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Table of Contents

Abstract

This study uses longitudinal tax data to explore several undocumented aspects regarding the duration of residential spells in low-income neighbourhoods. Although the length of new spells is generally substantial (at least compared to low-income spells), there is quite a lot of variation in this regard. Low-income neighbourhood spells exhibit negative duration dependence, implying that people are less likely to exit low-income neighbourhoods the longer they have resided in them. Spell length varies substantially by age and city of residence, and to a lesser extent, by family income and family type. Specifically, older individuals remain in low-income neighbourhoods for longer periods of time than younger individuals, as do residents of Toronto and Vancouver (in relation to Montreal). Individuals in low-income families have longer spell lengths than those in higher income families, and among these low-income families, lone-parents and couples with children generally spend more time in low-income neighbourhoods than childless couples and unattached individuals.

Keywords: neighbourhood effects, low-income, poverty, duration

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1. *Introduction*

Many studies have highlighted the rising level of neighbourhood income segregation in large North American cities. In the U.S., the emergence of low-income neighbourhoods and rising neighbourhood income inequality over the last couple of decades is very well documented in Wilson (1987), Massey and Denton (1988 and 1993), Massey and Eggers (1990), Jargowsky (1997), and many others. In Canada, MacLachlan and Sawada (1997) and Myles, Picot, and Pyper (2000) document the rising level of neighbourhood income inequality over the last two decades, while Hatfield (1997) and Lee (2000) find a rising incidence of low-income neighbourhoods in Canada.

As a result of the rising level of spatial income disparity in major cities, a substantial body of research has investigated the link between neighbourhood quality and individual outcomes. Four theories have been put forth to explain why neighbourhood quality might matter[1]. The first is peer group, or role model effects, whereby individuals base decisions on the behaviour of other members of the neighbourhood. The second is social network effects. This stipulates that the neighbourhood may act as a network in assisting residents in finding good jobs, or acquiring other forms of financial or psychological support. The third theory suggests that the quality of local resources may affect the residents of the neighbourhood. Examples include schools, libraries, and law enforcement. The fourth theory is conformism, whereby residents emulate the behaviour of others nearby. This is similar to peer and role model effects, but a key element here is that the mimicking is caused by a lack of information by the residents, so that their choice set is limited to the actions of others.

A challenge facing the neighbourhood effects literature is the possibility that selection into neighbourhoods is not entirely random. A low-income family settling into a middle-income neighbourhood may be very different than a low-income family settling into a low-income neighbourhood, even after accounting for differences in observable characteristics. To address this issue, recent studies have used data from social housing projects, whereby families are randomly selected to move to higher or lower income neighbourhoods. In the U.S., studies that followed two such experiments (the Gautreaux program[2] and the Moving to Opportunity program[3]) provide some evidence suggesting that labour market, health, and crime exposure outcomes were better for families who were selected to reside in higher income neighbourhoods, although it is generally believed that families play a larger role than the neighbourhood in child outcomes[4].

Some recent Canadian evidence suggests that the *long-term* impact of neighbourhood quality on children is very small. Using data from a quasi-random experiment in a Toronto social housing program, Oreopoulous (2002) found that children in families more or less randomly assigned to lower income neighbourhoods had about the same level of labour market success, educational attainment, and welfare participation in the future as children in families assigned to higher income neighbourhoods.

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1 The following information is taken from Oreopoulos (2002), which provides a comprehensive list of references in the literature.

2 Popkin et al. (1993), Rosenbaum (1995), and Rosenbaum et al. (1999).

3 Katz et al. (2001) and Ludwig et al. (2001).

4 Brooks-Gunn, et al., (1997).

Although the evidence on neighbourhood effects generally leans towards the negative, the Oreopoulous study does shift the balance of evidence somewhat more towards the neutral. And even the studies findings negative effects must be placed into context: these effects are generally smaller than family effects. One possible reason why neighbourhood effects are generally not very large is perhaps that many people do not tend to be exposed to them for a very long time. On the other hand, those who *do* spend a lot of time in low-income neighbourhoods may be more prone to experience negative outcomes.

The current study exploits longitudinal tax data to investigate several aspects of duration in low-income neighbourhoods. First and foremost is the measurement of the length of spells in low-income neighbourhoods. Due largely to a lack of appropriate data, little is known about this topic. In fact, no study to our knowledge explicitly measures the duration of time spent in low-income neighbourhoods in Canada. Moreover, only a few American studies look at transitions in and out of low-income neighbourhoods. Massey, Gross, and Shibuya (1994) examined the formation of "very poor black neighbourhoods"[5] by calculating yearly entry and exit rates into and out of these neighbourhoods by various socio-economic characteristics. Between 1979 and 1984 (the most recent point in their study), the authors found high exit rates out of very poor black neighbourhoods (upwards of 20%)[6]. Other U.S. studies that look at transition probabilities include Gramlich, Laren, and Sealand (1992) and South and Crowder (1997). Only Quillian (2000) directly measures duration in low-income neighbourhoods, and finds that 6% to 7% of black Americans were in high-poverty neighbourhoods for 10 consecutive years.

In a similar vein, recent studies have investigated the level of persistence in the low-income state. Although some may consider the rate of low-income to be high, it is now known that many low-income individuals in a given year leave that state in the near future. These transient low-income people may include students, recently displaced workers, or welfare recipients about to make the transition out of the system[7]. Laroche (1997), Morissette and Zhang (2001), and Finnie and Sweetman (2003) all find that roughly one-half of new spells end within two years[8].

Does the same result hold for the state of living in a low-income neighbourhood? Possibly not, as the costs of moving one's family might be quite high. Such costs may be broken down into economic (e.g. transportation costs, higher rents in other neighbourhoods, rent controls that are person-apartment specific, etc.) and psychosocial (e.g. the cost of leaving friends or family behind,

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5 Aside from the racial component, this concept is closely related to our concept of low-income neighbourhoods. See the data section for more details.

6 This is a very rough aggregation of the detailed racial breakdown used in the study. Specifically, 22% of poor blacks living in very poor black neighbourhoods exited within one year. Poor whites living in very poor black neighbourhoods had a 35% probability of exiting. Poor blacks and whites living in very poor black neighbourhoods were actually more likely to exit than non-poor blacks and whites (9% and 18%, respectively).

7 Frenette and Picot (2003) found that 91% of full-year welfare users in a given year (and about to leave the system) during the 1990s were in low-income families. Shortly after leaving welfare, only 58% were in low-income families.

8 Laroche (1997) and Finnie and Sweetman (2003) use tax data, while Morissette and Zhang (2001) use survey data; furthermore, Laroche includes the 1980s into her analysis, while the other studies focus exclusively on the 1990s.

the impact of transferring kids from one school to another, etc.). On the other hand, individuals in low-income neighbourhoods may have some level of discretion in choosing where to live (i.e. if the environment is so bad, they may absorb the costs and move). Individuals in the state of low-income generally have to land a good job or marry someone with a good job in order to escape low-income. Furthermore, the income status of any particular neighbourhood is not necessarily fixed. Improving economic conditions can help certain neighbourhoods escape the low-income state, as can economic and social development in nearby areas, or the flow of families with different income levels in and out of the neighbourhood over time. Thus, it is not clear *a priori* whether families tend to stay in low-income neighbourhoods for short or lengthy periods of time. The current study will directly compare the length of spells in low-income neighbourhoods to those in the state of low-income.

An important question often posed in studies of duration is, "Do people become less likely to exit the state the longer they remain in the state?" In other words, is there negative duration dependence? Negative duration dependence is usually detected in spells of social assistance, low-income, and unemployment. One possible reason behind this finding is labour market signalling: longer periods without verifiable work experience may send negative signals to potential employers vis-à-vis the productivity of the job candidate, which might be real (i.e. indicative of true skill atrophy) or unfounded (i.e. based on speculation or stigmas). If unemployment is a barrier to exiting low-income neighbourhoods, then one would expect to find negative duration. One might also expect to find negative duration dependence for spells in low-income neighbourhoods since people may build strong ties or "social networks" with the neighbourhood over time. The parents or kids may be strongly attached to relatives or friends. The kids may be negatively affected by changing schools if the family were to move. This study will test for duration dependence by accounting for observed and unobserved heterogeneity.

This paper also investigates how the length of spells in low-income neighbourhoods differs by socio-economic characteristics. These include family income, family type, age, and city of residence. Identifying *who* generally spends more time in low-income neighbourhoods can help us understand the barriers to exit faced by the residents of these neighbourhoods. In addition, this knowledge may provide important information to policy-makers involved in urban planning. Relocation incentives may be better targeted if one knew the characteristics of people who spend more time in low-income neighbourhoods.

Although the main focus of the current study is to describe how long individuals typically stay in low-income neighbourhoods, a second part of analysis consists of examining the roles of geographic mobility and changing neighbourhood status in helping people escape low-income neighbourhoods. Are the costs of moving to higher income neighbourhoods (with perhaps higher rental costs) an obstacle in helping individuals escape low-income neighbourhoods? Do improving economic conditions and/or large flows of residents (at the aggregate level) tend to help people exit low-income neighbourhoods? The answers to these questions may shed more light on understanding how individuals stay in or exit low-income neighbourhoods. One drawback of the transition and duration U.S. studies listed above is that neighbourhood income status is garnered from decennial census data. In essence, neighbourhood income status is fixed for a period of 10 years in these studies. Ideally, one would need a large annual database in order to classify neighbourhoods by income status on a more current basis. The present study addresses this issue by using annual tax data.

In previous work, researchers have investigated different mechanisms that may explain how low-income neighbourhoods are created (see Massey et al. [1994]). Despite the fact that one can draw parallels between this literature and the second part of our study, it is important to note the main difference. Specifically, we take the destruction of low-income neighbourhoods as given, and investigate its role in getting individuals out of the low-income neighbourhood state. Underlying this change in neighbourhood status might be the geographic mobility of residents (both in and out), changing incomes of residents who remain in the neighbourhood, or both.

Overall, the median length of new spells is 3.8 years. There is a high level of variation in spell length, however, as about one-third of spells are ongoing six years after observing entry, and almost as many have ended within two years following the observed entry. In comparison, the median spell length in the state of low-income is 1.9 years (one-half the median spell length in low-income neighbourhoods), and only 14% of spells are ongoing six years after observing entry. Low income spells and low-income neighbourhood spells are similar in that they both exhibit negative duration dependence, or declining exit rates over time spent in the state. The length of spells in low-income neighbourhoods varies widely by age and city of residence, and to a lesser extent, by family income and family type. For example, individuals greater than 54 years old have median spell lengths of almost six years (almost twice as high as individuals between 25 and 34 years old); furthermore the spells are generally much shorter in Montreal (median = 2.3 years) than in Toronto (median = 5.7 years) and Vancouver (median = 4.5 years). The median spell length of people in low-income families is almost one full year greater than individuals with family income more than 50% above the low-income threshold (4.3 and 3.4 years, respectively). Among low-income individuals, lone-parents and couples with children have longer spells than unattached individuals and couples without children (roughly five and four years, respectively).

The rest of the paper is structured as follows. The next section describes the methodology used in the study, including definitions and econometric modelling techniques. The following section describes the data in detail, geographic coding techniques used in the study, and the sample selection criteria. The results are then presented and discussed. And finally, a summary of the study, its importance, and how it could be complimented by future research are all discussed in the conclusion.

2. Methodology

Our objective is to study duration in low-income neighbourhoods. To do so, we need several things: a concept of the "neighbourhood", a rule to classify certain neighbourhoods as "low-income", an appropriate unit of analysis that can be followed over time, appropriate techniques for analysing duration in low-income neighbourhoods, and a set of rules to define transitions in and out of low-income neighbourhoods. Each is described below.

The Neighbourhood

Our concept of the neighbourhood is the census tract, which is created with "neighbourhood-like" characteristics in mind. These characteristics include: easily recognizable physical boundaries, a compact shape, and a homogeneous population in terms of socio-economic characteristics (i.e. similar income and living conditions). Census tract populations generally range from 2,500 to 8,000,

with an average of about 4,000. Certain types of census tracts, such as business districts or peripheral areas, may have populations below 2,500.[9]

Low-Income Neighbourhoods

The vast majority of Canadian and American low-income neighbourhood studies use census data. As census data do not contain taxes paid, it is total family income (as opposed to after-tax family income) that is used to classify neighbourhoods. To maintain the same concept of a low-income neighbourhood as in previous studies, we also use total family income[10]. We also follow standard practice in the literature by defining low-income neighbourhoods as those in which 40% or more of its residents live in low-income families[11].

There are two ways of classifying families as low-income. The Low-Income Cut-Off (LICO) classifies families as low-income if their income is below a certain threshold, which is defined relative to the average proportion of income spent on basic necessities. Different thresholds exist for different family and community sizes. Although adjusting for different community sizes partially accounts for the higher cost of living in more populated areas, the breakdown in the standard tables is not detailed enough to distinguish among the very large CMAs, such as Toronto, Montreal, and Vancouver[12]. An alternative approach is to use the Low-Income Measure (LIM). The LIM threshold is equal to one half of the median adult-equivalent income of a given population. The adult-equivalent adjustment consists of dividing family income by the square root of the family size, which yields a per capita measure of family income, and accounts for economies of scale associated with larger families (i.e. sharing economic goods)[13]. By calculating the LIM for each CMA, individuals are classified as low-income relative to the median family income of the CMA. By assuming that the economic well being of a person with income equal to each CMA's LIM

[9] More information on census tracts is available at http://www.statcan.ca:8083/english/freepub/92-351-UIE/07geo.pdf.

[10] This is despite having access to after-tax income, which is generally regarded as a more meaningful measure of economic well being. Since most previous studies looked at the links between low-income neighbourhoods based on pre-tax data and outcomes of its residents, looking at the duration in low-income neighbourhoods based on after-tax income would not necessarily have any implications for previous studies. Future work may explore the implications of using after-tax income, as opposed to total (pre-tax) income, in defining low-income neighbourhoods.

[11] Jargowsky and Bane (1991) closely examined neighbourhoods in large American cities, and concluded that those with a poverty rate of at least 40% corresponded closely to common perceptions of slums or ghettos. This says very little about Canadian cities, given that the U.S. poverty line and the Canadian low-income line are different concepts. And to the best of our knowledge, no one in Canada has directly correlated neighbourhood "quality" with neighbourhood low-income rates. As a result, readers should take caution in making any comparisons with the U.S. studies.

[12] Some preliminary work has been done to evaluate the impact of creating separate LICO thresholds for Toronto, Montreal, and Vancouver (see Statistics Canada (2001)), but the official statistics have not yet adopted such changes. Furthermore, the quality of the Vancouver estimate is questionable due to sample size (survey data is used to produce these numbers).

[13] A popular approximation consists of ascribing a value of "1" to the first oldest member of the family, "0.4" to the second oldest adult, and "0.3" to any child. For families that are not very large (say fewer than eight members), the two measures yield very similar results.

threshold is approximately equal, we effectively circumvent the problem of accounting for differences in the cost of living among CMAs. This assumption is, at the very least, a possibility. The assumption that the cost of living is the same in Toronto, Montreal, and Vancouver (necessary when using LICO across cities) is far less likely to hold[14]. We thus choose the CMA-specific LIM to classify neighbourhoods, with the caveat that the economic well being represented by these LIMs may vary from one CMA to another. Any neighbourhood with at least 40% of its population below the LIM is considered a low-income neighbourhood. For comparative purposes only, we also define high-income neighbourhoods as having fewer than 10% of its population below the LIM[15].

Unit of Analysis

Since we are concerned with longitudinal analysis, the unit of analysis must be consistent over time. Following the family would be desirable, yet impossible, given that its members may change over time. Hence, we follow individuals over time, ascribing to them their family level information (in order to examine family differences in low-income neighbourhood duration).

Analytical Techniques

In this study, we are primarily concerned with measuring duration in low-income neighbourhoods. Although we begin by estimating the actual distribution of time spent in low-income neighbourhoods, we quickly turn to econometric techniques in order to account for the many factors that may impact on duration in low-income neighbourhoods.

Two common issues with survival (or duration) data are right-censored spells and spells in progress. Right-censored spells do not have a known end time. They are not so problematic in that they still contain some useful and accurate information, at least up to the point of censoring. Spells in progress essentially do not have a known start time (the data period begins after the start of the spell). This is much more problematic, and usually results in these cases being dropped since all points in the spell will necessarily have unknown duration times (contrary to right-censored spells, which have correct duration times up to the point of censoring).

By dropping spells in progress, we would necessarily omit long-term low-income neighbourhood dwellers, such as individuals who live their entire lives in low-income neighbourhoods. We thus apply two approaches in estimating the actual time spent in low-income neighbourhoods. The first consists of looking at count data, or the number of times individuals are in low-income

[14] For the first time, Statistics Canada calculated inter-city indexes of retail price differentials, as of October 1999. After re-basing the combined city average to 100, the All Items retail price was 108 in Toronto, 95 in Montreal, and 105 in Vancouver. Note that the All Items retail price index includes shelter, as proxied by rental accommodations, which is perhaps quite prevalent in low-income neighbourhoods. The actual LIM values used in this study are described in the data section, but in relative terms, they are strikingly similar to the inter-city retail price index. After re-basing the Toronto LIM to 108, the Montreal LIM is 98, and the Vancouver LIM is 106.

[15] The 10% cut-off was chosen so as to yield high-income rates that are roughly the same as the low-income rates. Comparing duration in low- and high-income neighbourhoods would be meaningless if one type of neighbourhood were more plentiful; in short, a larger entity is more difficult to exit by simple virtue of its size or prevalence.

neighbourhoods in our data period. By doing so, we include long-term low-income neighbourhood dwellers in the analysis, although nothing can be said about any particular spell and whether or not it is transient; it only indicates what happens throughout the entire sample period.

The second approach is the standard hazard/survival rate analysis, which focuses on new spells only. The empirical hazard rate at time "t" [$\lambda(t)$] is the probability of ending the spell at time "t", conditional on having survived up to time "t", or:

$$(1)\lambda(t) = prob(exit \mid T \geq t),$$

where "T" is the last period of survival. The empirical survival rate at time "t" [S(t)] is the probability that a new spell lasts at least as long as the t^{th} period. To get S(t), we apply $\lambda(t)$ to the sample of survivors, as well as previously censored cases (even though $\lambda(t)$ is calculated from the sample of survivors only).

$$(2)S(t) = \prod_{s=0}^{t}[1-\lambda(s)]$$

At the beginning of the spell (period 0), the survival rate is 1 (i.e. everybody who begins a spell survives at least one period), while the hazard rate is 0 (i.e. people must enter first before being able to exit).

Note that since we use yearly data in this study, one must be careful in interpreting the actual time spent in a low-income neighbourhood. For hazard rates, this is not an issue, as we simply report the exit rates in a given year (since the beginning of the spell). For survival rates, a little more thought is involved. A survival rate of 50% in year 3 means that at the end of year 3, one-half of all original spells are ongoing. The minimum length for any of these spells is three years plus a day. We would be safe in stating that at least 50% of spells last at least three years. We say "at least", because some spells that ended in year 3 may also last at least three years, depending on when exactly they began in year 0. All we know with certainty is that 50% of spells are ongoing 3 years following the observed entry (i.e. December 31^{st} in year 0).

We also calculate medians, in which case we attempt to account for the variation in the number of days the spells may last. The medians are based on the survival rates and a few assumptions. We begin by asking what percentage of the original sample exits in each year (based on the survival rates[16]). We then calculate the minimum and maximum number of days for any spell ending in a given year, assuming no leap years (i.e. 365 in every year). We then assume that the spell lengths follow a uniform distribution within each of these years (and within the bounds of possible spell lengths for each year). Finally, the medians were calculated from this pseudo-distribution of spell lengths.[17]

[16] Recall that in calculating the survival rates, we ascribe the estimated hazard rates to all spells, even if they were censored prior to the year in question.

[17] More details of this procedure are available from the authors.

In order to account for the various factors that may affect the probability of exiting the low-income neighbourhood state, we turn to hazard models. Since virtually all data sources are in discrete time (including ours), we estimate a flexible baseline hazard function [$\lambda_0(t)$]. One simple way of doing so is through a logit model of exits, which is shown below[18]:

$$(3)\ \log\left[\lambda_{it}/(1-\lambda_{it})\right] = \lambda_0(t) + \mathbf{x}'_{it}\boldsymbol{\beta}.$$

Essentially, the (natural) log of the odds ratio of exiting is a function of time since the beginning of the spell (denoted by $\lambda_0[t]$) and a vector of fixed and time-varying covariates ($\mathbf{x}'_{it}$). The subscript "i" denotes the spell, while "t" denotes the time since the beginning of the spell (equal to 0 at the beginning of the spell). By specifying $\lambda_0(t)$ as a function of dummy variables indicating time since the beginning of the spell, we allow for a flexible baseline hazard function. Note that observations with t = 0 (the beginning of the spell) are deleted since $\lambda_{i1} = 1$ for all values of "i" (i.e. the outcome is predicted perfectly).

The term λ_{it} is the (general) hazard function, which can be easily recovered from equation (3) with some simple algebraic manipulations, yielding:

$$(4)\ \lambda(t,\mathbf{x}) = \exp\left[\lambda_0(t) + \mathbf{x}'_{it}\boldsymbol{\beta}\right] / \left\{1 + \exp\left[\lambda_0(t) + \mathbf{x}'_{it}\boldsymbol{\beta}\right]\right\}.$$

The hazard function can then be incorporated into the log likelihood function for binomial outcomes in the following (general) manner:

$$(5)\ \log L = \sum_{i=1}^{n} \left\langle c_i \log\left\{\lambda_{iT_i} \prod_{t=1}^{T_i-1}(1-\lambda_{it})\right\} + (1-c_i)\log\left\{\prod_{t=1}^{T_i}(1-\lambda_{it})\right\}\right\rangle,$$

where "L" is the likelihood function, "c" is a dummy variable equal to 1 for completed spells and equal to 0 for censored spells. The final period in the spell is denoted by T, which varies according to "i" (the spell).

A nefarious feature of baseline hazard functions is that their slopes may be estimated with a downward bias unless one accounts for unobserved heterogeneity. The basic intuition behind this observation is that as "t" increases, the remaining survivors are those who are obviously more likely to have survived, perhaps even after controlling for observable characteristics. But when one wants to test for duration dependence, it is necessary to account for this selection bias. One way of doing so is through a random effects model, which assumes that the model is missing a random unobserved term (drawn from a given distribution) that explains the outcome (exits), and is thus picked up by the error component. By assumption, the unobserved term only varies across individuals (it is constant across time). A high variance across individuals is indicative of unobserved heterogeneity (i.e. the unobserved terms are heterogeneous across individuals).

[18] See McLanahan (1988), Corak, Gustafsson, and Österberg (2000), and Finnie and Sweetman (2003) for examples of the logit model applied to duration data.

To this end, we turn to the Prentice-Gloeckler-Meyer (PGM) hazard model, which assumes a Gamma distributed random effects term based on the complementary log-log model (described below)[19]. The introduction of a random effects term to account for unobserved heterogeneity was common among "first-generation" solutions to the unobserved heterogeneity problem, which generally estimated Weibull distributed baseline hazard functions with Gamma distributed random effects. But as Heckman and Singer (1984) showed, parameter estimates governed by the Weibull distribution are unstable when a Gamma distributed random effects term is incorporated into the model. Meyer (1990) notes that the choice of the heterogeneity distribution may be unimportant when the baseline hazard function is non-parametric[20]. The PGM model allows one to introduce a random effects component when estimating a non-parametric baseline hazard function. Furthermore, the model allows one to study the relationship between the probability of exit and time-varying covariates.

The complementary log-log model is specified as:

$$(6)\ \log\{-\log[(1-\lambda_{it})]\} = \lambda_0(t) + \mathbf{x}'_{it}\boldsymbol{\beta}.$$

Rearranging to recover the hazard function, we get:

$$(7)\ \lambda(t,\mathbf{x}) = 1 - \exp\{-\exp[\lambda_0(t) + \mathbf{x}'_{it}\boldsymbol{\beta}]\}.$$

This hazard function is entered in the log likelihood function (5) to estimate the benchmark PGM model, where no unobserved heterogeneity is assumed. The random effects version of this model assumes that the error component includes an individual-specific term that is constant through time. For identification purposes, a mean of 1 is assumed, and the variance must be estimated (based on the Gamma distribution assumption).

Another issue in studying transitions in and out of low-income neighbourhoods is that these transitions can occur for two reasons: an individual can physically move from one neighbourhood to another, or the individual can stay in the same neighbourhood, but the neighbourhood itself can change income status. Do people take initiative and leave, or do external circumstances tend to favour certain neighbourhoods, pulling its inhabitants out of the low-income neighbourhood state? These external circumstances may include improving economic conditions, a more generous income transfer system (helping current families in the neighbourhood), public infrastructure investment in nearby areas (which may attract higher income families), or other factors that may attract/deter higher/lower income families (e.g. subsidized housing). We thus separately examine the role of geographic mobility and changing neighbourhood status in helping people escape low-income neighbourhoods through a "competing risks" model. Specifically, we estimate a

[19] See Prentice and Gloeckler (1978) and Meyer (1990) for more details on the PGM model.

[20] Dolton and van der Klaauw (1995) discuss why conclusions about unobserved heterogeneity are more reliably drawn if a flexible baseline hazard function is specified.

multinomial logit model with three possible outcomes: no exit (0), exit by geographic mobility (1), and exit by changing neighbourhood status (2)[21]. The model for the j[th] outcome is:

$$(8)\ \log\left[\lambda_{it}^{j} / \lambda^{0})\right] = \lambda_{0}{}^{j}(t) + \mathbf{x}_{it}^{'}\boldsymbol{\beta}^{\mathbf{j}}.$$

The reference category is 0 (no exit). If there are J outcomes in total, the hazard function for j>0 is:

$$(9)\ \lambda^{j}(t,\mathbf{x}) = \exp\left[\lambda_{0}{}^{j}(t) + \mathbf{x}_{it}^{'}\boldsymbol{\beta}^{\mathbf{j}}\right] / \left\{1 + \sum_{j=1}^{J} \exp\left[\lambda_{0}{}^{j}(t) + \mathbf{x}_{it}^{'}\boldsymbol{\beta}^{\mathbf{j}}\right]\right\}$$

And for j=0, we have:

$$(10)\ \lambda^{0}(t,\mathbf{x}) = 1 / \left\{1 + \sum_{j=1}^{J} \exp\left[\lambda_{0}{}^{j}(t) + \mathbf{x}_{it}^{'}\boldsymbol{\beta}^{\mathbf{j}}\right]\right\}$$

The log likelihood function in this multinomial outcome case is:

$$(11)\ \log L = \sum_{i=1}^{n} \sum_{j=0}^{J} \left\langle c_{i}^{j} \log\left\{\lambda_{iT_i}^{j} \prod_{t=1}^{T_i - 1}\left(1 - \lambda_{it}^{j}\right)\right\} + (1 - c_{i}^{j}) \log\left\{\prod_{t=1}^{T_i}\left(1 - \lambda_{it}^{j}\right)\right\}\right\rangle$$

Transitions In and Out of Low-Income Neighbourhoods

From a cross-sectional point of view, defining neighbourhoods as low-income if their low-income rate is at least 40% may be contested on grounds that it is a subjective threshold. Nevertheless, the work of Jargowsky and Bane (1991) in documenting the unfavourable conditions in such neighbourhoods (at least in the U.S.) provides some justification for using this cut-off.

From a longitudinal perspective, however, a potentially more serious problem may arise. If one thinks of neighbourhoods as being made up of several "units" (i.e. people), it is quite possible that the changing situation of only a few of these units may lead to a change in the income status of the neighbourhood as a whole. In a neighbourhood with 100 people, 40 of whom are initially considered low-income, we are left with the undesirable result that an exit from the state of low-income by one resident alone will change the overall neighbourhood income status. This is generally not a problem in low-income spells, since individuals usually exit that state by landing a better job, or by marrying someone with a well-paying job, and vice-versa for entries (i.e. transitions are generally more substantial).

To avoid such spurious (and perhaps insignificant) transitions, we tightened the entry and exit requirements. To enter a low-income neighbourhood, individuals must go from living in a neighbourhood with a low-income rate below 35%, to one with a low-income rate of at least 40%. Analogously, individuals exit low-income neighbourhoods when they go from living in a neighbourhood with a low-income rate of at least 40%, to one with a low-income rate below 35%. In essence, we have created a longitudinal low-income neighbourhood threshold, ranging from 35%

[21] See Gottschalk (1996) for an example of the multinomial logit model applied to duration data.

to 40%[22]. Although arbitrary in nature, this procedure allows us to focus on *substantial* exits. This measure resulted in substantially reducing the number of exits caused by a change in the neighbourhood income status, but had very little impact on exits caused by geographic mobility. In the end, most exits are caused by geographic mobility (see Appendix D for more details).

3. Data

The data we use is the Longitudinal Administrative Databank (LAD). Canada Customs and Revenue Agency (CCRA) collects personal income tax forms (the T1s) from all tax filers in Canada. From the T1 file, Statistics Canada creates the T1FF (the T1 Family File), which attempts to reconstruct census families by imputing the presence of non-filing children and spouses. The LAD is a 20% random sample of T1FF, whereby tax filers are followed through time beginning once they either file or their Social Insurance Number (SIN) appears on another family member's tax return. Once individuals stop filing (or their SIN stops appearing on another member's tax return), they may still be followed by imputation. Although it would be interesting to follow children who live in low-income neighbourhoods, it is not feasible to do directly since very few children file taxes, nor do their SIN numbers necessarily appear on another family member's tax return (as is the case for spouses). At best, individuals with kids of a given age may be followed over time along with information on children in the family.

Currently, the LAD spans the years 1982 to 1999. The data is best suited to study low-income beginning in 1992, so our data period spans the years 1992 to 1999[23]. As noted in the methodology section, we use CMA-specific LIMs that are based on adult-equivalent family (pre-tax) income and are calculated at the middle point of the data period (1996)[24].

Our notion of the neighbourhood revolves around the census tract. Coding the census tract involves mapping postal codes into geographic units through a postal code conversion file based on information we know from the Census. The file we use is the Postal Code Conversion File + (PCCF+). In the vast majority of cases, this yields a many-to-one mapping of six-digit postal codes

[22] For individuals within this range, the most recent neighbourhood income status prevails.

[23] There are many reasons for this. First, tax filers did not have to separately report income from Social Assistance, Worker's Compensation, and Net Federal Supplements prior to 1992–although they were required to report these as a total starting in 1989. Also, the Child Tax Credit was available as a tax credit for families with kids prior to 1993, which obviously did little for families with no earnings. The Child Tax Credit was replaced by the Child Tax Benefit in 1993, and this provided an incentive for families with children to file taxes even if they had no earnings. Finally, tax filers could apply for the Goods and Services Tax (GST) Credit beginning in 1989, although no payments were made until in December 1990. Generally speaking, the population coverage in the LAD (compared to Statistics Canada population counts) went from between 91% and 93% in the 1980s, to between 95% and 97% in the 1990s (based on LAD coverage tables, available from the Small Area and Administrative Data Division at Statistics Canada). Given the presence of the Child Tax Benefit, the years 1993 to 1999 are perhaps the best years in which transfer income is estimated. Nevertheless, our analytical sample begins in 1992 since the coverage rate in the LAD only jumped marginally between 1992 and 1993.

[24] In 1999 adult-equivalent dollars, the LIMs are $13,600 (Toronto), $12,300 (Montreal), and $13,300 (Vancouver). The results are quite robust to the choice of the year in calculating the LIMs.

to a census tract based on 1996 Census geography[25]. In certain cases, the match is one-to-many (a given postal code may physically span more than one census tract). Based on 1996 population counts of census tracts, the PCCF+ will proportionally allocate such postal codes to census tracts by random assignment. This only happens in about 2% of all cases we look at (i.e. Toronto, Montreal, and Vancouver), and may only become a substantial problem if people randomly "move" in and out of census tracts without actually physically moving. These moves only happen in 1% of all cases, and although some of them may be real moves, we chose to err on the side of caution by fixing the neighbourhood to the original one in such cases. Allowing such spurious transitions into the data would lead to a downward bias in the measurement of spell length.

Unless otherwise noted, our analytical sample consists of all tax filers aged 25 years old or above at the beginning of a spell and residing in Toronto, Montreal, or Vancouver. Individuals under 25 years old are not included to avoid looking at students, who may live in low-income neighbourhoods while in school (i.e. highly concentrated student neighbourhoods), and then move to higher income neighbourhoods after they graduate. We only look at census tracts with at least 50 sampled families in order to make reliable inferences regarding the income status of the neighbourhood. Spells are right-censored if they haven't ended by 1999, if individuals stop filing taxes in Canada (or can no longer be followed in the tax data for some other reason), if they move out of Toronto, Montreal, or Vancouver, or if they move into a very small census tract within one of these three cities (fewer than 50 sampled families).

Before moving to the analytical results, we should acquire an understanding of the presence of low-income neighbourhoods in Toronto, Montreal, and Vancouver[26]. The upper portion of Table 1 shows the number of low-income neighbourhoods (census tracts), the percentage of neighbourhoods that are low-income, the percentage of people living in these low-income neighbourhoods, and the percentage of children living in the low-income neighbourhoods by year and CMA.

[25] Some postal codes in our data may have retired prior to 1996. In that case, the PCCF+ looks at where the postal code was in 1991, and relates it back to 1996 geography.

[26] Cross-sectionally, low-income neighbourhoods are defined as those with low-income rates of 40% or more. Note that all individuals in the neighbourhood are included in this calculation, including those under 25 years old.

Table 1: Low and High-Income Neighbourhood Rates by CMA

Low-IncomeCTs	Toronto				Montreal				Vancouver				All Three CMAs			
Year	CTs #	LI CTs (%)	People (%)	Children (%)	CTs #	LI CTs (%)	People (%)	Children (%)	CTs #	LI CTs (%)	People (%)	Children (%)	CTs #	LI CTs (%)	People (%)	Children (%)
1992	804	2.5	4.2	3.6	755	9.3	6.6	5.7	298	2.7	2.8	2.0	1857	5.3	4.8	4.1
1993	806	3.8	5.3	4.5	756	13.5	9.5	7.9	298	2.3	2.5	1.8	1860	7.5	6.3	5.2
1994	806	5.3	6.5	5.6	756	13.1	9.1	7.6	298	3.0	3.3	2.4	1860	8.1	6.9	5.7
1995	807	6.2	7.8	7.2	756	13.8	9.6	8.2	298	3.4	3.6	2.7	1861	8.8	7.6	6.7
1996	807	7.8	9.5	9.0	758	15.0	10.3	9.0	298	2.3	2.9	2.2	1863	9.9	8.5	7.7
1997	808	7.8	9.6	9.1	759	13.7	10.0	8.8	298	3.7	4.2	3.2	1865	9.5	8.7	7.9
1998	807	4.8	6.5	6.0	758	10.2	7.4	6.7	298	3.7	3.9	3.1	1863	6.8	6.4	5.7
1999	807	3.8	5.1	4.6	756	7.9	6.0	5.7	298	3.0	3.4	2.5	1861	5.4	5.1	4.6
High-Income CTs	Toronto				Montreal				Vancouver				All Three CMAs			
Year	CTs #	HI CTs (%)	People (%)	Children (%)	CTs #	HI CTs (%)	People (%)	Children (%)	CTs #	HI CTs (%)	People (%)	Children (%)	CTs #	HI CTs (%)	People (%)	Children (%)
1992	804	16.4	15.0	16.4	755	12.7	15.2	17.9	298	7.7	6.7	7.7	1857	13.5	13.6	15.4
1993	806	5.2	4.1	4.2	756	5.7	7.1	8.6	298	3.7	2.7	3.2	1860	5.2	4.9	5.6
1994	806	4.3	3.4	3.5	756	6.3	8.2	9.8	298	2.3	1.4	1.5	1860	4.8	4.7	5.3
1995	807	5.6	4.4	4.3	756	6.3	7.4	8.7	298	1.7	1.2	1.3	1861	5.3	4.8	5.3
1996	807	5.2	4.2	4.3	758	7.5	9.7	11.2	298	1.7	1.1	1.2	1863	5.6	5.5	6.1
1997	808	6.7	5.4	5.5	759	7.9	10.0	11.6	298	1.3	0.8	0.9	1865	6.3	6.1	6.7
1998	807	8.1	6.1	5.8	758	13.1	18.7	21.7	298	2.0	1.3	1.3	1863	9.1	9.5	10.4
1999	807	7.6	5.7	5.7	756	16.5	23.2	26.3	298	1.0	0.5	0.6	1861	10.2	10.6	11.5

There are slightly more than 800 census tracts in Toronto, just over 750 in Montreal, and 298 in Vancouver. The number of census tracts varies slightly from year to year (in Toronto and Montreal only) because of births and deaths, which can be real, or simply the by-product of our criteria that census tracts have at least 50 sampled families in any given year.

The percentage of neighbourhoods that are low-income is lowest in Vancouver (between 2% and 4%), and highest in Montreal (between 8% and 15%). Toronto lies in the middle (between 2% and 8%). For all three CMAs taken together, the rate ranges from 5% to 10%. The rates generally rise until 1996 or 1997, then decline in 1998 and 1999 as the economy gained momentum. The high level of variability in these rates over time provided some justification in creating the tighter entry and exit requirements applied in the transition analysis below (see Section 2 for details).

How are these low-income neighbourhoods distributed within the three CMAs? The maps of these CMAs at the middle point in our data (1996) appear in Appendix A, with low-income neighbourhoods highlighted in dark. The three CMAs display very different spatial income patterns. Toronto's low-income neighbourhoods are highly dispersed and generally away from downtown. A "low-income ring" can be seen around the core, which might reflect the fact that Toronto's population growth has been outward, and much of this growth has been fuelled by recent immigrants. In Montreal, low-income neighbourhoods are generally more centralised around the downtown core, with only a few exceptions. In Vancouver, low-income neighbourhoods are even more clustered than in Montreal, forming one contiguous area (albeit a fairly small one with only seven neighbourhoods). This cluster contains the area commonly referred to as Vancouver's Downtown Eastside, which has recently attracted substantial media attention with regards to various socio-economic problems.

Returning to Table 1, an interesting set of statistics is the proportion of people living in low-income neighbourhoods. In Toronto, this rate is greater than the low-income neighbourhood rate, indicating that the average low-income neighbourhood is more populated than other neighbourhoods. The situation is quite different in Montreal: the average low-income neighbourhood is less populated than other neighbourhoods. As a result, the proportion of Toronto's population living in low-income

neighbourhoods is almost as high as the proportion in Montreal, despite the fact that far more neighbourhoods are low-income in Montreal (in relative terms). In Vancouver, the proportion of the population living in low-income neighbourhoods is generally the same as the proportion of low-income neighbourhoods.

The exposure of children to low-income neighbourhoods is of particular interest to many researchers and policy-makers. Holding every family's income constant in a given neighbourhood, an increase in the number of children should increase the likelihood that the neighbourhood is classified as low-income. This is because children generally do not have earnings, but an increase in their presence increases family needs, thus reducing *adult-equivalent* family income. Nevertheless, there are at least two reasons why neighbourhoods with relatively more children would be *less* likely to be classified as low-income. The first is that families with children are more likely to have a married couple present, and are thus more likely to have two earners. A second reason simply relates to the transfers that children may bring to the family, which may help pull some families above the low-income threshold (e.g. the Child Tax Benefit or higher welfare payments). It appears that these two reasons outweigh the argument based on adult-equivalent adjustments, as Table 1 indicates that a slightly smaller percentage of children live in low-income neighbourhoods than do people in general.

For comparative purposes only, some of the following results will focus on high-income neighbourhoods, which are defined as those with fewer than 10% of its residents living in the state of low-income. Table 1 suggests that there is more variability in the proportion of neighbourhoods that are high-income over time, especially between 1992 and 1993[27]. Perhaps the recession of the early 1990s had a delayed effect on these neighbourhoods since fewer people were at risk of falling into the state of low-income because of higher job security (e.g. many residents in these neighbourhoods may have been "first in, last out"). Nevertheless, the rate of neighbourhoods that are high-income is about the same as those that are low-income in all three cities, variations across years notwithstanding. This was in fact the objective in setting the cut-off for high-income neighbourhoods: it is preferable to compare exit rates between two entities that are similar in size.

4. Results

4.1 Exposure to Low-Income Neighbourhoods between 1992 and 1999

Table 2 shows the distribution of the number of years people are in low-income neighbourhoods between 1992 and 1999 in Toronto, Montreal, or Vancouver (among those living in these cities throughout the study period). The results are broken down into two groups: individuals who were in low-income families for at least three of the 8 years, and all others.

[27] In separate calculations, we found that family income declined at all points in the income distribution (including the top) between 1992 and 1993.

Table 2: Distribution of the Number of Years Individuals are in Low or High-Income Neighbourhoods between 1992 and 1999

	Number of Years Individuals are in Low or High-Income Neighbourhoods between 1992 and 1999										
	Sample Size	0	1	2	3	4	5	6	7	8	Total
		% of Individuals									
Low-Income Neighbourhoods											
Low-Income >=3 Years	133,215	73.8	5.5	3.7	3.0	2.4	2.3	1.8	2.1	5.4	100.0
Low-Income < 3 Years	685,580	91.3	2.4	1.4	1.1	0.8	0.8	0.5	0.6	1.1	100.0
All Individuals	818,795	88.4	2.9	1.8	1.4	1.1	1.0	0.7	0.9	1.8	100.0
High-Income Neighbourhoods											
Low-Income >=3 Years	133,215	89.4	5.0	2.2	1.2	0.7	0.5	0.4	0.3	0.4	100.0
Low-Income < 3 Years	685,580	75.6	8.8	4.7	3.1	1.8	1.5	1.2	1.3	2.1	100.0
All Individuals	818,795	77.8	8.2	4.3	2.8	1.6	1.3	1.1	1.1	1.8	100.0

About three-quarters (74%) of individuals in low-income families for at least three years did not live in a low-income neighbourhood throughout the data period (8 years). Among those who did live in a low-income neighbourhood for at least one year (about one-quarter of individuals in low-income families for at least three years), the number of years in a low-income neighbourhood varied a lot. About one in 5 (21%) spent exactly one year in a low-income neighbourhood, while the same proportion spent all eight years in a low-income neighbourhood. Among those who were in low-income families for less than three years, 91% were never in a low-income neighbourhood. Among the 9% who spent at least one year in a low-income neighbourhood, 27% and 13% spent exactly one and eight years in that state, respectively. Individuals in low-income families are thus more likely than others to live in a low-income neighbourhood, and conditional on doing so, they are more likely to spend many years in that state.

In contrast, individuals in low-income families for at least three years are less likely to live in a high-income neighbourhood than others (11% and 24% spent at least one year in a high-income neighbourhood, respectively). And conditional on doing so, individuals in low-income families (at least three years) are more likely to only spend one year in that state (47%), compared others (36%).

Table 2 suggests two things. First, there is a high turnover in the population make-up of low-income neighbourhoods. From Table 1, we know that the average proportion of the population (within the three CMAs) that is living in a low-income neighbourhood is about 7%. Yet, about 12% lived in a low-income neighbourhood for at least one year[28]. Secondly, individuals who spent at least three years in a low-income family were more likely to be exposed to a low-income neighbourhood at some point. And among those who were exposed to low-income neighbourhoods at some point, long-term exposure was far more likely among individuals in low-income families.

There also appears to be a high turnover rate in the population of high-income neighbourhoods, although Table 1 would suggest that this is probably the result of many neighbourhoods moving in and out of this class of neighbourhood income. For the transition analysis, the stringent entry and exit criteria discussed in the methodology section will minimize this effect.

[28] The proportions are not entirely comparable, as Table 2 excludes individuals under the age of 25; however, the rates in Table 1 are not sensitive to this restriction.

4.2 Who Enters Low-Income Neighbourhoods?

Before examining the duration of spells in low-income neighbourhoods, we should acquire some knowledge of who is at risk of entering such a spell. Table 3 shows the empirical probability of entering a low-income neighbourhood by various socio-economic characteristics.

Table 3: Empirical Probabilities of Entering Low-Income Neighbourhoods

Status in Year "t" (Individuals Not in a Low-Income Neighbourhood*)	Proportion in a Low-Income Neighbourhood in Year "t+1"
Overall	0.012
Family Income	
Low-Income*	0.025
LIM to LIM*1.5	0.016
LIM*1.5 to LIM*2	0.012
> LIM*2	0.007
Family Type	
Couples/Youngest Child < 6	0.010
Couples/Youngest Child >= 6	0.007
Couples without Children	0.010
Lone-Parents/Youngest Child < 6	0.028
Lone-Parents/Youngest Child >= 6	0.015
Unattached Individuals	0.020
Age	
25-34 Years Old	0.017
35-44 Years Old	0.012
45-54 Years Old	0.009
> 54 Years Old	0.009
CMA	
Toronto	0.014
Montreal	0.012
Vancouver	0.006
Sample Size	7,324,000

* Among individuals 25 years old or more, and living in Toronto, Montreal, or Vancouver.

On average, about 1.2% of individuals at risk of entering a low-income neighbourhood in a given year do so. Not surprisingly, individuals in low-income families in a given are far more likely to enter a low-income neighbourhood in the following year compared to individuals in higher income families.

There are also large differences by family type. Lone-parents with youngest child below the age of six have the highest probability of entering a low-income neighbourhood. Unattached individuals are second on this list, followed by lone-parents with youngest child aged six years or more. Overall, couples are about half as likely to enter low-income neighbourhoods.

The probability of entry declines with age, which is not surprising since older individuals are simply less mobile. Finally, entry probabilities are greater in Toronto and Montreal than in Vancouver, which is entirely consistent with the relative stocks of people shown in Table 1.

The entry probabilities tell us who is at risk of entering a low-income neighbourhood, which is quite useful information in its own right. But to acquire a better picture of the sample we will analyze throughout this paper, we need to look at the characteristics of those who actually experience spells in low-income neighbourhoods. The sample means of these characteristics at the beginning of the spell appear below, in Table 4. For comparison, the characteristics of the general population, as well as people entering high-income neighbourhoods and low-income are also presented.

Table 4: Sample Proportions

	General Population*	Low-Income CTs (at Beginning of Spell)	High-Income CTs (at Beginning of Spell)	Low-Income (at Beginning of Spell)
Family Income				
Low-Income**	0.185	0.343	0.092	
LIM to LIM*1.5	0.134	0.178	0.103	
LIM*1.5 to LIM*2	0.122	0.127	0.109	
> LIM*2	0.558	0.352	0.696	
Family Type				
Couples/Youngest Child < 6	0.138	0.125	0.204	0.172
Couples/Youngest Child >= 6	0.285	0.157	0.222	0.219
Couples without Children	0.281	0.240	0.312	0.184
Lone-Parents/Youngest Child < 6	0.014	0.033	0.014	0.044
Lone-Parents/Youngest Child >= 6	0.057	0.070	0.046	0.089
Unattached Individuals	0.226	0.376	0.203	0.291
Age				
25-34 Years Old	0.248	0.351	0.367	0.298
35-44 Years Old	0.259	0.266	0.286	0.292
45-54 Years Old	0.195	0.159	0.153	0.177
> 54 Years Old	0.298	0.224	0.193	0.233
CMA				
Toronto	0.356	0.528	0.335	0.470
Montreal	0.450	0.365	0.626	0.318
Vancouver	0.195	0.107	0.039	0.212
Sample Size	9,858,610	88,315	63,620	333,000

* This includes individuals 25 years or older living in Toronto, Montreal, or Vancouver.
** Note that children are not part of the analytical sample, but are included in the calculation of the neighbourhood low-income rates. As a result, the low-income rate in low-income neighbourhoods among our analytical sample is below 40%.

People entering low-income neighbourhoods are far more likely to be single (i.e. a lone-parent or unattached individual) than those entering high-income neighbourhoods, but slightly less likely than those entering low-income. People entering low-income neighbourhoods are generally about as old as those entering high-income neighbourhoods, but not quite as old as those entering low-income. The differences by CMA are interesting: relatively fewer low-income neighbourhood spells begin in Vancouver than do low-income spells. Also, almost two-thirds of high-income neighbourhood spells begin in Montreal, despite a much larger population in Toronto. This is consistent with Table 1,

which shown much that relatively more Montrealers lived in high-income neighbourhoods, compared to Toronto and Vancouver.

4.3 Duration of Low-Income Neighbourhood Spells

4.3.1 Empirical Results

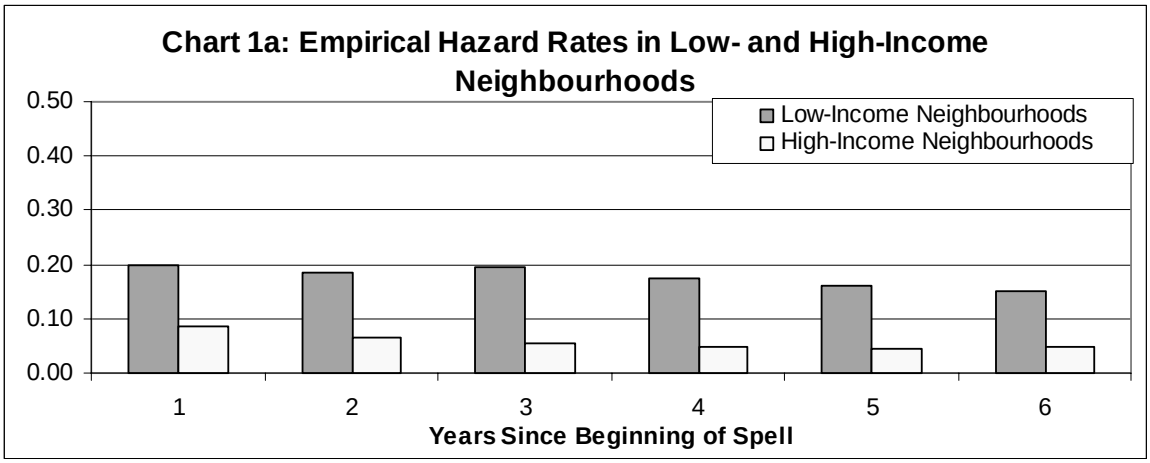
Individuals may exit low-income neighbourhoods by physically moving out of the neighbourhood, or if the neighbourhood ceases to *be* a low-income neighbourhood. Our primary concern for the moment is with the length of spells in low-income neighbourhoods *regardless* of how the exit took place. In Appendix D, we examine the relative roles of geographic mobility and changing neighbourhood status in helping individuals escape low-income neighbourhoods.

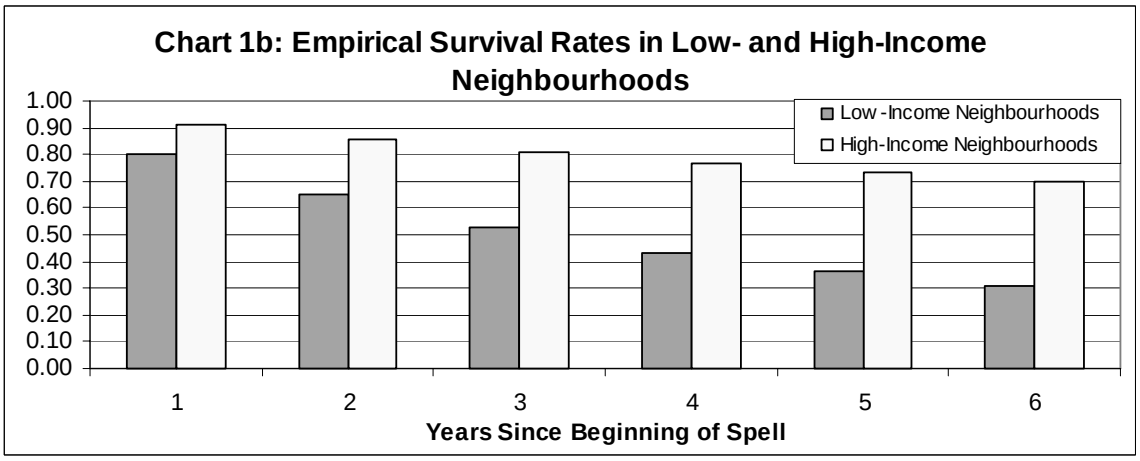
The count data shown in Table 2 allowed us to include the longer-term residents of low-income neighbourhoods in the analysis. To accurately measure the duration of spells (up to the point of censoring), however, only new spells should be examined. One problem with analysing new spells is that a potentially distinct group is omitted from the analysis: the longer-term residents of low-income neighbourhoods. Table 2 suggests that although this type of bias is probably not negligible, it is nevertheless not very large. Only 1.8% of all individuals in our sample were in a low-income neighbourhood during all eight years (representing about 16% of all those who spent at least one year in a low-income neighbourhood).

People tend to remain in high-income neighbourhoods much longer than in low-income neighbourhoods. Chart 1a shows the empirical hazard rates in low- and high-income neighbourhoods[29]. At any point in the spell, individuals are two to three times more likely to exit low-income neighbourhoods. From the survival rates (Chart 1b), we see that about 70% of new spells in high-income neighbourhoods are ongoing in year 6, more than twice the rate for spells in low-income neighbourhoods. The median spell length is 3.8 years in low-income neighbourhoods, compared to 6 or more years for high-income neighbourhoods[30]. In general, there is quite a lot of variability in the length of spells in low-income neighbourhoods, as one-third of spells are ongoing in year 6, while about as many were complete by the end of year 2.

[29] Recall that for entries in low-income neighbourhoods, the low-income rate in the individual's neighbourhood must go from below 35%, to 40% or above (and vice-versa for exits). Similarly, we created a 10% to 15% range for high-income neighbourhoods.

[30] All median spell lengths appear in Appendix B.





4.3.2 Regression Results

We now examine the duration of residential spells in low-income neighbourhoods through hazard models. Table 5 shows the results of logit and complementary log-log exit models. The results are discussed by group of variables below. Unless otherwise stated, all results pertain to the logit model.

Table 5: Low-Income Neighbourhood Exit Models

	Logit Model		Complementary Log-Log Models			
	No Random Effects		No Random Effects		Random Effects	
	Coeff.	z-stat	Coeff.	z-stat	Coeff.	z-stat
Year 2 of Spell	-0.1650	-11.01	-0.1415	-10.60	-0.1409	-10.54
Year 3 of Spell	-0.1546	-8.86	-0.1350	-8.62	-0.1344	-8.55
Year 4 of Spell	-0.3443	-15.12	-0.3017	-14.72	-0.3011	-14.59
Year 5 of Spell	-0.5136	-15.90	-0.4587	-15.82	-0.4586	-15.75
Year 6 of Spell	-0.6828	-13.70	-0.5995	-13.24	-0.5999	-13.20
Couple, Youngest Child Under 6	-0.1051	-5.28	-0.0907	-5.21	-0.0883	-5.08
Couple, Youngest Child 6 or Above	0.0218	1.21	0.0212	1.33	0.0231	1.45
Couple no Children	0.1474	9.00	0.1286	8.95	0.1294	9.00
Lone-Parent, Youngest Child Under 6	-0.2048	-5.59	-0.1795	-5.56	-0.1781	-5.52
Lone-Parent, Youngest Child 6 or Above	-0.0764	-3.09	-0.0674	-3.08	-0.0664	-3.03
Female	-0.0625	-5.03	-0.0570	-5.21	-0.0562	-5.13
35-44 Years Old	-0.2338	-14.81	-0.2044	-14.91	-0.2036	-14.85
45-54 Years Old	-0.4473	-23.41	-0.3933	-23.42	-0.3918	-23.32
55 Years Old or Above	-0.6771	-37.56	-0.5976	-37.60	-0.5964	-37.42
$Montreal_{-1}$	1.1196	45.96	1.0019	50.37	1.0060	50.05
$Vancouver_{-1}$	0.2932	12.44	0.2734	13.16	0.2740	13.14
Unemployment Rate (CMA-Year)	-0.1966	-37.22	-0.1757	-39.95	-0.1768	-39.92
Intercept	0.0950	2.43	-0.1903	-5.69	-0.1872	-5.58
Sample Size	188,175		188,175		188,175	
Log Likelihood	-89,377		-89,422		-89,364	
Gamma Variance					1.18E-06	

Duration (dummy variables indicating the number of years since the beginning of the spell): Note that Year 0 is not analysed since, by definition, no one exits in the first year. Year 1 is the omitted category, and its effect is thus absorbed in the intercept. Although the coefficients on the duration dummy variables refer to "logit" (or log of odds ratio) effects, it is clear from the results that the probability of exit declines as time spent in a low-income neighbourhood increases (indicating negative duration dependence)[31]. When we turn to the complementary log-log model, we once again observe a declining probability of exit as time spent in the neighbourhood increases. The coefficients change very little with the introduction of a Gamma distributed random effects term, which has a variance very close to zero[32].

Family Type: Individuals are classified as living in one of six family types: couples with children (with or without youngest under six), couples without children, lone-parents (with or without youngest child under six), and unattached (the omitted category). First, exit rates are higher for couples than for single people (lone-parents or unattached individuals) when comparing groups with a similar "child status". And whether we look at couples or singles, those with children have lower

[31] The log of the odds ratio is an increasing monotonic function of the underlying probability, so larger (smaller) values of one corresponds to larger (smaller) values of the other.

[32] Finnie and Sweetman (2003) controlled for unobserved heterogeneity in a low-income hazard model by assuming a Gamma distributed random effects term and a Weibull distributed baseline hazard function. They also find that this measure had little to no effect on the coefficients, but they stress that more years of data (they only used four) would be needed to make more conclusive statements. Although we have more data in this paper, we prefer to echo their statement of caution.

exit rates, especially if the youngest child is under the age of six. As a result, lone-parents with youngest child under six are generally the least likely to exit low-income neighbourhoods. In general, however, the coefficients are not very large.

Sex: Females are slightly less likely to exit low-income neighbourhoods, even after controlling for family type. This might be related to the fact that women generally earn less than men, and are perhaps more deterred by the financial costs of moving out of one's neighbourhood. It could also indicate that women create more social ties in the neighbourhood, and are thus less willing to move away[33].

Age: Four dummy variables are included in the model (25-34 years old is the omitted category). Older individuals are less likely to exit low-income neighbourhoods, suggesting that they have perhaps already tried living in various neighbourhoods and have settled on one, or simply that they are less mobile for some other reason (e.g. they have more ties to the area).

CMA (Census Metropolitan Area): The Montreal and Vancouver dummy variables have a positive and significant effect on the probability of exit compared to the omitted Toronto category[34]. The Montreal coefficient is particularly large, despite the fact that there are more low-income neighbourhoods to move to in Montreal than in Toronto—although the total number of people in low-income neighbourhoods is about the same in either CMA (Table 1). Note that when the unemployment rate variable (discussed below) is omitted, the difference in exit rates across CMAs is much smaller. In other words, exit rates would be higher in Montreal and Vancouver if only economic opportunities were as plentiful as in Toronto.

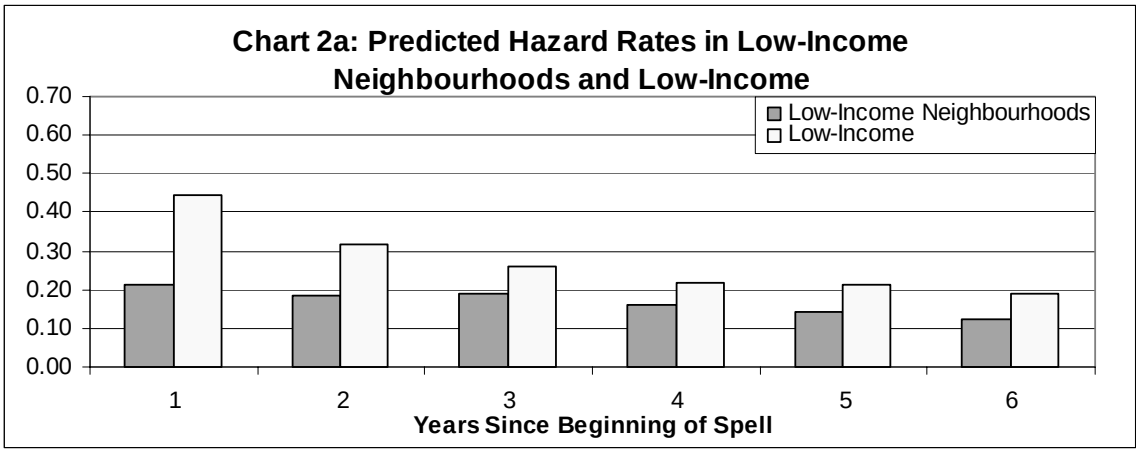
Unemployment Rate: To proxy economic conditions, the CMA-year specific unemployment rate of men aged 25 to 54 years old is added to the model. The effect is not surprising: individuals are less likely to exit in high unemployment climates, presumably because people are less likely to move to pursue job opportunities. It is imperative to control for economic conditions since later points in spells (e.g. years 5 or 6) necessarily occurred in the late 1990s, a period which had greater economic opportunities than in the earlier part of the decade.

To better visualize the magnitude of the negative duration dependence suggested by the logit model in Table 5, the predicted hazard rates are plotted in Chart 2a[35]:

[33] Frenette (2002) found that female high school students were far more likely to attend university in the near future, if one is near their home. When a university is beyond commuting distance from their homes, males and females are about as likely to attend university.

[34] Note that the CMA variables are lagged by one year, since individuals may move from one CMA to another in the year they exit a low-income neighbourhood.

[35] Instead of choosing one particular reference category (such as the mean of all other regressors), we calculated the predicted hazard rates for each individual in the sample. We then averaged these predicted probabilities and plotted them in Chart 2a. This is known as the average treatment effect method (see Mellor (1998) for an application), which alleviates the robustness problems associated with arbitrarily choosing a reference point in calculating predicted outcomes from a nonlinear model such as the logit.

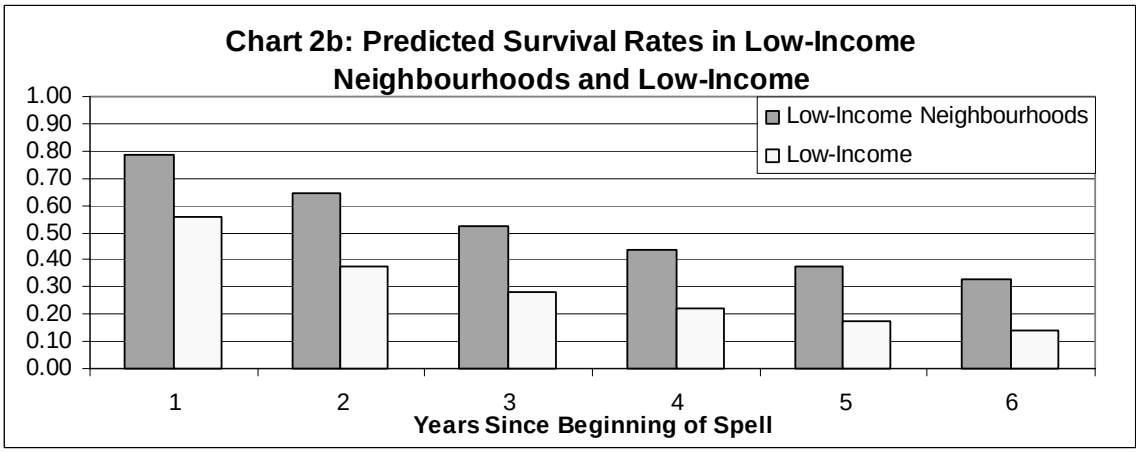


The low-income neighbourhood hazard rate is about 0.21 in year 1 of the spell, and then gradually declines to about 0.12 in year 6. As discussed in the introduction, this might be partially explained by spells out of the workforce (if jobs are indeed a barrier to exit), which might also exhibit negative duration dependence, or it might be indicative of growing ties with the neighbourhood (despite the local economic climate).

For the sake of comparison, the low-income hazard rate is also charted (see Appendix C for full model results). Although the low-income baseline hazard function also has a negative slope (with the exception of a flat portion between years 4 and 5[36]), the level of the rate is generally about two to three times higher than the low-income neighbourhood hazard rate. Although one might think the state of low-income is more difficult to exit than a low-income neighbourhood (since individuals can choose to move to a higher income neighbourhood, albeit at a perhaps higher rental cost), it appears that the financial cost of moving is a sufficient enough deterrent, or that people tolerate living in a weaker economic area given their social ties in the neighbourhood.

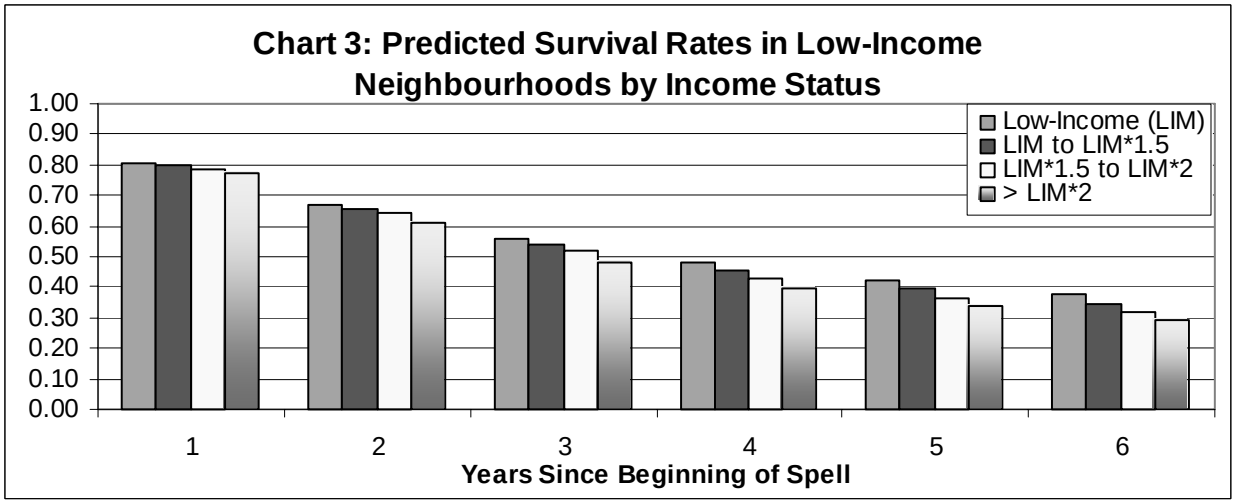
Chart 2b shows the (predicted) survival rates for both types of spells. Clearly, people tend to stay much longer in low-income neighbourhoods than in low-income. About one-third of new low-income neighbourhood spells are ongoing in year 6. In contrast, only 14% of new low-income spells last that long. The median length of low-income spells is 1.9 years, compared to 3.8 years for low-income neighbourhoods.

[36] This is due to the sharp decline in the low-income rate between 1997 and 1998, from 13.5% to 11.9% (see Statistics Canada (2002)). The 1998 results can only be reflected in years 0 to 5 (i.e. year 6 can only refer to 1999), but it is mainly reflected in year 5 (i.e. year 5 is comprised more or less in equal parts of the 1997 and 1998 results, whereas earlier years in spells are comprised in equal parts of more years).



The remainder of this sub-section presents the predicted survival rates from models where the duration terms are interacted with various socio-economic characteristics[37]. The goal here is simply to highlight differences in spell length by these socio-economic characteristics, as opposed to estimating the "effect" of these characteristics on duration.

We begin with family income. Chart 3 suggests that spell length does decline monotonically with family income, but the differences are not tremendous. For example, 38% of individuals in low-income families throughout the period have spells that are ongoing in year six, and the median spell length for this group is 4.3 years. In contrast, 29% of individuals with family income greater than twice the LIM threshold throughout the period have spells that were ongoing in year six, and the median spell length for this group is 3.4 years.

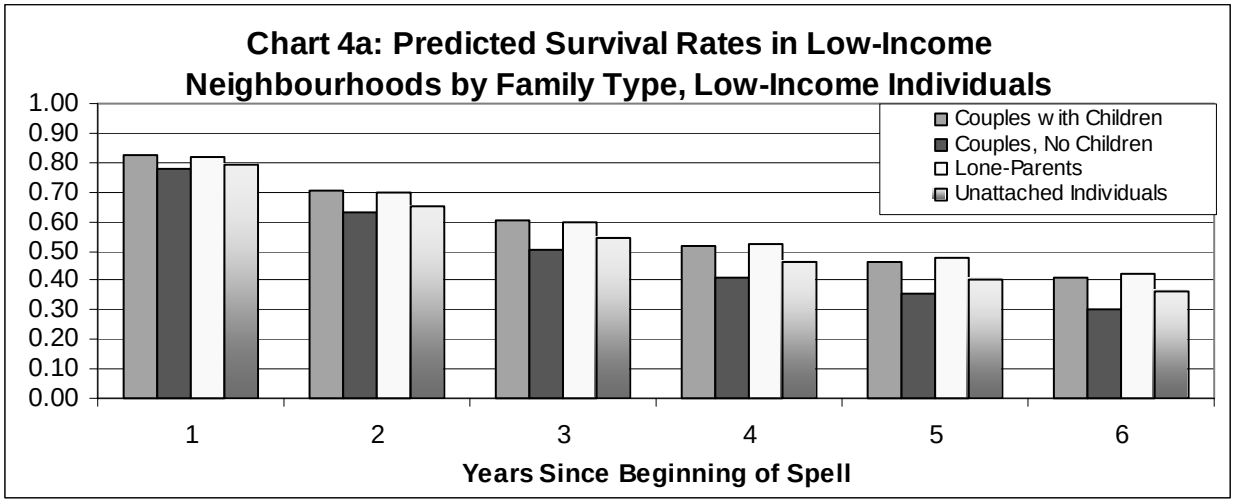


The fact that spells generally last longer for low-income individuals certainly lends some support to the notion that financial costs pose a significant barrier for exiting low-income neighbourhoods. The financial deterrents to moving that low-income individuals face may include direct moving costs

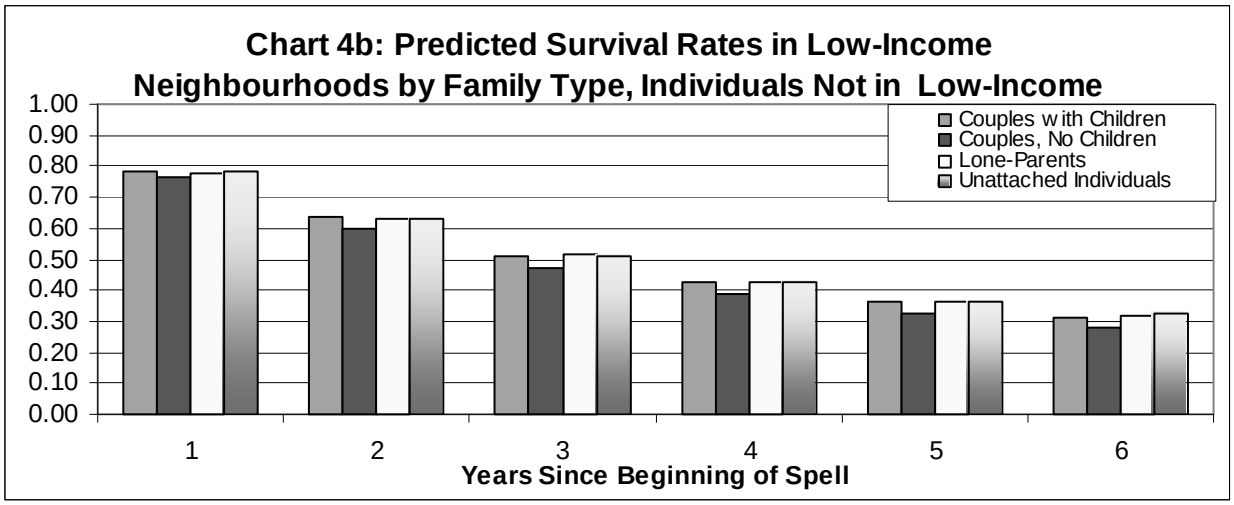
[37] The full set of regression results from the models with duration interactions are available from the authors upon request.

(truck rental, hired movers, etc.), higher rents in higher income neighbourhoods, rent control, or subsidized housing. Of course, the longer spells observed among low-income individuals may also be explained by a greater level of attachment to the neighbourhood, but this is impossible to assess with the current data[38].

What types of families remain in low-income neighbourhoods for longer periods of time? To answer this question, we interacted the duration terms with four family types (couples with/out children, lone-parents, and unattached individuals), as well as with a low-income dummy variable. The survival rates appear in Charts 4a and 4b.



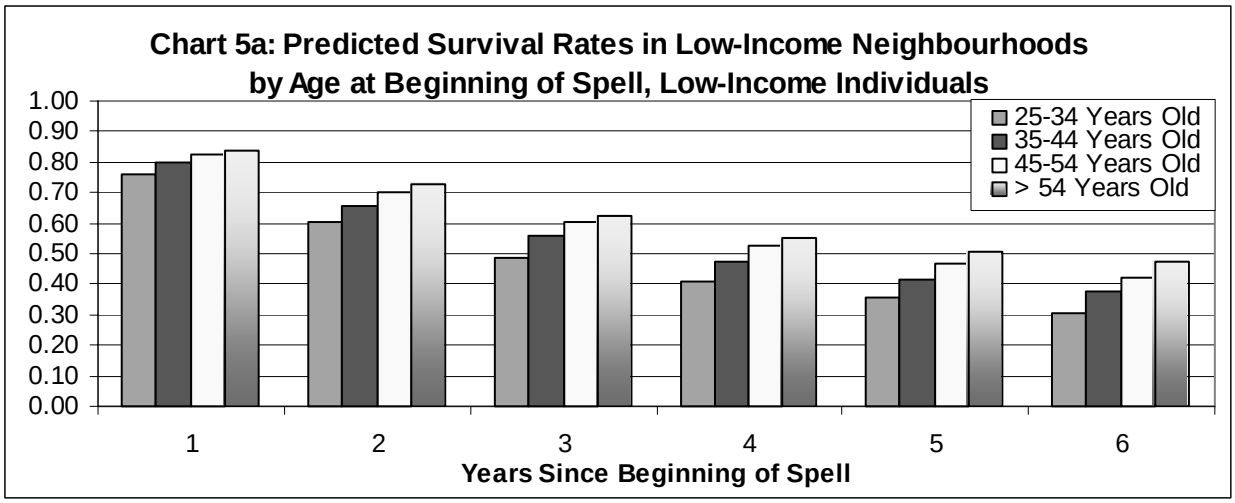
[38] Marsden (1987) finds that the educational attainment of social networks (groups of people that survey respondents discuss "important matters") is about twice as homogeneous as the general American population (as measured by the standard deviation of years of schooling). Furthermore, the social networks of individuals with less education are more closed (or denser), meaning that the members are more likely to have ties with each other. More dense networks are related to the availability of social support and to well-being (Fisher [1982], Kadushin [1982, 1983], and Burt [1986]). Although these findings say nothing about income, the strong positive correlation between education and income might suggest that people in social networks have relatively similarly income levels, and that social networks of lower income individuals are denser. As a result, low-income individuals may be less likely to exit low-income neighbourhoods, issues of cost barriers aside.



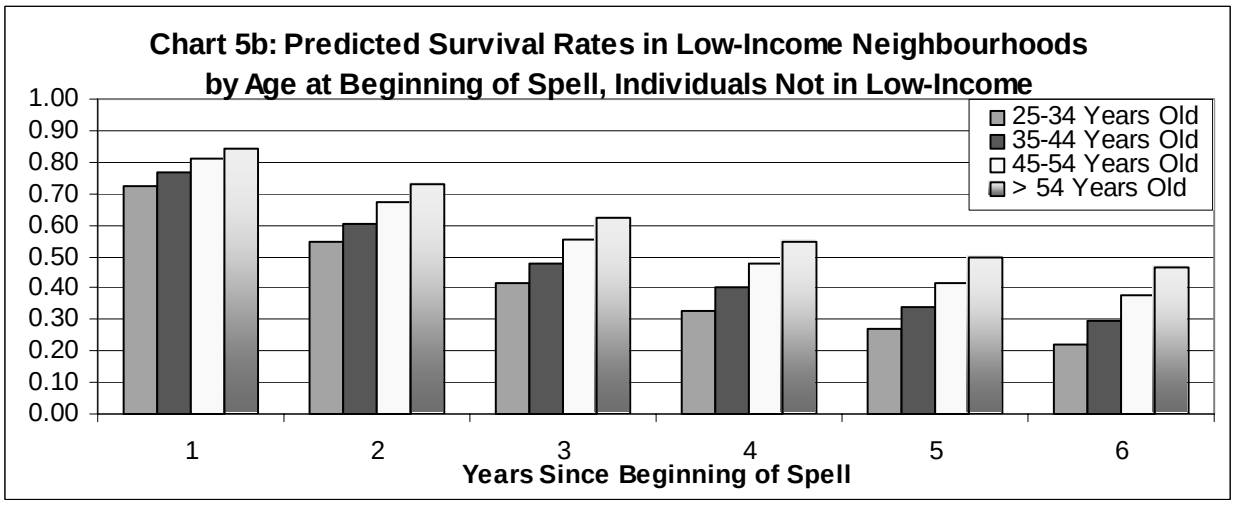
For individuals in low-income families, there are some differences worth noting by family type. Lone-parents and couples with children have median spell lengths of about five years. Unattached individuals and childless couples, on the other hand, have median spell lengths closer to four years. For non low-income individuals, there is virtually no difference by family type.

A priori, one might expect lower mobility among families with children. Parents may be less willing to move if their kids are attached to friends, or if the move requires their kids to attend a new school. On the other hand, if the parents believe that the neighbourhood may have detrimental effects on the social development of their kids, there may be a greater sense of urgency to move to a different neighbourhood. The evidence for non low-income people is certainly consistent with both of these effects cancelling each other out, or alternatively, neither effect matters.

How does spell length differ by age? To answer this question, we interacted the variables indicating age at the beginning of the spell with a low-income dummy variable. Starting with low-income individuals, we see that survival rates rise with age (Chart 5a). Among 25 to 34 year-olds, 30% of spells are ongoing in year six, compared to 47% among individuals above 54 years old. Median spell lengths range from 3.5 years (25 to 34 year olds) to 5.7 years (> 54 years old).



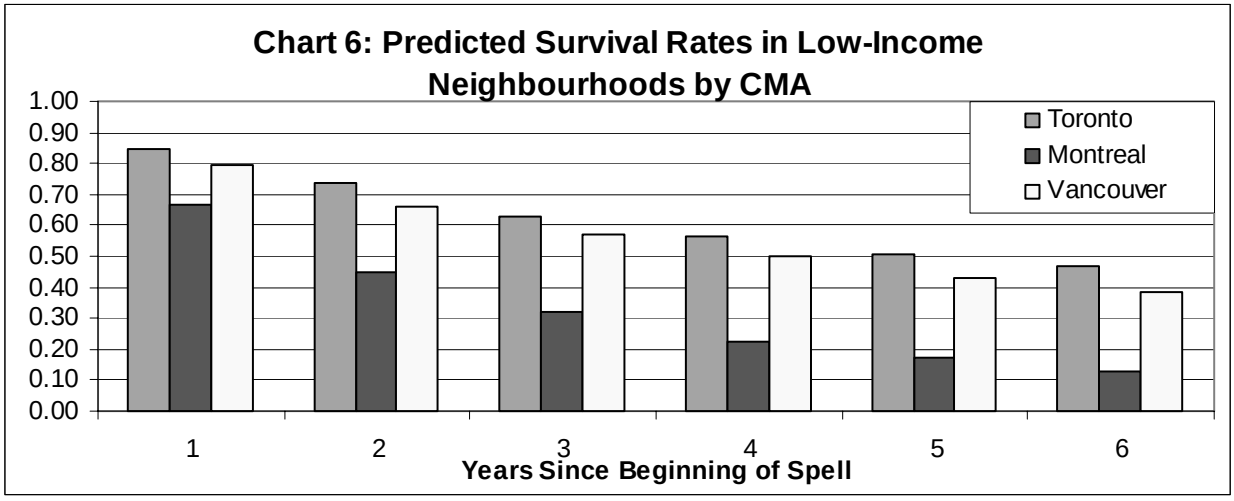
The story is quite the same for individuals not in low-income throughout the period (Chart 5b). It is interesting to note, however, that among individuals above 54 years old, differences by family income are slight: the median spell length for those in low-income throughout the period is 5.7 years, while for those not in low-income throughout the period, it is 5.5 years. For the younger age groups, there are more substantial differences in median spell length by low-income status.



How does spell length differ by CMA, and does this change over time? Recall that although Montreal has relatively more low-income neighbourhoods to move to than Toronto, about the same proportion of each city's population lives in a low-income neighbourhood. In Vancouver, relatively few people live in a low-income neighbourhood.

Almost one-half of low-income neighbourhood spells in Toronto are ongoing in year six (Chart 6). In Vancouver, about two in five spells last as long. In contrast, only about one in eight spells last as

long in Montreal. The median spell length in Montreal is 2.3 years, compared to 5.7 years in Toronto, and 4.5 years in Vancouver[39].



Why are low-income residential spells so much shorter in Montreal? The data suggest that it is the result of a higher level of neighbourhood-driven exits in Montreal. Although it is not clear why this would be, one possibility is that Montreal's low-income neighbourhoods are much more populous than Toronto and Vancouver's low-income neighbourhoods. For example, the average low-income neighbourhood in Montreal had 2,710 residents in 1996 (the mid-point in our data), compared to 5,750 in Toronto and 6,870 in Vancouver. Less populous neighbourhoods might be more susceptible to changing income status as a result of a small amount of in- and out-migration by its residents, or a slight economic improvement among its residents.

4.4 Neighbourhood Income after Leaving Low-Income Neighbourhoods

So far, we've treated all exits from low-income neighbourhoods as equals. This is not necessarily the case, as some destination neighbourhoods might still have a significant proportion of its residents living in low-income, while others may not. In this section, we examine the income class of the neighbourhood immediately following exit from a low-income neighbourhood. Although a longer outlook would be preferable, the span of the data period does not allow for such an analysis. Table 6 shows the low-income rate in the neighbourhood resided by low-income neighbourhood exiters immediately following their exit.

[39] The differences are much smaller in the raw data: 3.2 years in Montreal and 4.3 years in Toronto and Vancouver. These differences exist in spite of the greater job opportunities in Toronto and Vancouver, which the regressions address by controlling for local unemployment rates.

Table 6: Distribution of Neighbourhood Income Class Following Exit from Low-Income Neighbourhoods*

	Low-Income Rate in New Neighbourhood			
	30%-35%	20%-30%	10%-20%	<10%
Overall	0.369	0.363	0.235	0.034
	(0.108)	(0.361)	(0.447)	(0.084)
Family Income				
Low-Income*	0.393	0.412	0.180	0.015
LIM to LIM*1.5	0.418	0.374	0.188	0.020
LIM*1.5 to LIM*2	0.392	0.369	0.215	0.024
> LIM*2	0.324	0.323	0.298	0.055
Family Type				
Couples/Youngest Child < 6	0.344	0.364	0.257	0.036
Couples/Youngest Child >= 6	0.394	0.314	0.253	0.038
Couples without Children	0.348	0.344	0.262	0.047
Lone-Parents/Youngest Child < 6	0.319	0.460	0.199	0.018
Lone-Parents/Youngest Child >= 6	0.390	0.375	0.213	0.024
Unattached Individuals	0.380	0.391	0.205	0.025
Age				
25-34 Years Old	0.301	0.408	0.256	0.036
35-44 Years Old	0.362	0.372	0.233	0.032
45-54 Years Old	0.393	0.337	0.233	0.036
> 54 Years Old	0.465	0.298	0.206	0.029
CMA				
Toronto	0.307	0.394	0.269	0.030
Montreal	0.449	0.299	0.207	0.044
Vancouver	0.312	0.499	0.187	0.003
Sample Size	35,775			

* The numbers in parentheses are the proportions of the general population with similar neighbourhood income status (among those above 25 years old and living in a neighbourhood in Toronto, Montreal, or Vancouver where the low-income rate is less than 35%).

Overall, 37% of exiters were still living in neighbourhoods with a low-income rate of at least 30%. Almost three-quarters (73%) of exiters were in neighbourhoods with at least 20% low-income. Only a small minority (about 3%) reside in what we have been calling “high-income neighbourhoods” (fewer than 10% low-income). In contrast, only 11% of the general population lived in a neighbourhood with a low-income rate between 30% and 35% (among those in neighbourhoods with less than 35% low-income). It is very clear that individuals leaving low-income neighbourhoods have, by no means, assimilated with the rest of the population in terms of neighbourhood income status.

These results appear to be impervious to differences in family income, although individuals with family income greater than twice the low-income threshold have slightly more favourable neighbourhood outcomes following exit.

There is generally not much variation in the results by family type. The results by age show a much clearer trend: older low-income neighbourhood exiters are more likely to live in a neighbourhood that has at least 30% low-income (47% for individuals above 54 years old, compared to 30% for those between 25 and 34 years old). So, older individuals are less likely to exit low-income neighbourhoods, and conditional on doing so, their neighbourhood income status is still relatively low.

Recall that low-income neighbourhood spells in Montreal are generally much shorter than in Toronto and Vancouver. Table 6 adds quite a bit of perspective to this finding. Exiters in Montreal are substantially more likely to live in neighbourhoods with at least 30% low-income (45%, compared with 30% in Toronto, and 31% in Vancouver).

5. Conclusion

Previous work suggests that living in a low-income neighbourhood may have some negative social and economic repercussions, especially for children. Although the incidence of low-income neighbourhoods (and people living in them) has been well-documented in both Canada and the U.S., very little work has examined how long people remain in low-income neighbourhoods. This paper adds to our limited knowledge of this topic by using longitudinal tax data to study several issues related to the duration of residential spells in low-income neighbourhoods in Toronto, Montreal, and Vancouver in the 1990s.

The median spell length in low-income neighbourhoods is 3.8 years. About one-third of new spells end within two years after we observe the beginning of the spell. For others, however, living in a low-income neighbourhood is a longer term reality: about one-third of new spells are ongoing six years after we observe the start of the spell. In comparison, the median low-income spell length is only 1.9 years.

Previous research has shown that spells in low-income exhibit negative duration dependence: as time spent in the state increases, individuals become less likely to exit low-income. This result also holds for spells in low-income neighbourhoods, even after accounting for unobserved heterogeneity in a very flexible random effects model. An intuitive reason behind negative duration dependence in low-income neighbourhoods is that individuals may develop more social networks over time spent in the neighbourhood, and may thus be more likely to tolerate a weaker economic environment in exchange for social gains accrued from these networks. Of course, if finding a job is a barrier to exit, then the reasons for the negative duration dependence observed in low-income neighbourhood spells might be similar to those behind low-income spells (i.e. landing a job might become harder, the longer people have been away from the workforce).

We also investigate how residential spell lengths vary by socio-economic characteristics. Acquiring this knowledge has two advantages. From an academic point of view, differences in patterns by various groups may help us better understand the barriers to leaving low-income neighbourhoods.

This knowledge can in turn be used by policy-makers to better target urban planning policies (e.g. vis-à-vis subsidized housing).

To this end, four characteristics were examined: family income, family type, age, and city of residence. Among these, the largest differences in spell length were observed across age and city. Overall, the median spell length among those above 54 years old at the beginning of the spell was just under six years, which was almost twice that of individuals between 25 and 34 years old. Individuals in low-income neighbourhoods in Montreal generally have much shorter residential spells than their counterparts in Toronto and Vancouver. Median spells last 2.3 years in Montreal, compared to 5.7 years in Toronto, and 4.5 years in Vancouver.

Spell lengths also vary by family income and family type, but to a much lesser extent. Individuals in low-income families generally spend more time in low-income neighbourhoods. Their median spell length is 4.3 years, compared to 3.4 years for individuals with family income that is more than twice the low-income threshold. Among low-income individuals, lone-parents and couples with children generally spend more time in low-income neighbourhoods, compared with unattached individuals and childless couples (medians spells are roughly five and four years, respectively).

This paper has important implications for the literature on neighbourhood effects. If one believes the (mostly American) work suggesting that there are negative effects associated with lower neighbourhood income, then it is quite possible (although still untested) that more time spent in low-income neighbourhoods has even more detrimental social and economic effects. Our work suggests that the duration of spells in low-income neighbourhood is substantial for some, especially in comparison to low-income spells. On the other hand, residential spell lengths are highly dispersed, as many spells end within a couple of years. This might be one reason why neighbourhood effects are typically small, at least in comparison to family effects. As a result, a good avenue for future work in the neighbourhood effect literature would be to estimate the impact of long-term spells on the magnitude of negative outcomes.

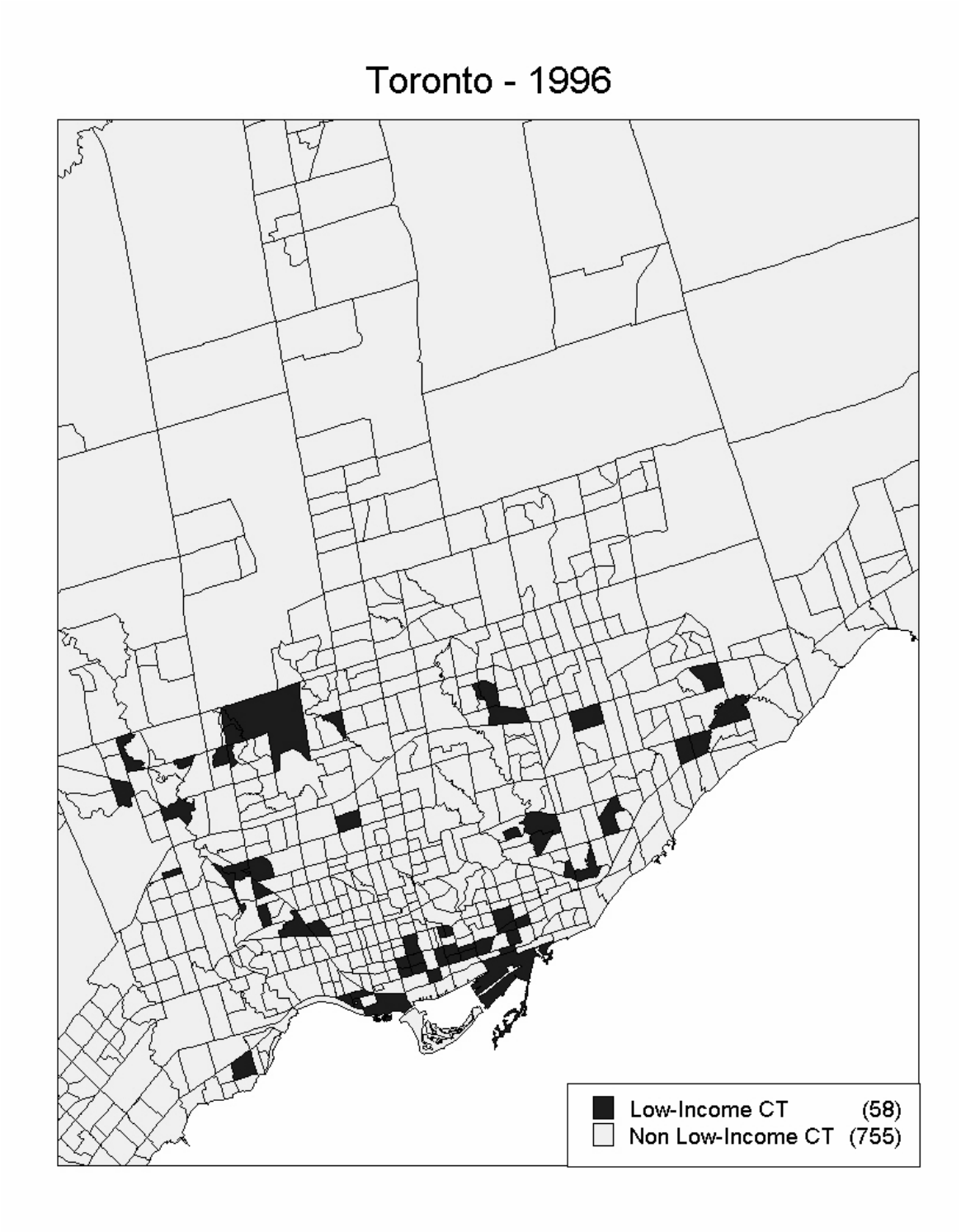
The study also provides policy-makers with important information. Previous research has indicated that low-income is generally a transient state, as most people generally spend no more than two or three years in that state. This study suggests that low-income does have a long-term *geographic* dimension associated with it. In particular, low-income individuals have a tendency to remain in low-income neighbourhoods for substantial lengths of time. This is especially the case among lone-parents. Taken together, this might imply a "double negative" effect for the children of these families. In other words, children growing up in low-income families with only one parent and living in a low-income neighbourhood may be disadvantaged by having fewer family *and* neighbourhood role models, relative to other children.

Policy-makers may also benefit from understanding the barriers to exiting low-income neighbourhoods. This study suggests that costs definitely seem like a strong candidate, as low-income individuals are less likely to exit. Social networks might also be a possibility. If social ties tend to increase over time spent in a neighbourhood, then individuals may be less likely to leave over time. The evidence of negative duration dependence is at least consistent with this notion. Focusing on immigrants may shed more light on the social networks theory. Immigrants tend to cluster in "enclaves", which are areas resided by groups of immigrants with similar ethnic or

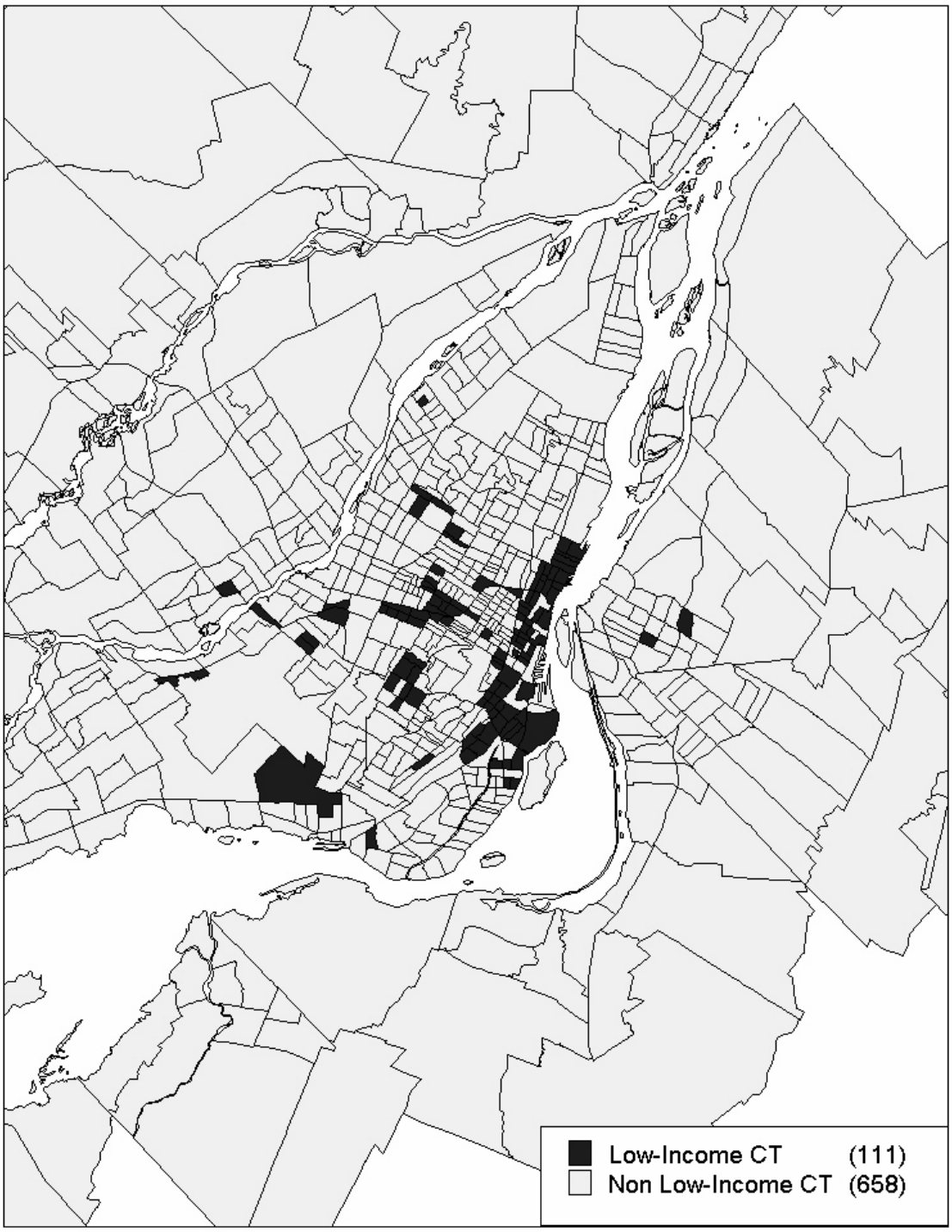
cultural backgrounds, where social support systems might be stronger for them. A more promising avenue of research would be to investigate the mobility patterns of immigrants in low-income neighbourhoods.

A. Appendix

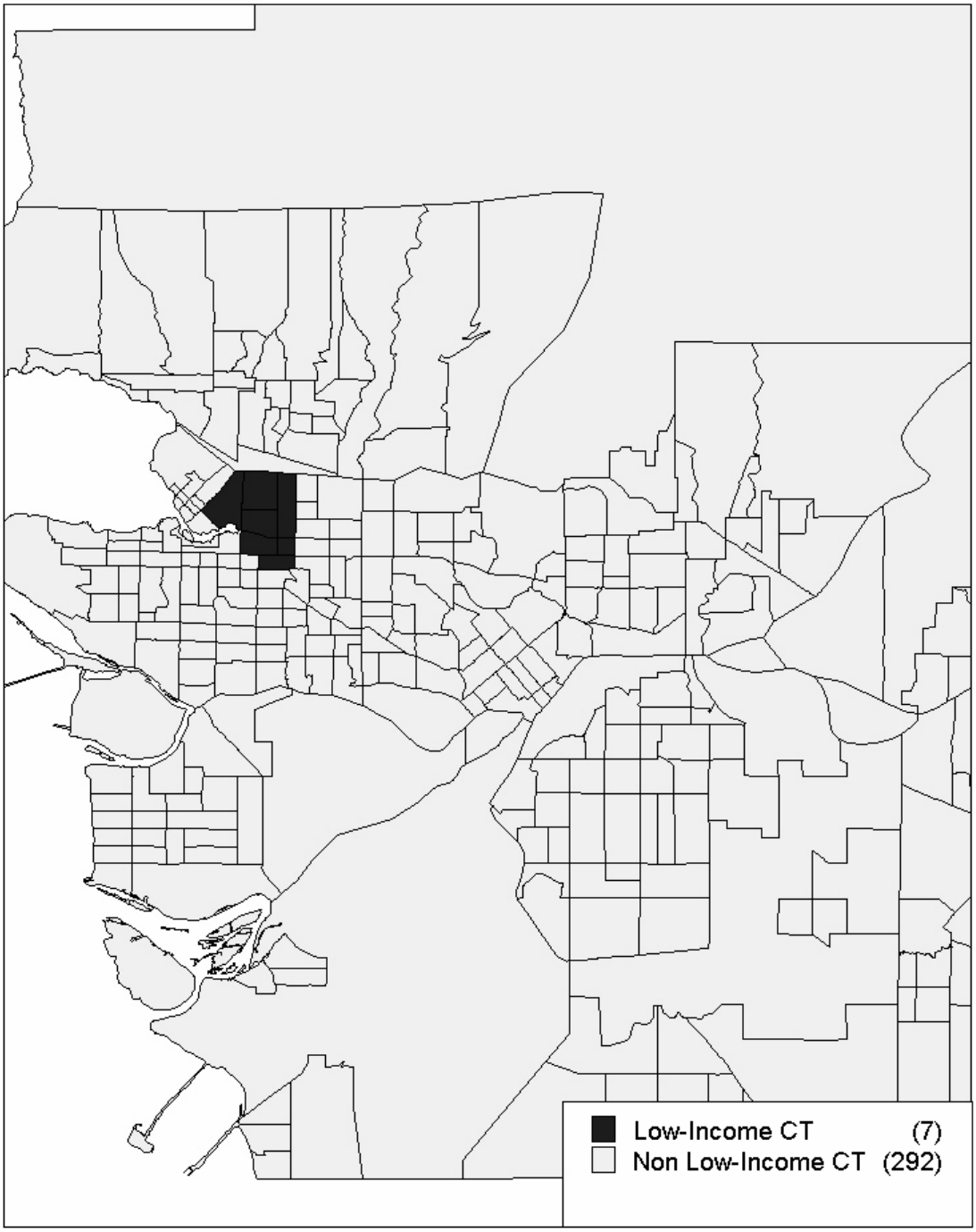
Appendix A: CMA Maps



Montreal - 1996



Vancouver - 1996



Appendix B: Median Spell Length

	Median Spell Length*,**
High-Income Neighbourhood Spells (Empirical)	6 or more
Low-Income Spells	1.89
Low-Income Neighbourhood Spells	
Overall	
Empirical	3.81
Predicted	3.79
Income	
Low-Income	4.29
LIM to LIM*1.5	3.97
LIM*1.5 to LIM*2	3.75
> LIM*2	3.44
Low-Income/Family Type	
Low-Income	
Couples with Children	4.85
Couples no Children	3.61
Lone-Parents	4.97
Unattached Individuals	4.06
Not Low-Income	
Couples with Children	3.70
Couples no Children	3.34
Lone-Parents	3.72
Unattached Individuals	3.71
Low-Income/Age at Beginning of Spell	
Low-Income	
25-34 Years Old	3.49
35-44 Years Old	4.22
45-54 Years Old	4.94
> 54 Years Old	5.74
Not Low-Income	
25-34 Years Old	2.88
35-44 Years Old	3.41
45-54 Years Old	4.21
> 54 Years Old	5.52
CMA	
Toronto	5.74
Montreal	2.33
Vancouver	4.51

* See the methodology section for specific details on how the medians were calculated.
** Unless otherwise stated, all numbers in this table refer to predicted values.

Appendix C: Low-Income Exit Models (Logit)

	Coeff.	z-stat
Year 2 of Spell	-0.5685	-73.01
Year 3 of Spell	-0.8686	-81.68
Year 4 of Spell	-1.0883	-73.91
Year 5 of Spell	-1.1169	-54.18
Year 6 of Spell	-1.2854	-38.30
Couple, Youngest Child Under 6	0.4935	46.04
Couple, Youngest Child 6 or Above	0.9083	98.21
Couple no Children	0.7232	74.86
Lone-Parent, Youngest Child Under 6	-0.7277	-34.98
Lone-Parent, Youngest Child 6 or Above	0.2192	18.00
Female	0.0082	1.26
35-44 Years Old	-0.2348	-26.75
45-54 Years Old	-0.2845	-27.80
55 Years Old or Above	-0.2159	-21.60
$Montreal_{-1}$	0.3232	28.15
$Vancouver_{-1}$	-0.0149	-1.73
Unemployment Rate (CMA-Year)	-0.0727	-29.30
Intercept	0.0086	0.42
Sample Size	488,980	
Log Likelihood	-303,398	

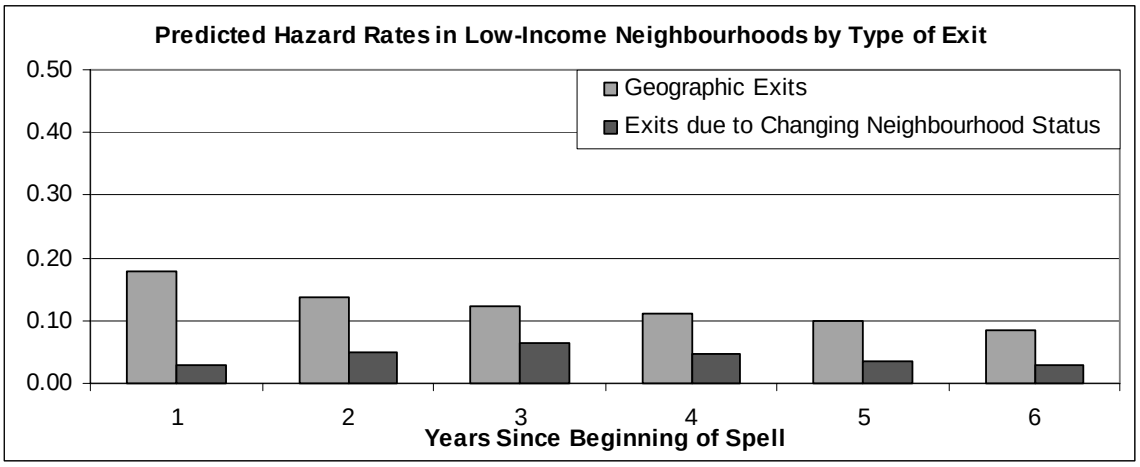
Appendix D: Exiting Low-Income Neighbourhoods: The Roles of Geographic Mobility and Changing Neighbourhood Status

The main focus of this paper has been to examine the exposure of individuals to low-income neighbourhoods. Whether people entered or exited low-income neighbourhoods in a physical sense, or their neighbourhood simply improved in an economic sense was of little concern. All that mattered was that people were in the state of living in a low-income neighbourhood for a given duration. In this appendix, we investigate the relative roles of geographic mobility and changing neighbourhood status in helping people escape low-income neighbourhoods.

The chart below shows the predicted hazard rates from a multinomial logit model, where there are three outcomes: no exit (the benchmark outcome), a geographic exit, and an exit due to a change in the neighbourhood status (see the table that follows for full model results). Despite the economic recovery of the late 1990s, people generally escaped low-income neighbourhoods (in a substantial way) by physically moving out, rather than through an economic resurgence in the neighbourhood. For example, 86% of exits in year one are caused by a physical exit. Although this number declines over time, it never falls below 65%.

Recall that our goal in tightening the entry and exit requirements was to limit the transitions to ones that are substantial. When we applied the simple 40% to transitions, the proportion of exits that were caused by changing neighbourhood status was far more substantial, but the number of exits caused

by geographic mobility was about the same. Our tighter restrictions thus increased the stability of neighbourhood income status over the period of study.



Low-Income Neighbourhood Exit Models (Multinomial Logit)

	Geographic Exit		Change in Neighbourhood Status	
	Coeff.	z-stat	Coeff.	z-stat
Year 2 of Spell	-0.2821	-17.02	0.5563	16.46
Year 3 of Spell	-0.4115	-19.83	0.8337	25.20
Year 4 of Spell	-0.5346	-19.54	0.4387	10.65
Year 5 of Spell	-0.6757	-17.19	0.1622	2.98
Year 6 of Spell	-0.8870	-13.61	-0.1312	-1.76
Couple, Youngest Child Under 6	-0.1574	-7.31	0.1724	3.94
Couple, Youngest Child 6 or Above	-0.0855	-4.18	0.4018	11.72
Couple no Children	0.1322	7.26	0.2220	6.84
Lone-Parent, Youngest Child Under 6	-0.1766	-4.57	-0.3667	-3.87
Lone-Parent, Youngest Child 6 or Above	-0.1071	-3.88	0.0633	1.30
Female	-0.0976	-7.04	0.0733	2.98
35-44 Years Old	-0.2853	-16.89	0.1490	4.04
45-54 Years Old	-0.5576	-26.45	0.1419	3.43
55 Years Old or Above	-0.9627	-46.42	0.3281	8.58
$Montreal_{-1}$	0.4187	15.13	3.4780	77.78
$Vancouver_{-1}$	0.2686	11.15	-1.1062	-7.37
Unemployment Rate (CMA-Year)	-0.0864	-14.63	-0.5917	-51.69
Intercept	-0.5194	-11.68	-0.8359	-11.04
Sample Size		188,175		
Log Likelihood		-103,891		

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