12.6% of individuals moved to a different area during the Observation Period, and 20.2% moved within their area of residence. The movers were more likely to move within their area than move to a different area; specifically, among the movers, 39.5% of the co-occurring disorders, 38.0% of the personality disorders, 37.7% of the anxiety disorders, 36.6% of the substance abuse disorders, and 33.4% of the schizophrenia groups moved to a different area.

Table 46. Urban Residential Mobility by Diagnostic Group, Winnipeg Regional Health Authority Cohort

Variable	Schizophrenia (<i>N</i> = 861)		Personality (<i>N</i> = 189)		Substance Abuse (<i>N</i> = 6,045)		Anxiety (<i>N</i> = 36,322)		Co-Occurring (<i>N</i> = 23,913)	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
CCA Move	265	30.8	72	38.1	1,813	30.0	8,965	24.7	7,901	33.0
Area Move	99	11.5	30	15.9	764	12.6	3,983	11.0	3,584	15.0

Among the 8,460 individuals who moved to a different area during the Observation Period, 82.0% changed areas only once. The maximum number of area changes was five.

WRHA area movers were classified as single area movers and multiple area movers. Single area movers had only one change in area of residence during the Observation Period (the baseline (June 2000) and study end date (June 2004) areas of residence were different). Multiple area movers had more than one change in area of residence during the Observation Period.

There were 6,940 individuals classified as single area movers. Of the 2,957 individuals who lived in the inner core at baseline and were single area movers, 88.1% moved to the suburbs and 12.0% moved to the outer core. There were 844 individuals who lived in the outer core at baseline and were single area movers. They were more likely to move to the suburbs (60.7%) than to the inner core (39.3%) by the end of the Observation Period. There were 3,139 individual who resided in the suburbs at baseline and were single area movers. They were more likely to move to the inner core (83.0%) than to the outer core (17.0%) during the Observation Period.

There were 1,520 individuals who were multiple area movers. Of the 651 individuals who lived in the inner core at baseline and were multiple area movers, 83.6% resided in the inner core, 5.7% resided in the outer core, and 10.8% resided in the suburbs by the end of the Observation Period. There were 145 individuals who resided in the outer core at baseline and were multiple area movers. By the end of the Observation Period, these individuals were almost equally likely to return to the outer core (31.0%) as to reside in the inner core (31.7%) or the suburbs (37.2%). There were 724 individuals who resided in the suburbs at baseline and were multiple area movers. They were more likely to reside in the suburbs (79.7%) than the inner core (15.5%) or the outer core (4.8%) by the end of the Observation Period.

Residential Mobility among the Inner Core Residents

Residential mobility was examined among the inner core dwellers and the results are presented in Table 47. Many of the inner core dwellers moved during the Observation Period (42.6%). Overall, the inner core dwellers were more likely to move within the inner core (25.4%) than move out of the inner core (17.3%) (i.e., had an area move) during the Observation Period. The personality disorders group was most likely to move out of the inner core (18.8%), while the schizophrenia group was least likely to move out of the inner core (8.9%). The majority of individuals who had an area move resided in the suburbs at June 2004 (end point) (74.1%); the remaining individuals either moved back to the inner core or moved to the outer core. All of the groups were more likely to move within the inner core than move out of it (or move to the suburbs). However, the anxiety disorders group was almost equally likely to move out of the inner core (17.3%) as move within the inner core (19.7%).

Table 47. Residential Mobility of Inner Core Residents, Winnipeg Regional Health

Authority Cohort

Variable	Substance									
	Schizophrenia (N = 473)		Personality (N = 69)		Abuse (N = 2,143)		Anxiety (N = 9,835)		Co-Occurring (N = 8,381)	
	N	%	N	%	N	%	N	%	N	%
Any Move	189	40.0	34	49.3	989	46.2	3,634	37.0	4,061	48.5
Area Move	42	8.9	13	18.8	343	16.0	1,700	17.3	1,510	18.0
Moved to the Suburbs	29	6.1	9	13.0	261	12.2	1,312	13.3	1,063	12.7
Moved within the Inner Core	147	31.1	21	30.4	646	30.1	1,934	19.7	2,551	30.4

Residential Mobility among the Suburb Residents

Residential mobility was examined among the suburb dwellers and the results are presented in Table 48. Slightly more than one-quarter of the suburb dwellers moved during the Observation Period (28.3%). Only 9.2% of the suburb dwellers moved out of the suburbs (i.e., had an area move), while 19.1% moved within the suburbs during the Observation Period. The schizophrenia group was most likely to move out of the suburbs (14.8%), while the anxiety disorders group was least likely to move out of the suburbs (7.5%). Interestingly, the schizophrenia group was least likely to move out of the inner core, but most likely to move out of the suburbs. The majority of individuals who had an area move resided in the inner core at June 2004 (end point) (70.3%); the remaining individuals either moved back to the suburbs or moved to the outer core. All of the groups were more likely to move within the suburbs than move out of it (or move to the inner core). However, the schizophrenia group was equally likely to move out of the suburbs (14.8%) as move within the suburbs (14.8%).

Table 48. Residential Mobility of Suburb Residents, Winnipeg Regional Health Authority Cohort

Variable	Substance									
	Schizophrenia (N = 325)		Personality (N = 96)		Abuse (N = 3,543)		Anxiety (N = 24,136)		Co-Occurring (N = 13,931)	
	N	%	N	%	N	%	N	%	N	%
Any Move	96	29.5	37	38.5	990	27.9	6,288	26.1	4,464	32.0
Area Move	48	14.8	10	10.4	333	9.4	1,812	7.5	1,660	11.9
Moved to the Inner Core	36	11.1	8	8.3	251	7.1	1,204	5.0	1,217	8.7
Moved within the Suburbs	48	14.8	27	28.1	657	18.5	4,476	18.5	2,804	20.1

Rural RHA Residential Mobility

Other definitions of residential mobility were examined among the rural RHA cohort and the results are presented in Table 49. These definitions correspond to moves of varying distances; across RHAs, RHA districts, and municipalities. RHAs are the largest geographic areas and municipalities are the smallest.

During the four-year Observation Period, 5.0% of the rural RHA cohort moved to a different RHA, 9.2% moved to a different RHA district, and 10.4% moved to a different municipality. The co-occurring disorders group was the most likely to move and the personality disorders group was the least likely to move. The rank order of the most mobile to the least mobile groups was not the same for these three measures of residential mobility. For moves across RHA districts and RHAs, the substance abuse disorders group (second most mobile) was more mobile than the anxiety disorders group (third most mobile), however, for moves across municipalities, the anxiety disorders group was more likely to move than the substance abuse disorders group.

Table 49. Rural Residential Mobility, Rural Regional Health Authority Cohort

Variable	Schizophrenia (<i>N</i> = 335)		Substance Abuse (<i>N</i> = 6,012)		Anxiety (<i>N</i> = 19,427)		Co-Occurring (<i>N</i> = 11,756)	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
RHA Move	13	3.9	325	5.4	893	4.6	659	5.6
RHA District Move	23	6.9	615	10.2	1,597	8.2	1,221	10.4
Municipality Move	30	9.0	576	9.6	1,936	10.0	1,381	11.8

Appendix B: Spearman-Brown Correlation Coefficients for Community Characteristics

Table 50. Spearman-Brown Correlation Coefficients for Community Characteristics, Winnipeg Community Centre Areas

Category	Variable	1	2	3	4	5	6	7	8	9	10	11
Demographic	1. Divorced	-	0.83	0.42	-0.87	0.78	-0.82	0.38	0.44	0.77	0.69	0.64
	2. Separated		-	0.36	-0.84	0.68	-0.84	0.47	0.59	0.82	0.64	0.63
	3. Widowed			-	-0.38	0.72	-0.51	-0.06	0.34	0.31	0.26	0.25
	4. Married				-	-0.73	0.92	-0.62	-0.52	-0.87	-0.83	-0.76
Social Isolation	5. Live Alone					-	-0.72	0.15	0.19	0.53	0.63	0.66
Socioeconomic	6. Median Household Income						-	-0.55	-0.67	-0.89	-0.72	-0.66
	7. Unemployed							-	0.47	0.65	0.52	0.43
	8. Less than Grade 9 Education								-	0.67	0.25	0.14
Social Disorganization	9. Single Parent									-	0.73	0.62
	10. One Year Mobility										-	0.89
	11. Five Year Mobility											-

Table 51. Spearman-Brown Correlation Coefficients for Community Characteristics, Rural Regional Health Authority Districts

Category	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Demographic	1. Divorced	-	0.49	0.11	-0.16	0.42	0.39	0.01	-0.64	0.08	0.27	0.23	0.06	0.20	0.33
	2. Separated		-	-0.30	-0.66	-0.15	-0.04	0.62	-0.08	0.70	0.43	0.46	0.07	0.14	0.34
	3. Widowed			-	0.19	0.83	-0.38	-0.40	0.05	-0.31	-0.37	-0.46	0.25	0.25	-0.01
	4. Married				-	0.17	0.39	-0.81	-0.29	-0.93	-0.50	-0.37	-0.27	0.09	-0.23
Social Isolation	5. Live Alone					-	-0.06	-0.41	-0.27	-0.32	-0.16	-0.28	0.33	0.37	0.17
Socioeconomic	6. Median Household Income						-	-0.32	-0.74	-0.40	0.18	0.29	-0.10	-0.10	0.12
	7. Unemployed							-	0.29	0.88	0.42	0.44	0.17	-0.24	0.15
	8. Less than Grade 9 Education								-	0.30	-0.11	-0.17	-0.07	-0.07	-0.25
Social Disorganization	9. Single Parent									-	0.49	0.46	0.20	-0.08	0.22
	10. One Year Mobility										-	0.81	0.23	0.17	0.38
	11. Five Year Mobility											-	0.15	0.15	0.40
Health Care Infrastructure	12. General Practitioner Rate												-	0.20	0.27
	13. Other Specialists Rate													-	0.54
	14. Psychiatrist Rate														-