

THE IMPORTANCE OF DENSITY IN
THE HOUSING CHOICE PROCESS:
A MODEL

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To my family.

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ABSTRACT

Many large North American cities are becoming so spread out as to be unmanageable. This, to a great extent, is being caused by the low density residential phenomenon known as suburbia. Many householders have made a conscious choice to live in a low density suburban environment. The purpose of this investigation is to determine how important density criteria are to householders when they are purchasing a house. As space perceptions differ from person to person, householder characteristics play an important role in determining to whom density will be most important.

The literature pertaining to both density and housing choice provided the basis for this investigation. Synthesis of the literature findings yielded a model showing the importance of density in the housing choice process for householders of various characteristics. As the literature was predominantly American in origin, the validity of the model was tested with respect to Winnipeg, to check whether it was applicable to a Canadian city. Data gathered by CMHC in its 1974 Survey of Housing Units was utilized for this purpose.

Results of the literature review as well as the data analysis, confirmed that density plays an important role as one of the major criteria that a householder evaluates when he is purchasing a house. These results lead to the dilemma that many householders want more space when purchasing a home, at a time when a move to increase residential densities is being initiated.

...Solving the problem of the human habitat is one of the most pressing and confusing issues that faces us today. We are faced with the fantastic prospect of concentrations of population without a viable means of dealing with these numbers in terms of services and movement. At this moment in the state of our culture we can only make an effort to appreciate the state of things. The state of things is not what appears on the surface, but the very essence of what exists and how it is changing. For the designer of structures, buildings, or cities, this is a recognition of 'what the problem is' in its most profound respect. For creators of environment, knowing the problem is most of the way to the solution (Erickson, 1966: 29).

One of the foremost problems of cities today is that of providing housing for expanding populations; housing that fulfills residents' space requirements yet prevents the city from being so spread out as to be unmanageable. At the root of this problem lie housing densities and housing choice.

CHAPTER I

INTRODUCTION

1.1 Statement of Problem

The reasons why people buy a certain house give an indication as to what housing and residential neighbourhood attributes house buyers find most appealing. A density standard on which residential development is usually based, although only stated as a measure of dwelling units per acre, in many ways determines the character of a residential area.

This investigation will aim to determine whether or not the density of a residential area is considered by a house buyer in the house purchase decision. If it is, then what is its relative importance with respect to the other criteria evaluated by the housebuyer, and does this importance vary with differing buyer characteristics.

1.2 Importance of Problem

The term 'density' is a much discussed and misunderstood concept. Currently it is being blamed for the problems of many large North American cities. The low density of suburban areas is being investigated (Gans, 1968; Sewell, 1977; Porteous, 1977; Michelson, 1977) and in many cases termed resource inefficient as well as not offering the idyllic country life style that it purports to. As a result of the controversy, solutions to urban sprawl are being offered by increasing housing densities in new subdivisions. Whether or not these new forms of housing become viable

alternatives to the single family detached dwelling on a large lot, depends to a great extent on the house buying public's preferences. By investigating how important the ramifications of density are to the housebuyer, it can be determined whether the density of suburbia can be raised in order to preserve scarce land resources but still make residential areas appealing. With this information, planners can incorporate householders' residential area preferences into policies.

1.3 Definitions and Assumptions

Due to the complexity of the housing choice process, several definitions and assumptions will be made. The choice of a residence can result in the selection of a rental unit, condominium ownership or ownership of a single family detached dwelling unit. For the purposes of this investigation, only the process leading to the purchase of a single family detached dwelling will be considered.

Definition 1: The Housing Choice Process

The activities leading to the purchase of a single family detached dwelling unit by a householder.

Definition 2: The Householder¹

The member of a household who is purchasing a house; the household head.

The householder is the member of the household where household is defined as follows:

Definition 3: The Household

Any person or group of persons occupying a dwelling unit as their usual place of residence.

¹Although the householder in this analysis will always only be stated as a male, it is taken for granted that a householder may be either male or female.

The householder's specifications for a dwelling unit change throughout the period he is evaluating different homes but when he finally decides on a house, it is based on his final choice criteria (Hempel, 1970).

Definition 4: Final Choice Criteria

The reasons given by a householder for purchasing his dwelling unit.

The dwelling unit purchased, the housing choice outcome, is the result of the housing choice process.

Definition 5: Housing Choice Outcome

The characteristics of the house that is purchased.

Although only the specifications of the actual house that is bought are stipulated in the housing choice outcome, each residence is situated in a neighbourhood.

Definition 6: Neighbourhood

A segment of a residential area identifiable by similar house and lot sizes as well as street character.

Changes in housing choice criteria in many ways are tempered by the forces of the housing market. As Hempel (1970) states:

It is important to recognize that the actual purchase of a house could have resulted from a variety of compromises and adjustments by individual buyers and sellers. The outcome represented in each purchase is a function of complex interactions between the behaviour represented in the buying process and the housing alternatives available in the market (Hempel, 1970: 27).

Although the housing alternatives offered by the market are not limitless and not all consumers are completely satisfied with the home they purchase, the following assumption will be made.

Assumption 1: The House Purchased

The house purchased by the householder reflects a realization of buyer preferences and specifications.

Menchik (1970) investigated the relationship between preferences and actual choice criteria for housebuyers and found a correlation, although not a strong one. The relationship is not a strong one as, such factors as income, information as to housing opportunities and changes in preferences are acting on residential choice (Menchik, 1971: 57). However, the fact that a correlation exists is enough to justify Assumption 1. This assumption implies that the residence presently occupied by the householder satisfies his preferences and specifications.

A general city form will also be taken for granted.

Assumption 2: Housing Densities

Housing densities (dwelling units per acre) decline with increasing distance from the downtown area of the city.

This assumption has its basis with such theorists as Casetti (1967) who have derived an exponential formula that describes housing density as a function of the distance from the central city. Casetti (1967) states that such patterns are a result of residents making compromises between centrality and non-congested housing sites.

The applicability of the above two assumptions may vary from population to population and city to city. As most of the literature used in this study is based on housing choice surveys carried out in the United States applying it to the Canadian context may be problematical. In most cases, housing choice findings are applicable to the population that was surveyed as well as to another population of similar demographic characteristics.

Synthesis of housing choice findings determined in different surveys may also prove difficult. This is due to the fact that each survey, although collecting similar information, words the survey questions

differently, surveys a population that have lived in their homes for differing periods of time and have surveyed populations of different characteristics. These all lead to different findings. Because of this, findings, determined from the survey of the largest and most diverse populations will be given the most weight. Despite these limitations, this analysis will aim to produce a housing choice model that is widely applicable.

1.4 Research Method

Two main methods of research are used for this investigation:

- (a) Literature review
- (b) Data analysis.

The literature review includes all relevant sources pertaining to housing choice and density as well as a brief investigation of housing choice theory. A framework for the housing choice process is outlined and main housing selection factors defined. An analysis of householder characteristics is undertaken to investigate their effects on the housing choice process.

The succeeding chapter derives a definition of density applicable to this investigation and elaborates on various measures of density. From this definition, the ramifications of a density standard on a neighbourhood are determined and similarities between density and housing choice variables investigated. These similarities form the basis for a housing choice model which shows the relative importance of density to householders of differing characteristics in the housing choice process.

The second form of research undertaken is the utilization of data¹

¹The raw data is contained on a computer tape entitled 1974 Survey of Housing Units, available from CMHC.

collected by Central Mortgage and Housing Corporation in its 1974 Survey of Housing Units. This survey collected data from cities across Canada pertinent to an investigation of the importance of density in the housing choice process. Most of the variables discussed in the housing choice model are present in this data base. The results of the Winnipeg portion of this survey are used to test the validity of the housing choice model.

Conclusions are drawn as to the applicability of the model to Winnipeg and as to whether or not density plays a part in the housing choice process in this city. The implications of these findings and their applicability to planning are discussed.

CHAPTER 2

THE HOUSING CHOICE PROCESS

2.1 Introduction

Unlike the decision to buy most consumer products, the decision to buy a home is not made with the entire field of competitive products clearly in mind at the point of purchase...Most people looking seriously for a new home, however, spend a considerable amount of time on the market, often as long as a year or two, and thus the process of shopping for a new home rather strongly resembles the process of shopping for a husband or wife. Rather than sampling the entire field of competition and then returning to 'the best', people in the market for a home or a spouse tend to go from offering to offering until a selection is finally made. They typically start with an 'ideal image' of what they want but decide not to act until they have gained some expertise, possibly even rejecting the ideal if it appears too fast; and in the process of gaining this experience, the ideal image is usually revised downward to conform to the limits imposed on choice by income (Werthman et al., 1965: 9).

The housing choice process, as described above, is a very complex series of events resulting in probably the most costly purchase any consumer will make during his lifetime. Due to the magnitude and importance of such a purchase, many factors enter into the decision as to which house will be selected. This chapter will outline in general how the housing choice process functions.

In order to provide a theoretical framework for this process, the findings of a number of housing choice theorists will be investigated. The most appropriate of the theories looked at will be selected as a general framework for this investigation of the housing choice process. Having established this framework and shown its relevance to this investigation,

the importance of who the house buyer is, as defined in Definition 2, as the householder, be they male or female, will be investigated. Then the housing choice process itself will be looked at starting from before a householder starts to look for a house and has an ideal image of the residence he would like to buy, to the reasons given for the final house purchase decision. The reasons given by the householder for actually purchasing a house, final choice criteria, will be used as an indication of the factors that are most important to a house buyer. These criteria will then be defined and ordered in relative importance to provide a definite listing of housing choice criteria. The ordering of the importance of these criteria would not be realistic without investigating them in connection with the characteristics of the householder. Such variables as ethnicity, income, socio-economic status, and previous housing tenure of the householder affect the ranking in importance of housing choice criteria. Then it will be shown in which way buyer characteristics influence housing choice. Conclusions will then be drawn as to what householder characteristics appear to have the greatest influence on the ranking of housing choice criteria.

2.2 Historical Perspective: Housing Choice Theory

Just as the housing choice process evolves over the time that a consumer is looking for a house, the theory that aims to explain this behaviour has also changed over time. One of the best known housing choice theories is that based on the hypothesis that a specific house is bought, based on the criteria that its location minimizes the householder's journey to work. Kain (1975),¹ one proponent of this theory,

¹The first publication of this theory was in 1961.

suggests that workers with higher incomes will prefer to live at lower densities, i.e. more land surrounds each house, which costs less per unit measure of land the greater the distance from the city centre. Lower income people working in downtown areas will either accept high residential densities closer in, or commute long distances to obtain the housing they desire or can afford. Thus, according to this theory, the place of employment is the key factor in arranging the spatial distribution of households.

Specifically, this theory assumes that householders have to make compromises between journey to work and housing site expenditures, with the amount of compromise depending upon the householder's preferences for low density, the rate the cost of the journey to work increases with the distance from place of employment, the assumption that site rents decrease with distance from a householder's workplace and are high only when there are employment opportunities nearby, that there is a fixed workplace for all, and that residential space (land) is a superior good, so that if all other things are equal, a householder's consumption of residential space increases with increases in income (Kain, 1975). Using classic economic theory of utility maximization, which states that householders allocate their incomes among competing goods and services to maximize satisfaction from limited resources, the residential housing choice decision becomes a matter of selecting a house at a point in the city where total cost of location is minimized.

With urban land market theory as a base, this and other similar housing choice theories explain, to a certain degree, the array of housing types and their locations throughout a metropolitan area. However, they

do not provide a complete explanation of housing consumer behaviour (Stegman, 1969: 23). Findings from a national survey in the United States, entitled Moving Behaviour and Residential Choice, undertaken by the National Cooperative Highway Research Board (Butler, 1969) as interpreted by Stegman (1969), led to conclusions contrary to Kain's accessibility based residential location theory. The survey data suggested:

1. a large majority of families who have recently moved to the suburbs are more concerned with neighbourhood quality than with accessibility to other parts of the metropolitan area;
2. similar proportions of central core and suburban households own cars, invalidating the assumption that central core residents locate there to use public transportation to minimize travel costs;¹
3. a number of values usually ascribed to suburban families are shared by core area residents; and
4. in major metropolitan areas, freeways, and decentralized work and shopping facilities make basic urban services more accessible than to inner core residents (Stegman, 1969: 22).

This implies that a large number of suburban families do not have to give up accessibility to work and shopping for savings in location rent. It is possible for them to have both.

Discrepancies, such as the one described above, are avoided by other theories of residential location. Chapin (1968) suggests using residential area resident's activity patterns, particularly those that relate to the way in which people use city space and community facilities, as an anchor for housing choice theory. This view means giving up the general macro view of the journey to work minimization theory in order to consider the level of the householder, where activities and preferences

¹This statement is only applicable to those cities that were surveyed.

unique to individuals become important in the residential location decision process.

Chapin (1968) argues that the key to understanding human settlements and the ways in which they evolve can be found in studying the activity patterns of urban residents in order to see how human satisfactions and dissatisfactions affect choices in activities. Those activity patterns that relate to the way in which people use city space and community facilities affect their choice of residence. Under this activity system based theory, a choice of a place of residence may involve social accessibility considerations but in addition is usually more centrally concerned with accessibility opportunities (time-distance to activity centres) and with livability opportunities (sought after living qualities) (Chapin, 1968).

Chapin (1965) has outlined a conceptual framework for developing this theory. He sees the location decision of a householder as being conditioned by:

1. the scope of choice and intensity of residential development prescribed in the general plan and by zoning regulations;
2. what the producer offers--not only the type of shelter package and the price, but also the accessibility the site offers to major employment centres, schools, and shopping, and the proximity of the site to utilities and thoroughfares;
3. what the household purse allows;
4. what the household activity patterns call for; and
5. what the taste norms of the household dictate (Chapin, 1965: 121).

Michelson et al. (1973) refers to the work of Wendel Bell to describe a current theory consistent with that of Chapin's activity system housing choice model. According to Bell, people rationally assess their

own characteristics and the activities they prefer. From this analysis they choose a place to live which aims to satisfy these needs. In effect, housing choice is a matter of weighting attributes of any residential house and its location to see if it satisfies a householder's preferences.

This model of satisfaction of preferences will be used as a general framework for analyzing the housing choice process. As Moriarty (1974) points out, in many cases, more than one housing choice theory may be applied in each housing choice situation, but one form of consideration, e.g. journey to work, may be more important than another, e.g. social accessibility preference. An attempt will be made in this investigation to determine the relative importance of the large variety of considerations involved in choosing a house.

2.3 The Housing Choice Process

The most fundamental clarification that must be made when dealing with the housing choice process, is to define who is buying the house; who, a male or female makes the decision whether or not to buy the house, and what are the differences between the two sexes when it comes to housing criteria importance. Michelson et al. (1973) in a study of residential selection by married couples concentrated mainly on the wives' viewpoints.

Wives appear at face value to assess alternatives in the selection process rationally, to be aware of limitations in housing and location they will experience and to have expectations about behavioural changes consistent with the degree of change represented by their destination environments (Michelson et al, 1973: 189).

When the viewpoints of the husbands and wives were compared, general agreement was most pronounced concerning the importance of the following factors in the house buying decision: size and layout of the housing unit, number

of bedrooms and bathrooms, immediate exterior setting, preference for ownership, accessibility to recreation and other facilities. Areas where agreement was less pronounced include facilities for children, in-home equipment, and the size of the kitchen. Husbands cite fiscal matters as being important considerations when buying a house, whereas wives do not (Michelson et al., 1973: 195).

According to Hempel (1970), husbands and wives give similar, but not identical, answers to questions regarding home buying behaviour. In general, this study found that both the husband and the wife gave similar accounts of the factual aspects of the home buying process, such as the family's satisfaction with their home and its surrounding neighbourhood. However, as already mentioned, Michelson et al. (1973) found that some differences exist when dealing with specific reasons as to why they purchased a particular home, although the rank order of criteria is similar.

Since the general ranking of the criteria used in buying a house is similar for husbands and wives, in the subsequent portions of this paper the following assumption will be made.

Assumption 3: The Sex of the Householder

The effect of the sex of the householder on the ranking of housing choice criteria is insignificant when compared to the effects of other householder characteristics.

The householder, when deciding on which house to buy, enters a very complex process. The choice and subsequent purchase of a house is a process with unique considerations, making it quite different from buying consumer goods, such as food or clothing. Some characteristics which distinguish the house purchasing decision from other purchasing decisions are that houses are:

1. durable consumer assets;
2. subject to regular upkeep and maintenance costs of money and time;
3. heterogeneous in nature;
4. subject to resale potential and continual market appraisal; and
5. usually the largest single item purchased during an individual's lifetime (Carvalho et al., 1974: 28).

Because of the large cost involved in purchasing a house, it is not possible to isolate the decision to purchase from the ability to finance. The householder must simultaneously purchase housing and financial services.

Aside from the variable of who the buyer is, most authors have reduced the housing choice process to a function of several variables. Hempel (1970) feels that the outcome of the buying process can be seen as a function of constraints, prior knowledge, and the information that has been acquired during the buying process. These three factors are also influenced significantly by information flows at various points in time. Rossi (1955) views the selection of a new house as being the result of three types of information: each householder is viewed as facing the housing choice process with a certain set of specifications in mind, employing certain sources of information from which knowledge can be obtained about available housing opportunities, and with the knowledge of a particular dwelling's attractions (Rossi, 1955: 152). Moriarty (1974) also feels that one of the main factors governing residential locational choice is the evaluation by the householder of an area's attractiveness. Householders judge these attributes against their preferences and rank residential areas on the basis of the attractiveness of the attributes (Moriarty,

1974: 453).

A more complex view of this house selection process is taken by Butler (1969). He sees the housing choice process as being a process of residential mobility composed of two linked yet distinct decisions: a decision to move and a decision to acquire a certain dwelling. The first decision is activated by 'push factors'; those factors that cause the householder to search for a new residence. Once a search is started, a second set of factors called 'pull factors' becomes important; those facilities and qualities it seeks in a new house.¹

...The second decision--dwelling choice--is the classic one where the household[er] makes tradeoffs among the opportunities available in the form of housing choices (Butler, 1969: 8).

Moriarty (1974) deals in terms of the selection of a neighbourhood and Rossi (1955) in terms of the choice of a particular dwelling. In fact, the choice of a house implies the choice of a community, as every house is in a community or neighbourhood. These two facets, housing and neighbourhood choice, are interrelated and both considered in the housing choice process. The relative importance of these two criteria as well as more specific attributes of both the house and its location change throughout the housing choice process. This process will be investigated in two stages as delineated by:

1. Initial 'dream home' criteria; and
2. Final choice criteria.

Initial 'dream home' criteria apply to those factors that householders state as being important in choosing a house before they actually start looking,

¹When discussing Butler (1969), the reasons for moving will be dealt with as a characteristic of the householder. Householder characteristics will be discussed in a subsequent portion of this chapter.

or very early in the search process before their 'ideal image' has been tempered by information of the market place. Final choice criteria refer to those reasons given for the actual purchase of a home.

Buyers develop definite preferences for various housing features, but these preferences may not be represented fully in the specifications which are expressed by the buyer (Hempel, 1970: 103). Rossi (1955) agrees with this and states that many householders make tacit assumptions about the house they would like to buy, and do not mention these assumptions as criteria. In Rossi's (1955: 155) study, he found that most prospective home buyers did not state whether they wanted to buy or rent, what cost range they could afford, or in what area of the city they wanted accommodation, although all these decisions had been made.

This is just one of the shortcomings that must be kept in mind when analyzing housing choice survey data. Another factor of major importance is that surveys taken after a house has been purchased may not accurately reflect buyers' initial preferences or final choice criteria because householders' attitudes may have changed during the period of time that they have lived in their new house. Despite these shortcomings, an indication of trends can be determined from the following investigation of 'dream home' criteria.

In answer to the question: "What were the important things you had in mind about a place when you were looking around?", Rossi (1955) found that specific dwelling unit attributes: space dimensions and design requirements (heating, layout, utilities) were by far the most important. Next in importance, with only half as many respondents citing it as the above, was location of the house, and even fewer cited costs (rent,

maintenance or purchase price), as being important (Rossi, 1955: 154). Hempel (1970) asked similar open ended questions: "What type of houses did you and your family consider to be particularly desirable when you were looking for a new residence?", and "What sort of neighbourhood did you and your family consider to be particularly desirable when you were looking for a new residence?" (Hempel, 1970; 117). He, too, found that of prime importance were such housing attributes as: architectural style, and the number of bedrooms, with neighbourhood attributes, such as quiet, private and suburban location being second. The main difference between Rossi's and Hempel's findings is that in Hempel's study, no mention of housing costs was made. Hempel accounts for this by stating that the cost range in which householders were looking for a house was taken as a tacit assumption and did not need to be mentioned.

Paxton's (1955) findings show the price of the house to be of slightly more importance than did both Rossi and Hempel. His data was gathered from responses to the question: "When you first started out to find a house, what kind of place were you looking for?" (Paxton, 1955: 13). The greatest portion of the householders were interested in location, followed by price and size of house. This is slightly different to the previous findings mentioned. Differences in the length of time that the respondents had resided in their new homes prior to being interviewed may account for this discrepancy.

As can be seen from the above findings, before a house is actually bought, the householder feels that the house size and design are of prime importance, followed by the location. The order of importance of these criteria shifts when evaluated after a house has been bought, i.e. what

were the reasons for actually buying a specific house? Hempel (1970) found, in response to the question: "Why was your present home chosen over all of the other housing units which you considered?" (Hempel, 1970: 130), that when the house is finally bought the tacit assumption of selecting a dwelling in a certain price range, becomes important. In response to the above question most respondents stated financial considerations, such as housing price and availability of financing, as being of prime importance. Next in importance was location followed by size or space attributes of the house and then features of the house. Neighbourhood attractions that were second in importance at the start of the housing choice process become the least in importance when reasons for actually purchasing a house are given.

Rossi's (1955) findings concur with those of Hempel. When respondents were looking for a house they mentioned space in the dwelling, particular dwelling design features, dwelling location and cost as being important, in the stated order. However, in the actual choice of the house, costs were the major consideration, followed by space, location and neighbourhood (Rossi, 1955: 9). Rossi goes on to state that:

...Apparently, the most important attribute of a dwelling is its dimensions, but then if two or more dwellings of roughly equal size are considered, the cheaper one is finally chosen. Costs are the 'clinching' factor in the choice point of housing selection (Rossi, 1955: 9).

Although Hempel and Rossi agree on the four main factors that are important to the householder in choosing a house, they differ in their evaluation of their relative importance. As Hempel and Rossi both deal with fairly specific populations, this discrepancy is understandable. In order to rank these criteria for more than just a specific population,

Butler (1969) provides an analysis of the housing choice process as evaluated by a survey of forty-three metropolitan areas of over fourteen hundred respondents in the United States. This sample is large and diverse enough to provide a general ranking of the four major reasons for house purchase. Butler found cost to be 'very important' for most people, followed by the dwelling unit itself, the general location and the lot or grounds (Butler, 1969: 72). The house purchase decision as discussed here is conceptualized in Figure 1.

The above findings indicate that over a large population, the house purchase decision is based on an evaluation of cost, the dwelling unit itself, the general location and the lot, listed in descending order of importance. In order to use these four criteria as the basis for a model of housing choice, each criterion must be specifically defined.

2.3.1 Definition of Final Choice Criteria¹

The most important criterion evaluated before a house is purchased is its cost.

Definition 7: Cost

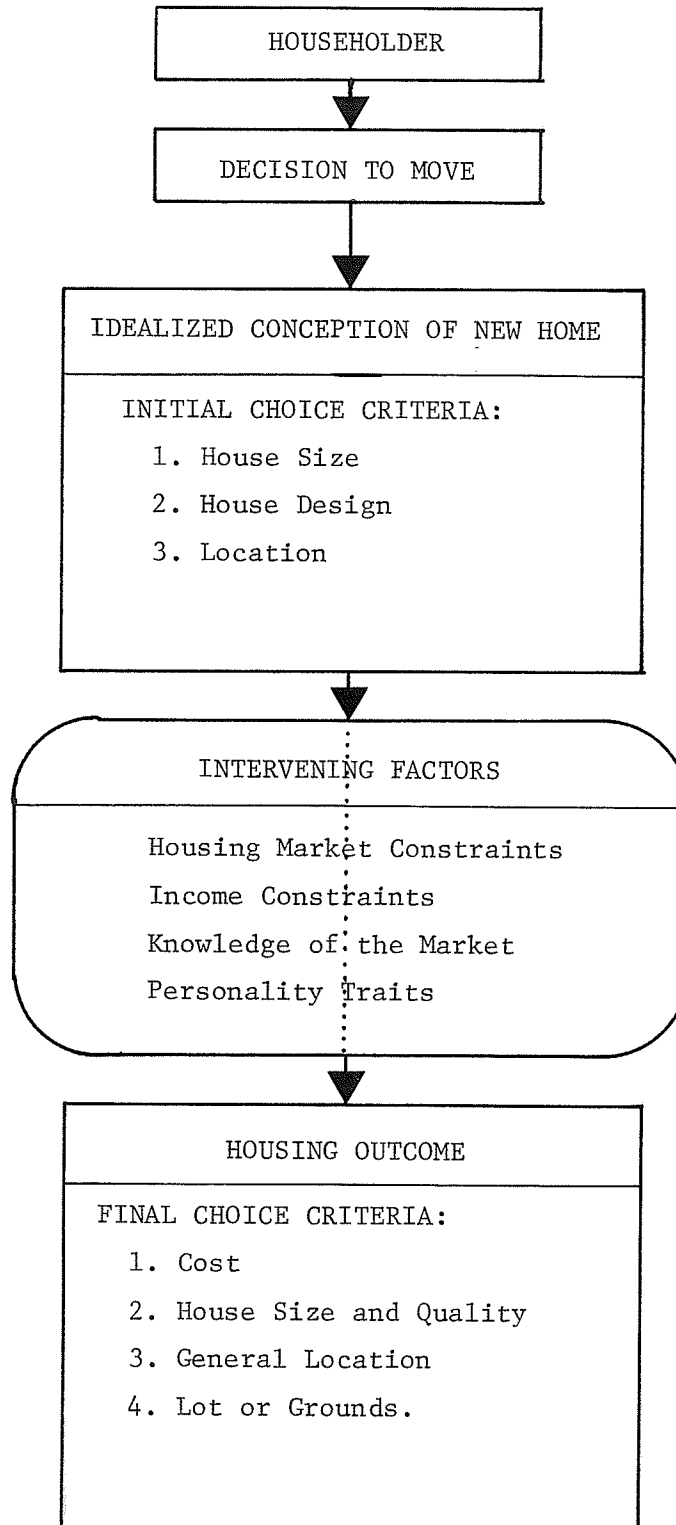
The purchase price of the house that is bought.

¹The definitions of the final choice criteria are derived from a synthesis of the literature (Hempel, 1970; Butler, 1969; Rossi, 1955), keeping in mind the selection given to respondents in the CMHC 1974 survey of housing units against which the housing choice model will be tested. The CMHC survey provided respondents with the following list as responses to the question "Which of these were the TWO most important reasons for selecting this particular dwelling?"

1. satisfied the need for less space
2. satisfied the need for more space
3. neighbourhood conditions
4. quality of the unit
5. closer to transportation, work, services, friends, etc.
6. satisfactory financial arrangements
7. & 8. Other. (Central Mortgage and Housing Corp., 1974a: 17)

Figure 1.

Conceptualization of the
Housing Choice Process



Included in this definition is the fact that because of the large cost of purchasing a house, the acceptance of the price of the house includes the ability to finance the purchase (Carvalho, 1974: 28).

Definition 8: The dwelling unit

- (a) The overall quality of the unit.
- (b) The size of the house in terms of number of rooms.

The overall quality of the dwelling unit refers to such factors as the condition of the home as well as its quality of construction. Number of rooms in the house is a measure of the space in a dwelling unit.

Definition 9: General Location

- (a) Neighbourhood condition/reputation.
- (b) Accessibility: time-distance to transportation, services, and friends.
- (c) Time-distance to work.
- (d) Central city or not central city.

Neighbourhood condition/reputation refers to such factors as immediate neighbours, a neighbourhood's reputation for trouble and the general appearance of the area in which the house is located. Accessibility in terms of a householder's description of time-distance, is divided into two parts to see if the theory of nearness to work reason for choosing a house is as important as some theorists (Kain, 1975) indicate. Although most surveys use an accessibility measure that is described by the respondent, Butler (1969) mentions:

...the possibility exists that any objective measure of time-distance between place of residence and, for example, place of work might vary from the subjectively derived measure of how households perceive relative and actual distances (Butler, 1969: 44).

Definition 10: Lot or grounds

- (a) Lot size/yard size.

Lot size cannot be measured in terms of square feet as respondents do

not indicate the size of lot they require, rather it is a relative measurement of whether they want a larger or smaller lot. Yard size can be determined by the house location on the lot, the lot size as well as the relationship between the house and lot size.

2.3.2 Influence of Householder Characteristics on Ordering of Final Choice Criteria

The four main categories of final choice criteria as defined above (Definitions 7 - 10) can be applied to most heterogeneous population groups. However, when dealing with a specific population with unique characteristics, the ordering of these factors will vary. In order to determine the extent of this effect, householder characteristics will be examined to see which characteristics are the most influential in altering the order of the four main housing choice criteria: cost, the dwelling unit itself, general location and lot.

It is hypothesized that different people perceive and evaluate the same segment of the urban residential environment differently. Two logical questions arise from this simple hypothesis. How do these perceptions and evaluations differ? And what factors explain the variation? Answers to these questions are complicated by the fact that persons often have difficulty in articulating ideas associated with their perception and evaluation of urban residential factors. Perceptions vary not only by going from one specific residential characteristic to another but change also with changes in one's attitudes, expectations, his needs, and values (Ermuth, 1974: 4).

People's attitudes, expectations, needs, and values are to a large extent determined by one's socio-economic status. Hinshaw (1973) hypothesized that environmental preferences would vary according to factors such as socio-economic status, stage in family life-cycle, educational level, age, occupational expectations, race or ethnicity and life experiences. He limited his study by attempting to keep educational level, geographic location, age

and general occupational expectations relatively constant. His sample was of freshman students who had not yet entered the housing market. He found that there were definite differences in preferences towards housing amongst respondents from various ethnic, racial and income groupings. However, he found little differences in housing preferences among respondents currently living in different housing types.

This finding is disputed by Michelson (1977). His research, based on families already living in their own accommodation, either owning or renting apartments/houses in either suburban or downtown locations, found that significant differences were evident in the way each of these groups evaluated housing. Each respondent was asked to evaluate a good place to live by indicating the relative importance of the dwelling unit, the location and the neighbourhood. Those living downtown rated location as the most salient of the three dimensions. Those in suburbia, regardless of housing type, placed the dwelling unit first (Michelson, 1977: 284).

Hinshaw (1973) as well as Michelson (1977) held stage in family life cycle constant over the population that they surveyed. This variable is very important in explaining difference in housing requirements and therefore housing choice. Yeates (1971) sees the stage in the life cycle of the householder as being important to the residential location decision three ways:

1. as an individual passes through the life cycle, house type and physical location that is optimally required varies;
2. most of residential locational decisions are made by the heads of the family in accordance with their perception of the requirements of the family; and
3. length of each stage in the life cycle varies (Yeates, 1971: 246).

Over different stages of the life cycle the family has differing housing

requirements but there is a wide contradictory variation in patterns of housing among households at similar stages in the life cycle (Murie, 1974: 114).

These differences may be accounted for by social class and life style which are both affected by income. Income may help to explain why a householder does not choose a particular house but it does not go far in explaining what people actually select (Michelson, 1977: 135). Higher social classes appear to demand better quality housing than lower social classes. A rise in social standing may be associated with a change in residential location (Yeates, 1971: 247). Life style/style of life may also influence residential location, but the degree to which this determines a residential locational decision often depends very much on the stage in life cycle and income.

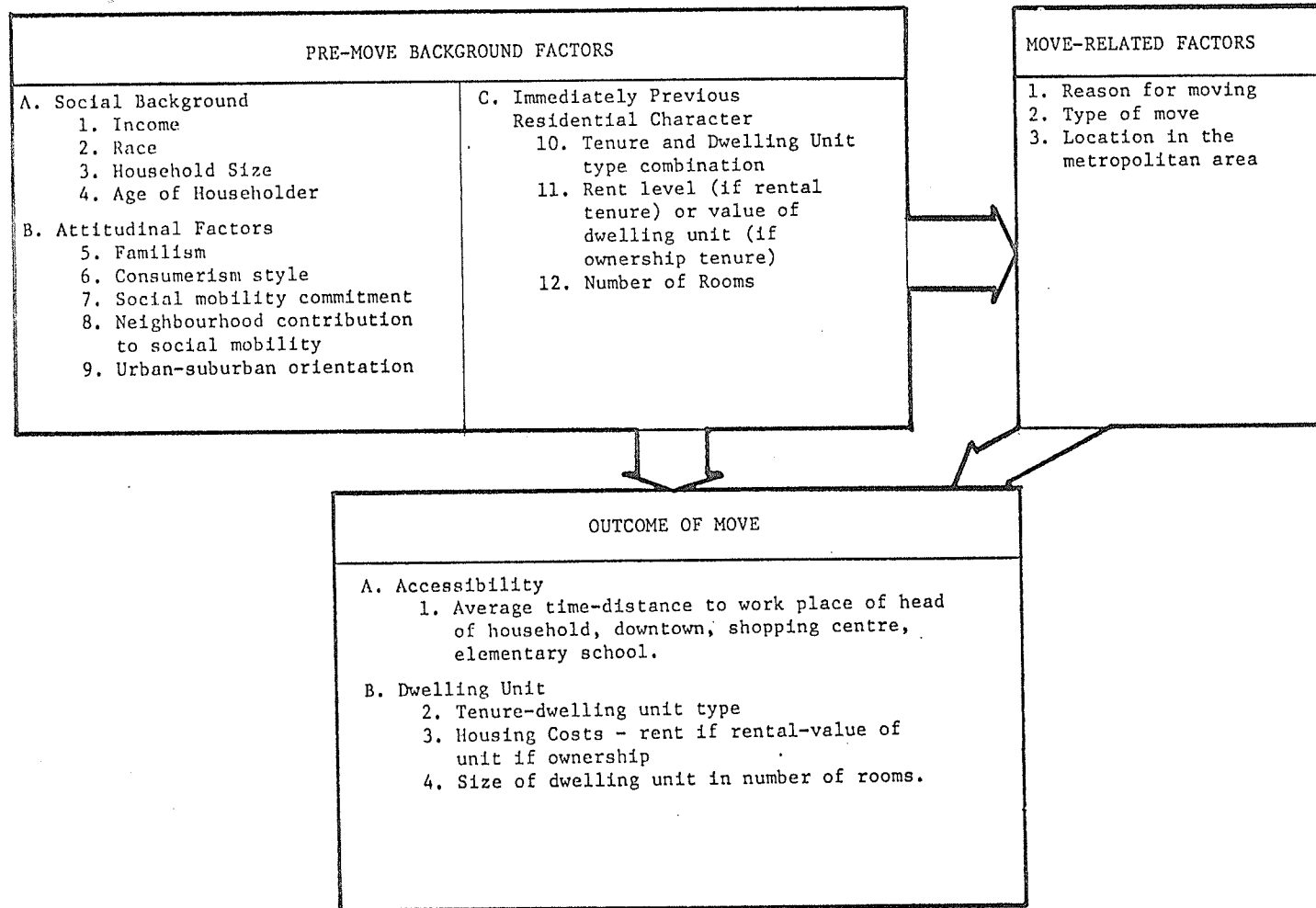
Butler (1969) views the differences in people's criteria for selecting a house as stemming from two sets of variables. These two sets determine the third set; the outcome of the move. These three sets are:

1. premove background factors which describe the social background characteristics and attitudinal characteristics of the household and its immediate residential accommodations;
2. move-related factors; consisting of type of move and general location in the metropolitan area; and
3. the outcome of the move in terms of housing accommodations and accessibility (Butler, 1969: 75).

Although the third set of variables is of most importance, it is the first set which contains the basic predictors of the outcome of the move, and the second set, although being dependent on the first group, also helps to predict what house will be chosen. The conceptualization of the relationships between these three variable sets can be seen in Figure 2. The premove

Figure 2

Factors Influencing the Outcome of the Move



(Source: Butler, 1969: 78)

background and move-related factors influence the outcome of the move in terms of the house's location and characteristics. In order to determine which specific variables in sets 1. and 2. most affect the outcome of the move, an investigation of Butler's (1969: 79) findings was carried out. Of all the predictors, income has the highest index of association with the most move outcome characteristics. It is important in determining housing location, tenure and housing unit type, number of rooms in the housing unit and housing costs. Race is of moderate importance in all facets of the move outcome. The only other social background factor of any significance is that of the household size in determining the number of rooms in the housing unit. The attitudinal characteristics of the householder as listed in Figure 2 have very little bearing on the outcome of the housing choice process and therefore will not be discussed. However, previous tenure and dwelling unit type have a significant effect on future tenure and housing type. Although previous rent is a very important factor in predicting present rent, since only home buyers are being considered in this investigation, previous rent will only be used as a predictor for future value of housing unit. Value of the previous residence and its number of rooms are good indicators of the same characteristics of the new home. The final background characteristic, according to Butler's findings, of importance in determining future housing choice, is previous location in the metropolitan area. It is important in the prediction of future tenure and housing unit type as well as housing unit value. As determined from Butler's (1969) survey, the householder's age/family life cycle stage is a good predictor of whether or not a householder will move, but is of little significance in determining actual housing choice

outcome. This finding is disputed by Hinshaw (1973), Michelson (1977), Yeates (1971), and Menchik (1971). These authors state that the age of the householder is important in determining the characteristics of the house that is bought. Hence age of the householder will be considered as a predictor variable.

From this analysis, the following householder characteristics¹ will be analyzed as having the most effect on the ordering of the four main housing choice criteria.

1. household income
2. race of householder
3. household size
4. previous tenure and dwelling unit type
5. previous rent
6. value of previous residence
7. number of rooms in previous residence
8. location in the metropolitan area
9. age of householder.

Due to the large differences in housing studies that have been discussed in this analysis, a synthesis of findings in this area is difficult. Although some contradictions between the authors' (Hinshaw, 1973; Michelson, 1977; Yeates, 1971; Murie, 1974; Butler, 1969) findings exist, due to the comprehensiveness of Butler's study (and general agreement with other studies) most weight will be placed on his findings, and the above list of householder characteristics will be analyzed and their effect diagrammed in a model (Chapter 4).

Having determined what householder characteristics have the greatest effect on housing choice process, it will now be investigated as to how exactly this effect becomes apparent. For completeness, three housing choice

¹A complete definition of these variables will be given in Chapter 4.

studies will be investigated: Werthman et al. (1965), Planning and the Purchase Decision: Why People Buy in Planned Communities; Hempel (1970), A Comparative Study of the Home Buying Process in Two Connecticut Housing Markets; and Butler (1969), Moving Behaviour and Residential Choice, again with the most weight being given to the Butler study for the aforementioned reasons. An attempt will be made to account for contradictions between findings.

Werthman et al. (1965) investigated the criteria used to select new homes in four new planned communities that catered to upper working, middle, upper middle and wealthy class people. The relative weights of what these buyers stated were necessary conditions for the purchase of their new homes were assessed over four socio-economic classes: upper working, middle, upper middle, and wealthy upper middle. It is evident from Werthman's (1965: 224-226) findings that factors that are important to one socio-economic class are not important to another. The upper working class were most interested in 'more space for the money' as were the middle class buyers, but more interested in a good investment than those with a higher income. Middle class buyers focus is entirely different, with architectural merit of the home being of most importance. The focus shifts again, where the wealthy upper middle class bought for the natural attractiveness of the area. This group is not very concerned about the price of their home, being more interested in the area's amenities.

Hempel's (1970) findings appear slightly different from those of Werthman. Hempel surveyed two areas during two different time periods, but during the same portion of the year (those that had registered deeds between January and July 1967, and January and July 1968), random sampling new home

purchasers. From the demographic data of the populations sampled in Hartford and southeastern Connecticut (Hempel, 1970: 34-35), it can be seen that the Hartford sample is slightly older, better educated and having a higher income than those from southeastern Connecticut. When using this information, and looking at the major reasons of home purchase in the two areas, it appears that the higher income group's major reason for the choice of a particular home was financial considerations, mainly price. The Hartford buyers also felt that the house that they chose was 'better in price' than the other houses that they had considered. The southeastern residents selected their homes more for location and size of home and lot reasons, than for price. In general their homes were cheaper, mean price \$22,400 compared with \$25,500 for the Hartford residents. This can be explained by two factors: their families are somewhat larger, therefore they require more space and can afford this space less. As well as being of lower income, the southeastern residents are slightly younger and have less equity tied up in a house as many are first buyers.

As indicated, there are differences between Hempel's and Werthman's findings. Hempel's findings show that financial considerations are the main reasons that the higher income buyers selected their homes over the others that they considered. According to Werthman, the opposite is true. These discrepancies may be accounted for by the different ways in which the populations were surveyed, as well as Werthman's very broad categorization of the population. What is important to note is that different populations do not place the same importance on certain housing choice criteria.

This phenomenon becomes even more noticeable when studying Butler's

(1969) results. These results can best be shown by investigating portions of his findings (Butler, 1969: 82-95). Butler (1969) uses householder characteristics as predictor variables for the outcome of the housing choice process. Using Assumption 1, which states that the homes in which the respondents live represent householders' choices, it can be interpreted that for higher income respondents, the house value is of prime importance, followed by location, and housing size. The race of the respondent, be they non-white especially, may limit housing choice; therefore, location becomes of prime importance. When dealing with household size, the most important housing characteristic is the home's size. Previous housing characteristics are strong influences on future residences. To previous home owners, cost of the new housing unit will be less important than to those who are moving from rental accommodations.

This is just a simple overview of the effects of householder characteristics on the housing choice process. More complex relationships will be dealt with in the model (Chapter 4).

2.4 Conclusion

In many ways, as Werthman et al. (1965) described, "shopping for a new home rather strongly resembles the process of shopping for a husband or wife" (Werthman et al., 1965: 9). Economic theories based on land rent functions describe the housing choice process to a certain extent (Kain, 1975; 'Journey to Work Theory') but do not account for such factors as "the selective interaction involved in social relationships" (Moriarty, 1974: 466), or a whole host of other demographic variables that influence this complex process. Chapin (1968) believes that the housing choice process can best be described by activity patterns, as earlier indicated.

Although both Chapin's and Kain's theories are valid in certain instances, in most housing choice situations, as Moriarty (1974) states, more than one housing choice theory may be applied. As each housing choice situation is different, depending on who the house buyer is, a framework for the housing choice process emerges that has as its basis buyer preferences. Moriarty (1974) feels that householders select which area they want to live in by evaluating an area's attractiveness. Butler (1969) sees the housing choice process as a householder seeking the facilities and qualities he wants in a new house. Hempel (1970) describes this process as being one of the satisfaction of housing preferences. A householder's characteristics determine a set of housing preferences that he seeks to fulfill in the housing market. The preferences that a householder would most like to satisfy change during the course of choosing a house. Initially, house size and design are of prime importance, but when the house is finally bought, cost becomes the major consideration, followed by the characteristics of the dwelling unit and its general location.

The relative importance of these housing choice criteria is altered by certain householder characteristics. Of most importance is the householder's income at the time of the move. The household's size as well as the characteristics of their previous residence also play a part in determining the outcome of a move. The listing of final choice criteria which are determined by a householder's characteristics and are a statement of a householder's preferences when buying a house forms the framework for this analysis of the housing choice process.

Household size and income determine to a large extent the ability to pay for and the need for residential space. Space occupied by buildings

in a city is usually measured and planned for in terms of density. This concept of and measuring of density will be investigated in the subsequent chapter in order to fit density into the context of the housing choice process.

CHAPTER 3

DENSITY

3.1 Introduction

Densities can be negative and give rise to unpleasant interferences, but they also can be very positive and give rise to social cohesion, security, etc. Densities can also define social contacts, and proper densities have contributed to the creation of civilization. Without sufficient density, people cannot come in contact with one another. It is only when it becomes too high that there is trouble. The same quantitative densities do not necessarily result in the same qualitative ones. However, certain quantitative densities make good frames within which to work, since they can easily satisfy needs for sunshine, traffic access, etc. (Delos Three, 1972: 213).

As can be seen, 'density' is a confusing concept. Measures and categorizations of high, low and medium density have been blamed for everything from delinquency and crime in the case of high density, to urban sprawl caused by low density development. Whether high, low or medium, categorizations of cities are made in terms of density; be it dwelling units per acre, people per acre or people per dwelling.

This chapter will attempt to elaborate on what density is in the city; a categorization of the environment from which a householder selects a house. First density itself will be looked at; what is it, what different kinds are there, and in what units can it be measured. Crowding and density are often confused, so an investigation of their differences will be undertaken. The concept of density leads to the whole idea of residential space. How people state their preferences and differences in residential space needs will therefore be examined.

Following this examination of the concept of density, it will be determined exactly what elements of a residential area are determined by a density standard. These variables will be listed and defined and a comparison made between these variables and those listed as final choice criteria in the purchase of a house. Commonalties will be examined and conclusions drawn as to which elements of density play a part in the housing choice process.

3.2 What is 'Density'?

...The first question to be considered is how does one go about measuring human [in this study, building] density? The term density refers to the distribution of objects in space, but what kind of objects and what kind of space? (Delos Three, 1972: 214).

James (1968) defined density as a quantity of some kind divided by the area which envelopes it. Density is a measure of the average intensity of that quantity within that envelope (James, 1968: 30). He elaborates on three kinds of density, all of which deal with exterior space.

1. Town density

In this case the quantity being measured is the population and the envelope in which it is contained is the whole town.

2. Net density

Net residential density deals in terms of the quantity being either population or accommodation in a space that only contains the housing area.

3. Gross density

Gross density measures population but over a space that includes all land covered by dwellings and gardens, roads, local shops, primary schools and most open spaces (James, 1968: 30).

As well as density being a measure of the intensity of the use of exterior space, such a measure can be calculated in interior spaces, e.g. number of people per room. Combinations of both interior and exterior density occur in all areas of our cities. Typical suburbia involves both

interior and exterior low densities with the other extreme being the urban ghetto where high interior and exterior densities are prevalent.

As well as differences in measures and the meaning of interior and exterior density, Altman (1975: 154) cites findings which indicate that attention must also be given to geographical features of population distribution. An example is cited of two situations of a spatial distribution; one is that where farm land is spread equally over a geographical area, the second being where the same number of farms are packed along the coastline and the interior is not used.

...In these examples, the same average population concentration [density] can be very differently dispersed over a fixed area, which will obviously have different implications on the lives of the people (Altman, 1975: 154).

For the purposes of this study, density will deal with the distribution of dwelling units, single family detached houses, in space; the space being measured in acres of the residential environment of a city. The Course Team (1973) isolates four factors that determine the level of population density in a community area.

1. number of persons per room
2. number of persons per housing unit
3. number of housing units per structure
4. number of residential structures per acre.

Using multiple regression analysis, they found that the structural measures of density (housing units per structure and structures per acre) accounted for most of the variance in persons per acre (Course Team, 1973: 35). Using density measured in units per acre thus gives a good idea of exterior space as well as being an important factor in population density. As defined by the Ministry of Housing and Local Government, London (1952), the general

meaning of residential density is

...the degree of closeness with which dwellings and hence people occupying them, are arranged in residential areas (Ministry of Housing and Local Government, 1952: 1).

Thus, for the purposes of this study

Definition 11: Density

The number of single family detached dwelling units per gross acre of residential land.

As can be seen from this definition of density, density is a measure of space. Broad categorizations are made, such as high and low density, in order to indicate the relative amount of space in a given area. High density, a term associated with a relatively small amount of living space, has often been linked to another term implying a lack of space: crowding. By defining the difference between these two concepts, the meaning of density will be clarified.

Altman (1975) differentiates between crowding and density by stating that crowding is an interpersonal process at the level of people interacting with one another, and that density is a strictly physical measure of the number of people per unit of space. Stokols elaborates on crowding by stating:

...First, crowding is a personal, subjective reaction, not a physical variable. Second, it is a motivational state that often results in goal-directed behaviour, to achieve some end or to relieve discomfort. Third, crowding centers around a feeling of too little space (Altman, 1975: 150).

He elaborates by saying that density is a necessary though not sufficient condition for the feeling of being crowded. In Altman's (1975) view, crowding occurs when

...various privacy-regulation mechanisms fail to produce a match between desired and achieved levels of privacy, with less privacy resulting than was desired (Altman, 1975: 151).

For different people, depending on such personal factors as personality, past history and momentary psychological and physiological states, their 'privacy-regulation mechanisms' will fail to produce a desired level of privacy under different circumstances. In some cases a certain density of people is desired, e.g. party or social gathering. But again, each individual will view the concentration of people in the same room differently. One may be comfortable as he knows everyone in the room, where another person, being among strangers, may feel that he is in a 'crowded' environment. The same feelings can be attributed to housing density; a friendly neighbour whose house is close to yours will not induce feelings of crowdedness, however, if the same neighbour is unfriendly his house always appears too close.

Bird (1972) agrees with this concept, stating that the density of occupancy has significance only in interdependent relationship with other variables, such as: environmental, structural, temporal, psychological and social. She goes on to state that the concept of crowding is based on the notion that every human being needs a certain amount of 'breathing room', as violations of personal space arouse discomfort. She accounts for the move by middle class families to the suburbs not so much as to get away from 'too many people' but rather the need to get away from close proximity with the 'wrong kind of people' (Bird, 1972: 82). As well as requiring more space to be distant from the wrong kind of people, the amount of space a family requires is determined by their activities as much as by their social class.

Hall (1966) links people's differing uses and perceptions of space to culture. He states that Japanese and Arabs are much more able to

tolerate restrictions on personal space in public places than Americans and Northern Europeans, but in their own homes are more concerned about fulfilling their space requirements. These differing uses of senses lead to very different needs regarding space.

...Perceiving the world differently leads to differential definitions of what constitutes crowded living (Hall, 1966: 154).

Because of this, neither density nor crowding can be given specific measures as to what is a correct density and what specific factors create a crowded situation. Density cannot be taken out of its context or even be adequately considered apart from such things as social organization, child raising techniques, the enculturation devices used by a group, discipline, sensitivity to materials, need for screening of the various senses, and the significance of the buildings themselves as a communication to the people who live in them (Hall, 1971: 250). Evidence of this is the living densities in Hong Kong that appear to have no detrimental effects on the inhabitants (Schmitt, 1963). The average density of Hong Kong is six hundred persons per gross acre, whereas in the United States standards do not permit densities in excess of 150 persons per acre. The ability of the Chinese to live under such conditions is attributed to family cohesiveness which imposes strict social controls as well as an affinity of these people to live in close quarters (Schmitt, 1963). Altman (1975) attributes their ability to live in what we consider to be crowded conditions to styles of family functions, social organization and other cultural mechanisms for coping with high density.

On the average, residents of Hong Kong occupy far less living space than the average person living in the United States. As a result, they view living space in an entirely different way. What to them appears to

be sufficient living space would not be to an American. However, such cultural differences are not necessary in order to find differences in the ways in which people use and perceive space.¹ It is commonplace that perception varies from individual to individual within the same culture.

...Two individuals with different past experiences and present wants may become aware of the same external stimulus, receive the same image on the retina, and yet perceive the image differently after it has been processed by the brain (Altman, 1975: 216).

Three main personal characteristics are suggested to alter both how we perceive and use space: culture, social class (measured by education, income and influence) and stage in life cycle (Altman, 1975: 143). Hall (1966) has coined the term 'proxemics' to describe this concept; "the interrelated observations and theories of man's use of space as a specialized elaboration of culture" (Hall, 1966: 1). It is such factors that have an influence on how much space householders feel they require in a residential environment.

This space preference for most is typified by a description of their ideal living environment as being a rectangular, single family detached structure standing on its own lot (Altman, 1975: 65). The historical roots of this preference lie deep in the British and North American psyche. Owning a home as a territorial unit provides the homeowner with security, identity and stimulation. Elaborating on these concepts, Altman (1975) relates the security of the home to its protective qualities from the outside world, i.e. privacy; identity refers to the house being a symbol

¹The term 'perception' for the purposes of this analysis will imply the way in which people see their environment as modified by their past experience, in general (culture, upbringing, etc.), and the individual's state at that moment that he/she is viewing a stimulus.

of one's self; the house itself is a vehicle for expressing the owner's identity; and stimulation is derived by the satisfaction of having territory (home base) to defend.

Newman (1973) sees home ownership as being the symbol in western culture of having a stake in the social system.

...To many it represents the reaching of maturity and the achievement of success and potency. In certain cities and states in our nation, home ownership brings with it special rights and responsibilities which relate to participation in legal processes and the opportunity to reinforce existing societal values (Newman, 1973: 51).

By its nature, the single family detached dwelling is a statement of territorial claim. This territoriality gives privacy, and an indication of a density preference. Single-family detached dwellings can only be built up to a certain density. This gives some indication that residential density is of importance to some householders. Although this measurement of the concentration of development in the urban environment is important to some or even all city inhabitants, it has yet to be determined as to what are 'correct' densities. What may be considered a density too high for pleasant living by one group is acceptable and even exciting to another. Ylvisaker (1975) sees two trends emerging out of this dilemma. The first and most prevalent is a long-run reduction in residential densities with the second simultaneous trend being to redensify among certain age groups. The first trend he sees as being linked to the historical fact that North Americans always wanted more elbow and ego room. Ylvisaker (1975) attributes part of the resistance to higher densities today to our need for privacy. He accounts for the move to redensify by our changing cultural patterns. When both parents in a suburban family become commuters into the central city to work, their home must be connected to services which are

more available, the closer they are to the city centre (Ylvisaker, 1975: 24). Closer to the city centre usually implies densities higher than those found in suburban residential subdivisions.

This investigation shows that the density of a residential area indicates more than just units per acre. People see their home as providing privacy, a feeling of territoriality, and its location as placing them in contact with certain services.

3.3 Ramifications of Density

Residential areas are planned initially by stipulating how they will be zoned. Zoning ordinances in most cases distinguish between residential housing uses, by indicating density standards and the housing type connected with that standard. Different density standards, as well as implying differing housing types and the number of units per acre, also alter other characteristics of the residential environment.

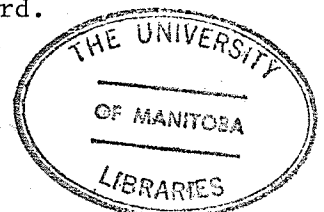
The best way to investigate which housing and residential community standards are dependent on density is to look at a residential zoning by-law as well as criteria used when planning neighbourhood services. Taken as an example of a residential zoning by-law is that from St. James-Assiniboia, City of Winnipeg, by-law #1558. The zoning by-law specifies lot area, lot width, building coverage, front yard, rear yard and side yard dimensions, for each zoning district. Thus, each zoning district, by giving lot dimensions permitted, specifies building density, house size, as well as yard size. Of course, in actual fact, each zoning district has variations in house and lot dimensions although all structures are of similar size.

Residential areas as well as being planned with respect to density are divided up into neighbourhoods for which services such as schools, shops,

public transportation access, are provided. Neighbourhoods are expressed in terms of the population size and the geographic area they cover (De Chiara, 1969). This source states the commonly used neighbourhood standards. The geographic area is fixed mainly by the walking distance to the school and other community facilities. Since density is the ratio of population to area, two of these variables, population, geographical area and density, will determine the third. De Chiara (1969: 191) feels that a good population size for a planning unit of a neighbourhood is five thousand people, as it supports a school of a size recommended by educational authorities. A community of this size will have a geographic area of radius of a desirable one-quarter mile except for one-third mile for very low densities (De Chiara, 1969: 191). As can be seen from this analysis, a school's average proximity to homes will vary according to the neighbourhood's density. Although variations occur in actual distance to facilities according to densities, it is impossible to determine the time-distance values. It can be argued that the higher the density of an area, the more congested the roads may be, which may prolong a short journey, whereas in a low density area, although distance to amenities may be greater, by car on uncongested roads, it takes less time to reach them. Due to this ambiguity, although actual distance to amenities is in many ways determined by density, this measure of amenity proximity will not be considered as being determined by density. However, lot size, house size and yard size will be taken as being determined by residential density.

3.4 Elements of Density/Final Choice Criteria

The examination of density has yielded three main characteristics of a residential area that are the result of a density standard.



Definition 12: Lot size

The area of the lot on which a single family detached home is located.

Definition 13: House size

The area in square feet of the house.

Definition 14: Yard size

The area of the enclosed back portion of the lot on which is located a single family detached dwelling unit.

These three variables are prime determinants of the characteristics of a dwelling unit. As the relationship between house and lot size as well as the siting of the house on the lot determine yard size, these variables will be combined as lot/yard size in the subsequent analysis.

As already determined in Chapter 2, four main criteria are considered when choosing a house:

1. Cost
2. Dwelling unit
3. General location
4. Lot or grounds.

These four criteria, according to the way they have been defined, can be further broken down. From these definitions, it becomes evident that some of the criteria used to select a house have been determined by the density of the residential area in which the house is situated. A complete listing of both density and housing choice variables will show these commonalities (see Figure 3).

The one discrepancy between the two sets of variables is in defining house size. House size as defined in housing choice variables refers to the number of rooms in a house. However, the density measure of house

Figure 3

Final Choice Criteria/ Elements of Density

Final Choice Criteria ¹	Elements of Density ¹
1. Cost	1. House Size
2. The Dwelling Unit	2. Lot/Yard Size
(a) quality	
(b) size	
3. General Location	
(a) neighbourhood condition/ reputation	
(b) accessibility	
(c) time-distance to work	
(d) central city or not	
4. Lot or Grounds	
(a) Lot/Yard Size	

¹For complete variable definitions, see Appendix A.

size relates to lot coverage and is therefore indicated by a measurement in square feet.

Just as the consumer is generally unaware that he is buying a specific square footage of space within the dwelling (he knows only that he is obtaining a certain number of rooms of adequate size), so the consumer is only dimly aware of specifications concerning lot area, beyond the vague desire that there should be 'enough' open space (Foote et al., 1960: 260).

As the householder deals in terms of number of rooms required, it is difficult to translate this measure into square feet. However, it is reasonable to assume that a three bedroom house will be smaller than one containing four bedrooms, so that in fact the square footage measure of a home's size will be reflected in the number of rooms it contains. Therefore, a correlation can be made and house size be considered as a density variable.

3.5 Conclusion

The concept of density is an ambiguous one, yet areas of cities are categorized as to their density and new developments follow some form of density standard. Residential areas are usually based on a standard in dwelling units per acre. This in many ways determines the character of the environment by allotting each house a specified lot size. House siting and lot coverage are also stipulated. Thus, the setting down of density standards affects more than just the number of units per acre. House size and lot/yard size are also determined.

These two variables also enter into the housing choice process. This link suggests that the density of a residential neighbourhood is a factor considered by a householder when he is buying a house.

CHAPTER 4

MODEL: THE RELATIVE IMPORTANCE OF DENSITY IN THE HOUSING CHOICE PROCESS

4.1 Introduction

Chapter 2 reviewed the housing choice process and determined from the literature that the final choice criteria used in selecting a house are:

Final Choice Criteria:¹

- Cost
- Dwelling Unit
- Location
- Lot/Yard Size

listed in their order of importance. An investigation of the effects of a density standard on the characteristics of a residential area were determined in Chapter 3. This density standard, as stated in most zoning by-laws, regulates:

Elements of Density:²

- House Size
- Lot/Yard Size

Comparison between the variable sets of 'Final Choice Criteria' and 'Elements of Density' (Figure 3) yield some similarities. The dwelling unit, as previously defined, refers to the house size as well as its quality. Therefore, both the final choice criteria of 'the dwelling unit' and 'lot/yard size' are evaluations of the density of a neighbourhood.

¹See Definitions 7-10 Appendix A p.92 for complete definitions.

²See Definitions 12-14 Appendix A p.93 for complete definitions.

Although the house and lot size of only the residence to be purchased are stated as being evaluated, the relationship between house and lot size of each dwelling unit is characteristic of the neighbourhood; the unit on which a density standard is applied. Hence the synthesis of the literature yields the following statement:

The density of a neighbourhood in a residential area is one of the elements of a householder's final choice criteria.

Although not directly stated by the householder as being one of the reasons for or for not selecting a house, density does enter into the housing choice process. When a householder decides on the amount of residential space, both exterior and interior that he requires, when purchasing a house, he is in fact stating a density preference.

Assumption 4: Density Preference

A householder states his density preference in terms of wanted exterior (lot/yard size) and interior (house size) space.

In most cases a low density area will have both lot and house sizes larger than in an area of higher density.

Assumption 5: Density/House-Lot Sizes

The lower the density of a residential area, the larger the houses and lots, the higher the density the smaller the houses and lots.

For most residential areas of cities this assumption holds. In some instances in the inner city, very large homes are on relatively small lots and some new subdivisions are retaining house sizes but reducing lot sizes. For these two cases, large homes are on small lots, which implies a higher density but not correspondingly larger lots. Hence, for these two instances Assumption 5 does not hold.

The importance that a householder gives to this density preference

with respect to other final choice criteria will be defined as follows:

Definition 15: The Importance of Density

The ranking that a householder gives to the density criteria, a desire for more space (house and lot size) when buying a house with respect to other final choice criteria.

The rankings being:

- very important
- moderately important
- low importance

Only a desire for more space is being considered as according to Michelson (1977), most people purchasing homes are mainly interested in increasing the amount of space in their dwelling unit.

For a heterogeneous population, importance of density is moderate as seen from the listing of the final choice criteria.

Final Choice Criteria: Cost
Dwelling Unit = Density
Location
Lot = Density

This ranking of final choice criteria varies according to specific householder and previous residence characteristics as determined in Chapter 2. Both sets of characteristics will hereafter be referred to as householder characteristics. As these characteristics alter the general ordering of the final choice criteria, they also have an effect on the importance of density to each householder. These householder characteristics, as determined in Chapter 2 are:

Householder Characteristics: Income
Race
Household Size
Age
Tenure
Value
Number of Rooms
Location

These variables will be defined as follows:

Definition 16: Income

Total income of the household during the calendar year of the move.

Definition 17: Race¹

The race of the householder:

- (a) white, or
- (b) nonwhite

Definition 18: Household Size

The number of members, both adults and children, in the household at the time of the move.

Definition 19: Age

The age in years of the householder at the time of the move.

Definition 20: Tenure

The tenure of the householder's previous residence:

- (a) rental
- (b) ownership

Definition 21: (a) Value / Rent

The monthly rental of the householder's previous residence.

(b) Value / Selling Price

The monetary value (selling price) of the householder's previous residence.

Definition 22: Number of Rooms

The number of rooms in the householder's previous residence which are finished and suitable for year-round living. Excluded are bathrooms, halls, garages, laundry and furnace rooms.

Definition 23: Location

The location of the householder's previous dwelling as indicated by its distance from the central city.

¹As these predictor variables were selected from an American study, the prime distinction was between whites and blacks (non-whites).

Butler (1969: 86) states that of these householder characteristics, income, tenure and household size are the strongest in predicting the outcome of the move with respect to the amount of space in the new residence. As well as these three characteristics, Butler (1969: 79) indicates that number of rooms in the previous residence is also of importance. These four characteristics are of greatest strength in predicting the importance of density when a householder is selecting a new house. Location, age and race fall into the second strongest predictor category with the remaining variable, value, being of least importance. These findings will be used as the basis for a housing choice model to be discussed in the succeeding portions of this chapter.

4.2 Model Form

Showing the relative importance of density in the housing choice process, this model is stated in the form of hypotheses. Each hypothesis states the expected relationship between one householder characteristic and the importance of density. To better illustrate these hypotheses, each one is also stated in the form of a linear equation. For simplicity, the relationships are assumed to be linear, where the predictor (independent) variable causes a constant variation in the dependent variable (importance of density).

These relationships will be stated in the form:

$$Y = a_0 + a_1X_1 + \dots + a_8X_8$$

where:

Y = the relative importance of density as defined in Definition 15.
Y is the dependent variable.

X = the householder characteristic used to predict the importance of density for the householder with the given characteristic.
X is the predictor or independent variable.

a_0 = Y intercept: the point at which the graphed line crosses the vertical, Y, axis.

$a_1, a_2 \dots$ = the slope of the graphed line, or the weighting on the independent variable X. The steeper the graphed line, (the greater the slope) the greater the change in Y per unit change in X.

The predictor variables, X, will be denoted as follows:

X_1 = income

X_2 = household size

X_3 = number of rooms

X_4 = tenure

X_5 = location

X_6 = race

X_7 = age

X_8 = value

Specific cases of the above variables will be represented as follows:

$X_4 \begin{cases} 0 & \text{if ownership} \\ 1 & \text{if rental} \end{cases}$

$X_6 \begin{cases} 0 & \text{if nonwhite} \\ 1 & \text{if white} \end{cases}$

and with the following dummy variables:¹

$X_9 \begin{cases} 0 & \text{if } X_1 \text{ is less than or equal to } \$25,000 \\ 1 & \text{if } X_1 \text{ is greater than } \$25,000 \end{cases}$

$X_{10} \begin{cases} 0 & \text{if } X_3 \text{ is less than or equal to } 2 \\ 1 & \text{if } X_3 \text{ is greater than } 2 \end{cases}$

¹A dummy variable is a variable created to explain specific cases of another variable, e.g. when X_1 is less than or equal to \$25,000, the dummy variable X_9 is given the arbitrary value 0.

$$X_{11} \begin{cases} 0 & \text{if } X_5 \text{ is greater than 1 mile from the central city} \\ 1 & \text{if } X_5 \text{ is less than or equal to 1 mile from the central city} \end{cases}$$

4.3 The Model

The set of equations, stated as hypotheses, that will comprise this model of the importance of density in the housing choice process will consist of linear relationships showing the effect of one predictor variable on the importance of density, with all other predictor variables being held constant. These equations will be graphed in order to better illustrate the direction of the relationships. Although stated, the coefficients a_0 , $a_1 \dots$ only have meaning in terms of their sign (either positive or negative) but not in terms of their magnitude. This model also assumes that the dependent variable Y is continuous in nature.

4.3.1 Hypotheses

The strongest predictors of the importance of residential density to the householder, when purchasing a house, will be listed first. Butler (1969) indicated that the strongest predictor of all housing choice outcomes is income. The relationship between income and the importance of density is a positive one; the higher the income, the more important density is to the householder. Werthman et al. (1965) agrees with the above statement. His findings indicate that the highest income group was most interested in an area's amenities. Such amenities can include low density. Lansing (1964) states more specifically that there is a positive relationship between income and lot/housing size. These findings result in the following hypothesis.

Hypothesis 1: Importance of Density vs. Income

There is a positive relationship between the importance of density and income.¹

General equation: $Y = a_{01} + a_1X_1 - a_9X_9 + a_{90}X_9X_1$

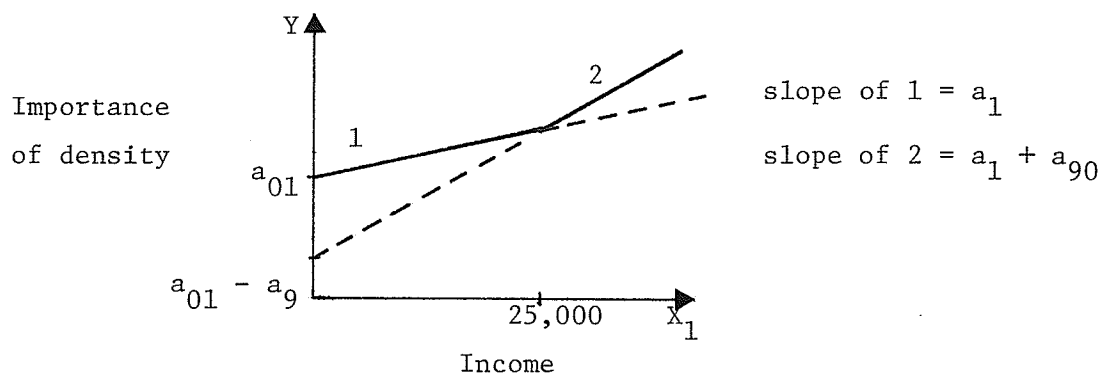
where a_1 , a_9 and $a_{90} \neq 0$

Case 1: $X_1 \leq \$25,000$ $X_9 = 0$

$Y = a_{01} + a_1X_1$

Case 2: $X_1 > \$25,000$ $X_9 = 1$

$Y = a_{01} + a_1X_1 - a_9 + a_{90}X_1$



Two cases are stated; for those with income less than \$25,000 and for those with higher incomes. Once a higher income, greater than \$25,000 is reached it is hypothesized, that the importance of density increases with respect to income at a rate faster than for those with incomes of less than \$25,000.

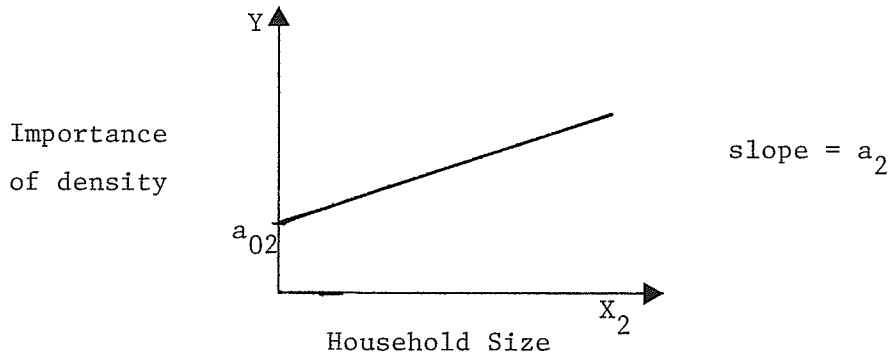
Of similar importance and completely independent of householder income, household size is a good predictor of the importance of density. Household size remains a strong predictor even when the effects of other variables are controlled for (Butler, 1969: 85).

¹\$25,000 was chosen as the point at which the importance of density increases at a rate faster than for those of income less than \$25,000 as in CMHC (1977), Canadian Housing Statistics, this was a break point for categorizations of income. This implies that an income of over \$25,000 was considered to be a high income.

Hypothesis 2: Importance of Density vs. Household Size

There is a positive relationship between the importance of density and household size.

General equation: $Y = a_{02} + a_2 X_2$ where $a_2 \neq 0$



Hoover (1959) agrees with this relationship by stating that the larger the number of children, which implies a larger household size, the stronger is the incentive to seek lower density single family detached housing.

Of slightly less strength than the two aforementioned predictors, is the number of rooms in the householder's previous residence. Butler (1969) states that there is a strong trend towards home ownership and a move to the suburbs. Both these trends imply the purchase by householders of more space in their new residences than in their previous ones. He indicated that of his sample, fifty-seven percent have more rooms in their present dwelling than in their previous one (Butler, 1969: 12).

These findings lead to the following hypothesis:

Hypothesis 3: Importance of Density vs. Number of Rooms

There is an inverse relationship between the number of rooms in a householder's previous residence and the importance of density in selecting a new home.

General equation: $Y = a_{03} - a_3 X_3 + a_{10} X_{10} - a_{101} X_{10} X_3$

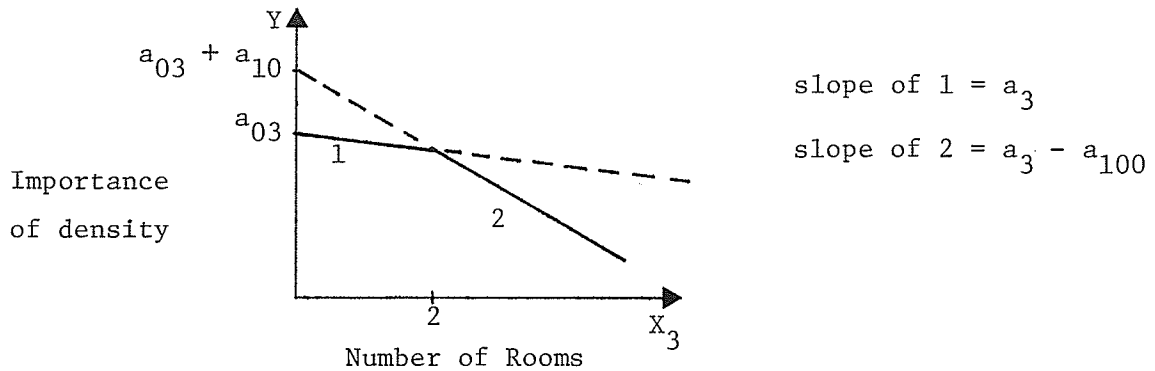
where $a_3, a_{10}, a_{101} \neq 0$

Case 1: $X_3 \leq 2$ $X_{10} = 0$

$Y = a_{03} - a_3 X_3$

Case 2: $X_3 > 2$ $X_{10} = 1$

$$Y = a_{03} - a_3X_3 + a_{10} - a_{100}X_3$$



As in Hypothesis 1, two cases exist in this hypothesis. For those with less than two rooms in their previous residence, density importance declines less quickly with increasing previous residence size, than for those whose previous homes were larger.

The fourth member of the most important group of predictors of density importance is the tenure of the householder's previous dwelling unit. This hypothesis cannot be graphed as only two cases exist, either the previous residence was rented or owned.

Hypothesis 4: Importance of Density vs. Tenure

Density is more important to householders whose previous accommodation was rented as opposed to owned.

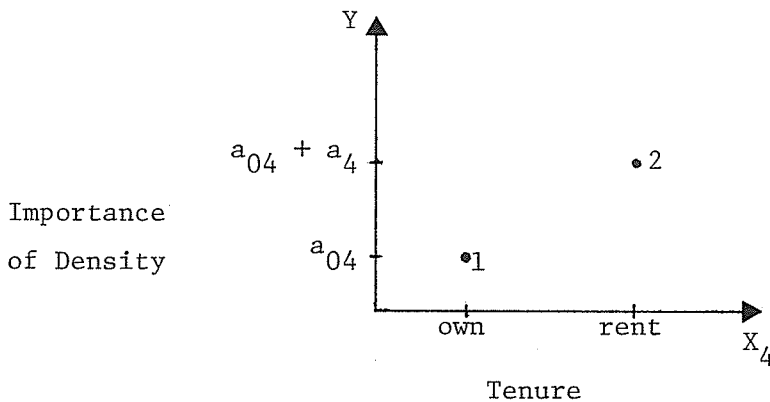
General equation: $Y = a_{04} + a_4X_4$ where $a_4 \neq 0$

Case 1: own: $X_4 = 0$

$$Y = a_{04}$$

Case 2: rent: $X_4 = 1$

$$Y = a_{04} + a_4$$



Although previous homeowners purchase more residential space than do previous renters, Rossi (1955) states that renters are more sensitive to space considerations. Previous homeowners most likely purchase more space as they may be able to (afford) easier satisfy their house size specifications and are more concerned with other house features (Butler, 1969).

These first four hypotheses concern the four strongest predictors of density importance in the house purchase decision. The following predictors, being of influence in the housing choice outcome in general, are hypothesized to have an effect on the importance of density in particular.

A householder's previous residential location, in terms of distance from the central city, is a very strong predictor of future housing tenure and unit type (Butler, 1969). The central city is usually an area of fairly high density as described in Assumption 2. As people buying homes are largely interested in increasing their amount of useable space (Michelson, 1977), to those living in the central city who have less space than those living in the suburbs, finding a home in an area of lower density will be of prime concern.

Hypothesis 5: Importance of Density vs. Location

There is an inverse relationship between the importance of density and a householder's previous distance from the central city.

$$\text{General equation: } Y = a_{05} - a_5 X_5 + a_{11} X_{11} - a_{110} X_{11} X_5$$

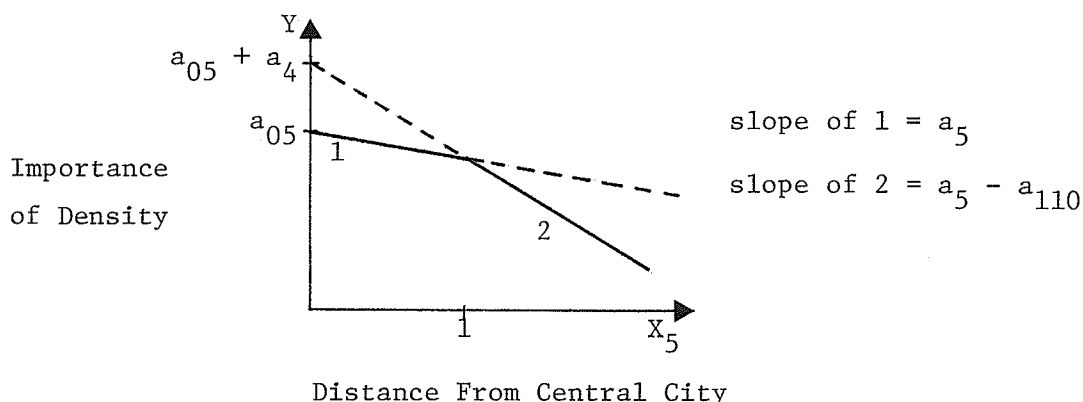
$$\text{where } a_5, a_{11}, a_{110} \neq 0$$

$$\text{Case 1: } X_5 \leq 1 \quad X_{11} = 0$$

$$Y = a_{05} - a_5 X_5$$

$$\text{Case 2: } X_5 > 1 \quad X_{11} = 1$$

$$Y = a_{05} - a_5 X_5 + a_{11} - a_{110} X_5$$



This hypothesis contains two cases. The first refers to those living up to one mile¹ from the city centre. For these people, the importance of density declines at a slower rate with increasing distance from the city centre than for those whose previous residence is more than a mile from the centre of the city.

The subsequent hypothesis concerns the race of the householder. Butler (1969) states that nonwhite households are more likely to locate in the central city than are whites. In many cases nonwhites may not have a great choice of where to live should they have a low income and/or wish

¹One mile was chosen as a reasonable figure for being outside the high density area of the city centre.

to live in a cultural ghetto. Hence the density of the area in which they decide to live is not as important a consideration as are other factors. This hypothesis, as that relationship concerning tenure, can only be represented as two points.

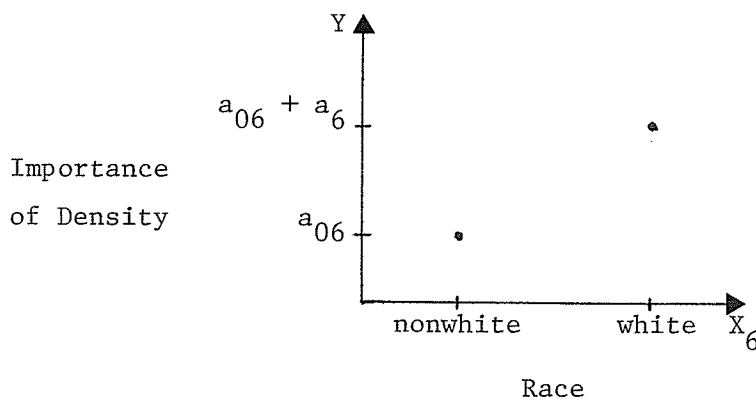
Hypothesis 6: Importance of Density vs. Race

Density is more important to whites than to nonwhites when selecting a residence.

General equation: $Y = a_{06} + a_6 X_6$ where $a_6 \neq 0$

Case 1: nonwhite: $X_6 = 0$ $Y = a_{06}$

Case 2: white: $X_6 = 1$ $Y = a_{06} + a_6$

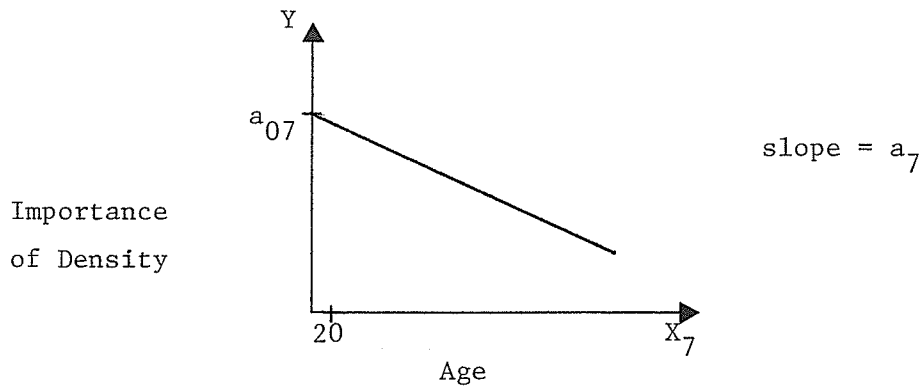


Concerning the age of the householder as a predictor of density importance, Menchik (1971) hypothesized that the relationship between householder age and the importance of density would be an inverted U-shaped function with house and lot size being of prime importance to those adults of child-rearing age. However, his actual findings found a weak relationship supporting the following hypothesis.

Hypothesis 7: Importance of Density vs. Age.

There is a negative relationship between the importance of density and the age of the householder.

General equation: $Y = a_{07} - a_7 X_7$ where $a_7 \neq 0$



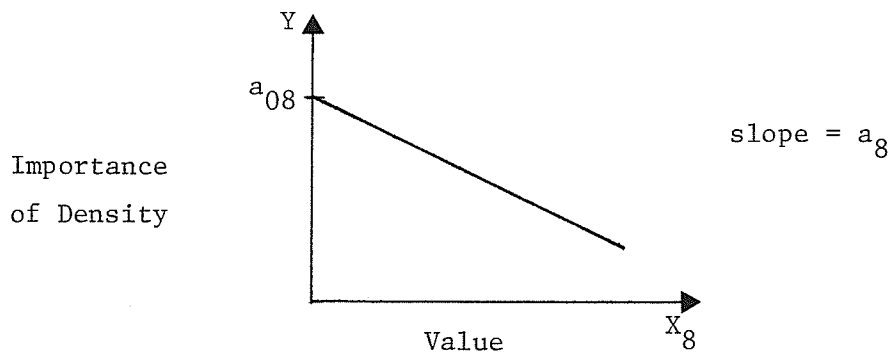
This relationship does not exhibit the inverted U-shaped tendency that Menchik (1971) hypothesized. Instead the relationship shows the negative sloped portion of the inverted U, with density being most important to young, expanding families. The decline in density importance continues at a constant rate with increasing age, as there is not one set householder age at which children leave home. If such an age existed, density importance would decline at a faster rate for those householders above that certain age.

The final single predictor of housing density importance is the value of the householder's previous residence.

Hypothesis 8: Importance of Density vs. Value

There is an inverse relationship between the value of a householder's previous residence and the importance of density in selecting a subsequent residence.

General Equation: $Y = a_{08} - a_8 X_8$ where $a_8 \neq 0$



This hypothesis goes on the assumption that there is a strong correlation between house size and cost, i.e. the higher the value the larger the house. As already hypothesized, density is more important to those that have a small amount of space in a previous house than to those who had large residences.

4.4 Conclusion

These eight hypotheses comprise a model that seeks to explain how the importance of density, Y, varies with respect to X, householder characteristics. As determined from the literature, the first four hypotheses illustrate the effect of the strongest predictors, income, household size, number of rooms and tenure, with the succeeding four using variables important in determining the ordering of final choice criteria in general.

CHAPTER 5

MODEL TESTING

5.1 Introduction

Synthesis of the literature dealing with density and housing choice indicated that the density of a residential area is a factor considered by a householder in the house purchase decision. With the literature as a basis, a housing choice model was constructed showing the way in which the importance of density varies according to certain householder characteristics.

This chapter will seek to determine the accuracy of this model with respect to Winnipeg. Does density play a part in the housing choice process in this city and what are the householder characteristics that have the greatest effect on the ranking of density with respect to other final choice criteria? Differences between the model and findings obtained from the analysis of the data will be discussed and an attempt made to account for any discrepancies.

5.2 Description of Data

The data used to test this housing choice model were collected by Central Mortgage and Housing Corporation in its 1974 Survey of Housing Units. Approximately 74,000 dwelling units were surveyed in twenty-three cities across Canada.

Personal interviews were conducted to collect demographic information, dwelling characteristics, income of occupants, carrying charges or rents, market values, and information on the push and

pull factors involved in the choice of units (Central Mortgage and Housing Corp., 1974).

For the purposes of this analysis, only the data collected in Winnipeg will be used.

5.2.1 Limitations of the Data

The data collected by the CMHC survey is not representative of the whole city of Winnipeg as only the following areas were surveyed: the central city, West Kildonan, East Kildonan, Transcona, St. Boniface, St. Vital, Tuxedo and St. James-Assiniboia. Figure 4 indicates the areas of Winnipeg that were surveyed. Although a random sample was taken that was controlled to ensure even weighting of respondents according to tenure, income and age of the householder, as respondents were not selected from all of Winnipeg, the sample is representative only of the areas surveyed. Therefore, generalizations can only be made for the specified areas of the city. For simplicity, however, this data will be termed as 'Winnipeg-based' in the subsequent portions of this analysis.

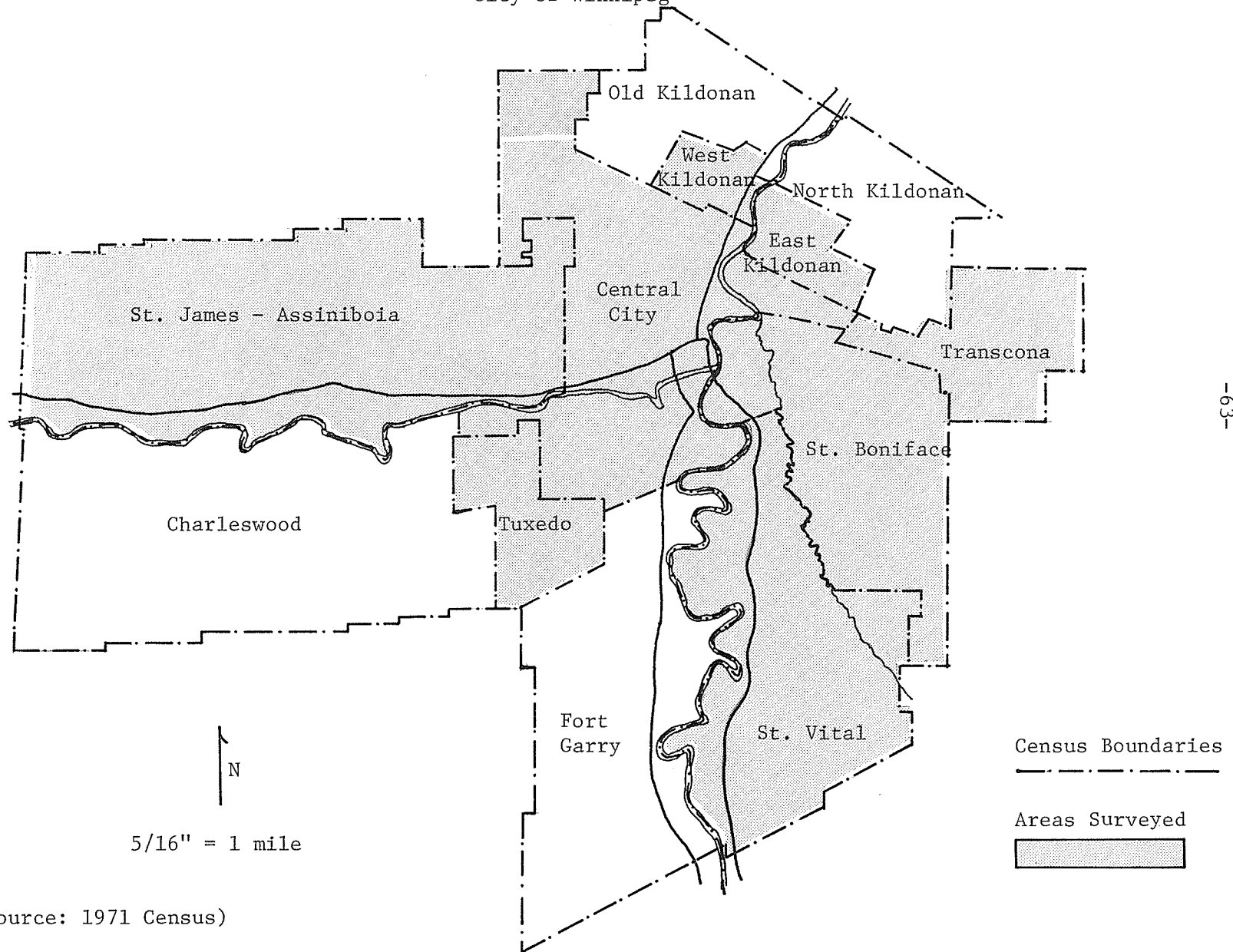
As well as being only representative of parts of the city of Winnipeg, the data has one other limitation. The householder characteristic of 'location' will not be able to be verified as a predictor of density importance as this information was not collected by the CMHC survey. Therefore, the validity of Hypothesis 5: Importance of Density vs. Location, will not be tested.

5.2.2 Size of Data Set

The Winnipeg portion of the CMHC survey recorded a total of 2,813 responses. Due to the limitations, as stated in Chapter 1, put on this investigation, only a portion of this data will be utilized. The sample

Figure 4

Areas Surveyed: 1974 Survey of Housing Units
City of Winnipeg



(Source: 1971 Census)

size was reduced by selecting only those respondents that now own a single family detached dwelling unit. As complete data on all these respondents previous dwelling units was not recorded, the data set was further reduced to a total of 441 respondents. This number was reduced even further in certain portions of the analysis due to missing data.

5.3 Method of Testing

The general framework used to test the applicability of the data to the model was to select as many possible householder characteristics as were available from the data, then through statistical analysis narrow this list to the most important ones and then determine the relationship between these strongest householder characteristics and density. This analysis was done in four main steps.

First it was necessary to ensure that density was important to a significant number of respondents. To ascertain this, a frequency distribution was computed of the first and second reasons for selecting a house (see Appendix B: Reasons for Selecting Present Dwelling, p.96) as taken from the responses in the 1974 Survey of Housing Units.

The second step in analyzing the data was to select all possible householder characteristics that could be used as predictor variables for the importance of density. Then it was necessary to check that there were sufficient respondents in each variable category. This was accomplished by investigating the frequency distribution of all possible predictor variables.

After eliminating those variables with a poor distribution, it was necessary to determine the strength of predictors as well as the degree of association between the predictor variables and the importance of density.

This step enabled predictors of insignificant strength to be eliminated. Analysis of crosstabulation tables of 'predictor variables by importance of density' accomplished this.

The strongest predictor variables were selected and used in the fourth step of this data analysis. The purpose of this final step was to find the strength of individual predictor variables while holding other predictor variables constant, as well as ascertaining the direction of the relationship between each predictor variable and the importance of density. The results of an analysis of variance and multiple classification analysis provided the necessary information.

Each of these four steps taken to investigate the relevance of the housing choice model with respect to the Winnipeg based data will be elaborated on in the subsequent sections.

5.3.1 Creation of Dummy Variable IMPDEN and Selection of Predictor Variables

A householder's ranking of density importance was ascertained from the question on the CMHC survey (Item Numbers 127 and 128; see Appendix B) asking the householder what were the two most important reasons for selecting his present residence. Householders had a choice of the following responses: Reasons For Selecting House:

1. satisfied the need for less space
2. satisfied the need for more space
3. neighbourhood conditions
4. quality of the unit
5. closer to transportation, work, services, friends, etc.
6. satisfactory financial arrangements

7. other

8. other (Central Mortgage and Housing Corp., 1974a: 17)

Response (2) 'satisfied the need for more space' was interpreted as being a 'density' criterion.¹ This statement was taken to imply both interior and exterior space; i.e. the house bought satisfied the householder's space needs in terms of wanted house and lot sizes.

To simplify this analysis, a dummy variable, IMPDEN, indicating the importance of density was defined as follows:

Definition 24: Dummy Variable IMPDEN	
Importance of Density	IMPDEN
·very important	= 4
·moderate importance	= 2
·low importance	= 0

A value of IMPDEN = 4 implies that the householder selected response (2) of 'Reasons For Selecting House', as listed above, as the first reason for choosing his present house. If response (2) was noted as being the second reason for selecting a dwelling, IMPDEN = 2 and if response (2) was not selected as either the first or second reason for selecting a dwelling IMPDEN = 0.

The frequency distribution of all the possible reasons for selecting a house are listed in Table 1. This table indicates that most respondents stated the 'density' criterion as their first reason for purchasing their present dwelling. This means that 41.4% of the sample population rated density as 'very important' when selecting a house. No respondents rated density as of moderate importance. This frequency distribution of the reasons for selecting a dwelling indicated that there are sufficient respondents

¹Although response (1), 'satisfied the need for less space' is in fact a density criterion, this study has defined density in terms of the need for more space.

Table 1

Frequency Distribution For First and Second

Reasons For Selecting a House

Reasons for selecting a house	Absolute frequency for first reason	Adjusted frequency %	Absolute frequency for second reason	Adjusted frequency %
Less space	15	3.4%	0	0%
More space	181	41.4	0	0
Neighbourhood conditions	112	25.6	39	10.1
Quality of unit	45	10.3	104	26.8
Closer to transportation	36	8.2	39	10.1
Satisfactory financing	26	5.9	170	43.8
Other	20	4.6	28	7.2
Other	2	0.5	8	2.1
Not stated	4	-	53	-
Total	441	100%	441	100%

(Computed from data collected in 1974 Survey of Housing Units)

to whom density is important to warrant further analysis.

The data set was investigated to find as many householder characteristics as possible, to ascertain if the ones that were selected for the housing choice model were in fact the ones that were of most importance in determining the importance of density. The following list contains the householder characteristics common to both the housing choice model and the CMHC survey.¹

1. INCOME
2. HOUSEHOLD SIZE
3. AGE
4. TENURE
5. VALUE/RENT
6. VALUE/SELLING PRICE
7. NUMBER OF ROOMS

In addition to the above, the following variables were investigated as possible predictors of the importance of density.

8. LANGUAGE²
9. PREVIOUS DWELLING TYPE
10. SEX OF THE HOUSEHOLDER
11. MARITAL STATUS OF THE HOUSEHOLDER
(AT THE TIME OF THE MOVE).

¹For complete definitions of all variables as defined by the CMHC survey, see Appendix B.

²This variable can be stated as being equivalent to the 'Race' predictor used in the model.

5.3.2 Frequency Distributions

In preparation for running crosstabulations, all continuous data was converted to an ordinal level of measurement. The frequency distributions of all predictor variables are listed in Table 2. Unfortunately the sample was totally English speaking so the effect of LANGUAGE on the importance of density cannot be studied. Also, as the sample consisted almost entirely of married, male householders, the effects of differing marital status and sex of the householder on the importance of density could not be investigated. Thus, the three variables LANGUAGE, SEX, and MARITAL STATUS will not be included in any further analyses. The frequency distributions listed in Table 2 give a good indication of the characteristics of the population that is being dealt with. The mean age of the householder is 36.4 years, who has a mean income of \$12,700 per year with a mean household size of 3.47 persons. As almost the whole sample consists of married householders, each family consists of two adults and 1.47 children.

Comparison of these figures (see Table 3) of just homeowners to the demographic characteristics for all households surveyed in the 1971 census in Winnipeg yields that the study population is of slightly higher income than all households in Winnipeg (renters and homeowners). Also, the survey population is older and has slightly larger families than the mean for Winnipeg. Although the results of the CMHC survey were obtained in 1974, the income, age and household size figures are for the households at the time that they moved to their present dwelling, which could be anywhere between June 1, 1971 and the fall of 1974. Thus, a simple comparison between these figures and the 1971 Census data has some value.

Table 2

Frequency Distribution of Predictor Variables

Predictor Variables	Category Label	Absolute Frequency	Missing Values	Mean
INCOME (dollars)	up to \$10,000	133		
	\$10,000 - \$19,999	237		
	20,000 - 29,999	37		
	30,000 - 45,000	7		
	TOTAL	441	0	\$12,702
HOUSEHOLD SIZE (persons)	1 - 3	249		
	4 - 6	175		
	7 - 9	16		
	TOTAL	441	0	3.47
AGE (years)	0 - 19	1		
	20 - 39	304		
	40 - 59	102		
	60 - 75	31		
	TOTAL	338	3	36.4
TENURE	OWN	179		
	RENT	260		
	OTHER	2		
	TOTAL	441	0	
VALUE-RENT (dollars/mo.)	\$25 - 124	93		
	125 - 224	156		
	225 - 350	9		
	TOTAL	258	183	\$133.15
VALUE-SELLING PRICE (dollars)	up to \$10,000	10		
	\$10,000 - 19,999	58		
	20,000 - 29,999	51		
	30,000 - 39,999	19		
	40,000 - 49,999	7		
	over 50,000	4		
	TOTAL	149	292	\$23,022
NUMBER OF ROOMS	1 - 4	203		
	5 - 8	222		
	9 - 12	13		
	13 - 17	2		
	TOTAL	440	0	4.9
LANGUAGE	ENGLISH	441		
	FRENCH	0		
	BOTH	0		
	TOTAL	441	0	

Table 2--continued

Predictor Variables	Category Label	Absolute Frequency	Missing Values	Mean
PREVIOUS DWELLING TYPE	SINGLE DETACHED	220		
	ATTACHED HOUSE	3		
	SEMI-DETACHED	21		
	ROW HOUSE	16		
	DUPLEX	38		
	APARTMENT	<u>143</u>		
TOTAL		<u>441</u>	0	
SEX OF HOUSEHOLDER	MALE	416		
	FEMALE	<u>24</u>		
TOTAL		<u>440</u>	1	
MARITAL STATUS OF HOUSEHOLDER	SINGLE	16		
	MARRIED	406		
	OTHER	<u>16</u>		
TOTAL		<u>438</u>	3	

(Computed from data collected in the 1974 Survey of Housing Units)

Table 3

Comparison of Study Population
to Winnipeg as a Whole

	Study Population ¹ Homeowners	1971 Census All Winnipeg Households
MEAN AGE OF HOUSEHOLDER	36.4 years	39.5
MEAN HOUSEHOLD SIZE	3.47 persons	3.3
MEAN HOUSEHOLD INCOME	\$12,700	\$12,009

¹Source: 1974 Survey of Housing Units

5.3.3 Selection of Strongest Predictor Variables

Following analysis of the frequency distribution of all predictor variables, those that remain out of eleven noted on p. are:

1. INCOME
2. HOUSEHOLD SIZE
3. AGE
4. TENURE
5. VALUE/RENT
6. VALUE/SELLING PRICE
7. NUMBER OF ROOMS
8. PREVIOUS DWELLING TYPE

This section will further narrow this list, selecting only those predictor variables that have a significant effect on the importance of density.

In order to determine how significant an effect a predictor variable has on the importance of density, crosstabulations were run between all predictor variables and IMPDEN, and a Chi-Square value of statistical significance obtained. The Chi-Square statistic helps determine whether a systematic relationship exists between variables. A large value of Chi-Square indicates that a relationship of some sort exists between two variables (Nie et al., 1975: 224). In order to determine whether a relationship does exist, it is necessary to calculate the probability of obtaining a Chi-Square value as large or larger than the one calculated from the sample. This probability depends in part on the degrees of freedom; a number based on the number of cells in the crosstabulation table. For instance, the Chi-Square value for NUMBER OF ROOMS is 10.27 (see Table 4) for three degrees of freedom. The probability of obtaining

Table 4

Relationship and Degree of Association
Between Predictor Variables and IMPDEN

Predictor Variable	Chi Square	Degrees of Freedom	Significance	Cramer's V
NUMBER OF ROOMS	10.27	3	.02	.15
AGE	10.21	3	.02	.15
VALUE/SELLING PRICE	6.85	5	.23	.21
HOUSEHOLD SIZE	3.02	2	.22	.08
INCOME	2.74	3	.43	.08
VALUE/RENT	1.38	2	.50	.07
PREVIOUS				
DWELLING TYPE	1.03	5	.96	.05
TENURE	.82	2	.66	.04

(Computed from data collected in the 1974 Survey of Housing Units)

this value or a larger one is less than 2%. This means the probability of obtaining this Chi-Square value where no systematic relationship exists is 2%. Therefore, it can be concluded that a systematic relationship between IMPDEN and NUMBER OF ROOMS does exist.

To determine the degree of association between the predictor variables and IMPDEN, the Cramer's V statistic was calculated. Ranging from zero to plus one, the larger the value of Cramer's V, the higher the degree of association between variables (Nie et al., 1975: 225).

Table 4 lists the eight predictor variables in order of declining Chi-Square value. The first five predictor variables have a probability of less than 45% of obtaining the stated Chi-Square value and not having a systematic relationship with IMPDEN. This means that the first five predictor variables listed in Table 4 have a better than 55% chance of having a systematic relationship with IMPDEN.

As seen from the Cramer's V statistic, none of the predictors have a very high degree of association with IMPDEN. The highest value of association is for the predictor variable VALUE/SELLING PRICE. Thus the five predictor variables to be used for the balance of this analysis are:

1. NUMBER OF ROOMS
2. AGE
3. VALUE/SELLING PRICE
4. HOUSEHOLD SIZE
5. INCOME

Although the above variables are considered to be, in theory, independent of each other, in fact they are not. Crosstabulations run between variables suspected to have interaction effects obtained the results

tabulated in Table 5. The Chi-Square value of statistical significance indicates whether or not a relationship exists between two variables. A high value of Chi-Square indicates that a relationship of some sort exists between the variables being analyzed. This analysis shows that a degree of relationship exists between all the predictor variable pairs listed in Table 5. In order to calculate the true predicting value of each predictor variable, these interaction effects must be controlled for.

5.3.4 Strength of Predictor Variables and Direction of Relationships

The final step in testing the applicability of the CMHC data to the housing choice model, is to determine the amount of variation that each predictor variable causes in IMPDEN, with all other predictor variables held constant, as well as checking the direction of this variation. In order to test the validity of the variation a predictor variable causes in IMPDEN, the results of an F ratio test must be investigated. An F ratio indicates the probability for a given degrees of freedom of getting an F ratio greater than or equal to the stated value. This indicates the probability that the variances between samples are not due to chance. It ensures that the two populations used by the dependent, IMPDEN and independent (predictor) variables are the same (Nie et al., 1975: 335). Therefore, the lower the value of the significance coupled with a high value of F, there is a high probability that the dependent and independent variables are from the same population.

The statistic Eta^2 indicates the degree to which the predictor variable is responsible for the variability in the dependent variable (Nie et al., 1975: 224). For example, from Table 6, the unadjusted Eta^2

Table 5

Relationships Between Predictor Variables

Predictor Variables	Chi Square	Degrees of Freedom	Significance
HOUSEHOLD SIZE/NUMBER OF ROOMS	109.5	6	.000
VALUE-SELLING PRICE/NUMBER OF ROOMS	27.1	15	.028
INCOME/AGE	26.3	9	.002
HOUSEHOLD SIZE/AGE	24.8	4	.000
VALUE-SELLING PRICE/INCOME	24.7	15	.054
INCOME/NUMBER OF ROOMS	14.9	9	.093

(Computed from data collected in the 1974 Survey of Housing Units)

Table 6¹

Strength of Predictor Variables Before
and After Controlling for Covariates

Predictor Variable	Predictor Variable			Covariates			Predictor Variable	
	F	Degrees of Freedom	Significance of F	F	Degrees of Freedom	Significance of F	Eta ² Unadjusted	Adjusted For Covariates
NUMBER OF ROOMS	7.73	2	.001	3.86	4	.005	.06	.12
HOUSEHOLD SIZE	7.13	2	.001	4.31	4	.003	.09	.10
VALUE/SELLING PRICE	1.25	5	.290	7.23	4	.000	.07	.04
AGE	.97	4	.424	6.96	4	.000	.04	.02
INCOME	1.14	3	.334	7.06	4	.000	.02	.02

¹See Appendix C for complete results

(Computed from data collected in the 1974 Survey of Housing Units)

NOTE: Number of respondents for this table was 135 as only those respondents with no data missing from the above variables could be used.

value for NUMBER OF ROOMS is .06. This means that 6% of the variation in IMPDEN is accounted for by NUMBER OF ROOMS.

To obtain these statistics, an analysis of variance computer program was used, with each of the five predictor variables being used as the main predictor variable with the other four predictors used as covariates for whose effect is controlled. A covariate is an independent (predictor) variable that is in part responsible in determining the value of the dependent variable; in this case IMPDEN. For example, from Table 6, with NUMBER OF ROOMS as the predictor variable, HOUSEHOLD SIZE, VALUE/SELLING PRICE, AGE and INCOME are covariates.

Investigation of Table 6 indicates that the only predictors of any significance are NUMBER OF ROOMS and HOUSEHOLD SIZE, as the succeeding three predictors have very low F ratio values. When adjusted for covariates, the NUMBER OF ROOMS accounts for the greatest variation in IMPDEN, followed by HOUSEHOLD SIZE. The total amount of variability in IMPDEN accounted for by these five predictor variables is also indicated in Table 6. Summing the Eta^2 values shows that NUMBER OF ROOMS, HOUSEHOLD SIZE, VALUE/SELLING PRICE, AGE, and INCOME explain 30% of the variation in IMPDEN. This implies that 70% is left unaccounted for. Variables that have not been investigated account for this. Such factors as education levels, ethnic origins, sociability and perception of space of the householder for which data was not available may all contribute to the variability in IMPDEN.

Now that the strength of predictor variables has been ascertained, the direction of the relationship between the predictor variables and IMPDEN will be investigated and compared to the relationships hypothesized in the model.

The strongest predictor, NUMBER OF ROOMS, was hypothesized to have a negative relationship with IMPDEN.

NUMBER OF ROOMS	MEAN IMPDEN ¹
1 - 4	2.55
5 - 8	1.47
9 - 12	0.0

The mean IMPDEN decreases with increasing NUMBER OF ROOMS, as was hypothesized (Hypothesis 3) in the model. However, the model indicated that the rate of decline of the importance of density would be less for those with greater than two rooms than for those with less than two rooms. However, the data indicates that the rate of decline of IMPDEN with increasing NUMBER OF ROOMS is constant.

HOUSEHOLD SIZE, indicated by the data as being the second strongest predictor variable, exhibited the following relationship with IMPDEN.

HOUSEHOLD SIZE	MEAN IMPDEN
1 - 3	.39
4 - 6	2.08
7 - 9	2.18

The data shows a very strong positive relationship as was indicated by Hypothesis 2: Importance of Density vs. Household Size, in the housing choice model. The model, however, did not hypothesize a large jump in IMPDEN from 1 - 3 to 4 - 6 HOUSEHOLD SIZE categories. This indicates that when a family has two children as compared to a family with one or less children, IMPDEN increases a considerable amount.

According to the data, VALUE/SELLING PRICE showed the following mean IMPDEN for these variable categories.

¹IMPDEN was ranked as: very important = 4, moderate importance = 2, low importance = 0. Therefore, a mean IMPDEN of 2.55 implies that those with 1 - 4 rooms place a moderate importance on density when purchasing a house.

VALUE/SELLING PRICE	MEAN IMPDEN
Up to \$10,000	2.50
\$10,000 - 19,999	1.33
20,000 - 29,999	1.93
30,000 - 39,999	1.27
40,000 - 49,999	1.13
over 50,000	1.08

The data indicates a negative relationship between VALUE/SELLING PRICE and IMPDEN, as was hypothesized in the model, Hypothesis 8. The lower the value of the householder's previous residence, the greater the importance of density to him when purchasing a subsequent dwelling. Note, that this relationship only pertains to those householders whose previous tenure was that of ownership.

INCOME, a predictor variable thought to be very strong as indicated by the literature (Butler, 1969), and hypothesized in Hypothesis 1, as exhibiting a positive relationship with IMPDEN, according to the data is neither a strong predictor, nor exhibits a positive relationship with respect to IMPDEN.

INCOME	MEAN IMPDEN
Up to \$9,999	1.52
\$10,000 - 19,999	1.48
20,000 - 29,999	2.41
30,000 - 45,000	1.42

The data indicates neither a positive nor a negative relationship. The high mean value of IMPDEN for the income group \$20,000 - 29,999 appears to be due to variables linked to income but not controlled for. Families in that income bracket may feel that they are now able to afford more space, while those of INCOME above \$30,000 are interested in other home features. This analysis was not able to control for education levels or

occupational status which both may have had an effect on IMPDEN for the \$20,000 - 29,999 INCOME class. Although not being in agreement with the housing choice model, these findings of INCOME being a poor predictor of IMPDEN concur with those of Michelson (1977). He found that income may explain why a householder does not select a particular dwelling, but it does not go far in explaining what householders actually select (Michelson, 1977: 135).

The final and also weak predictor of IMPDEN, AGE, was hypothesized in Hypothesis 7 to have a negative relationship with IMPDEN.

AGE	MEAN IMPDEN
20 - 29	2.24
30 - 39	1.51
40 - 49	1.60
50 - 59	1.30
60 - 75	1.31

The results also suggest a negative relationship between AGE and IMPDEN. IMPDEN has the most importance to those expanding families between the ages of twenty and twenty-nine.

5.4 Conclusion

The data analysis in the preceding sections of this chapter indicated that differences exist between these findings and the model of the importance of density in the housing choice process, described in the preceding chapter. This section will elaborate on the differences and account for these discrepancies.

The first discrepancy is in listing for a population in general, the four most important final choice criteria. The literature indicated the following list:

Final Choice Criteria: Cost
Dwelling Unit
Location
Lot or Grounds

However, the data as indicated in Table 1, shows that space considerations are the most important to the Winnipeg population with cost (satisfactory financial arrangements) rated as second. This discrepancy is probably due to the length of time that the respondents lived in their dwellings before being interviewed in the CMHC survey. During this length of time which for some may have been up to three years, their original reasons for purchasing their present dwelling may have been tempered. Another reason for this difference between the survey results and the literature may be due to the fact that 50% of the sample did not live in a single family detached dwelling prior to their move, so space considerations were of prime importance to them, when selecting their present dwelling.

It is also interesting to compare the results of the data analysis to those hypothesized by Kain's (1975) 'Journey to Work Theory'. He stated that one of the primary reasons for the choice of a particular residence is the journey to work considerations (Kain, 1975). In the CMHC sample, only 8.2% (see Table 1) listed 'closer to transportation, work, services and friends' as being the primary reason for their choice of residence. This was fourth after space considerations in the percent of respondents responding to the question asking them the first reason for purchasing their present dwelling.

Although not following Kain's hypothesis, this analysis indicates (see Table 1) that for this sample, density is a consideration when a house selection is made and a very important one in this case.

The literature indicated that the four strongest predictors of the

importance of density are:

Householder Characteristics: income
tenure
household size
number of rooms

with the first three being of greatest strength. This analysis of the CMHC data found the five strongest predictors to be:

Householder Characteristics: NUMBER OF ROOMS
HOUSEHOLD SIZE
VALUE/SELLING PRICE
AGE
INCOME

listed in descending order of strength. As indicated by Table 6, NUMBER OF ROOMS and HOUSEHOLD SIZE are by far the strongest predictors accounting for 12% and 10% respectively, of the variation in IMPDEN.

The prime difference between the findings obtained from the Winnipeg based CMHC data and those determined from the literature is that income was found to be a rather poor predictor of the importance of density. This discrepancy is probably due to two reasons. The first is the way in which the literature was interpreted. Butler (1969) states that income is a strong predictor of housing outcome in terms of the size of the house bought. The data, however, analyzed the reasons why a householder selected a particular house. Therefore, income may be a strong predictor in determining the housing outcome, but not of the reasons for which the house was bought. The second reason for this discrepancy is the length of time between the respondents' house purchase and the CMHC survey. In some instances this may have

been as long as three years. Over that length of time, the original reasons for purchasing a dwelling may have been forgotten, or tempered by actually living in the residence.

The direction of the relationships hypothesized in the model for number of rooms, household size, value/selling price, and age are the same as those indicated by the analysis of the data. However, the relationship between one of the weakest predictors, INCOME and IMPDEN, differs from that hypothesized in the model. For INCOME vs. IMPDEN, the relationship is an ambiguous one with density only being important for the \$20,000 to \$29,999 income class. As indicated, this effect may be due to other variables such as education and occupational status that were not controlled for.

Analysis of the Winnipeg based CMHC data indicates that for this city, density is a final choice criterion with 41.4% of the population sampled stating space as the most important reason for purchasing a house. The strongest predictor of density importance is the number of rooms in a householder's previous residence, with the population group having the highest mean IMPDEN being those householders whose previous residence had between one and four rooms. For those with between nine and twelve rooms in their previous residence, importance of density was the lowest of all population categories studied.

Although, as previously mentioned, these findings are not indicative of all householders in the City of Winnipeg, they do indicate that the housing choice model describing the importance of density in the housing choice process does apply to the population sampled.

CHAPTER 6

SUMMARY AND CONCLUSIONS

The purpose of this investigation was to determine whether or not a house buyer considers the density of the area in which a prospective home is located, as part of the house purchase decision. This investigation was carried out in two stages. The first stage reviewed the literature pertaining to density and housing choice. Synthesis of the findings yielded the following statement.

The density of a neighbourhood in a residential area is one of the elements of a householder's final choice criteria.

This statement is the result of combining a householder's final choice criteria:

Final Choice Criteria: Cost
Dwelling Unit
Location
Lot or Grounds

with the elements of a residential neighbourhood determined by a density standard.

Elements of Density: House Size
Lot/yard Size

House size (dwelling unit) and lot/yard size (lot or grounds) are both Final Choice Criteria and Elements of Density. Thus, density is part of a householder's final choice criteria as indicated by the above statement.

It was also determined that to each householder, the density criterion is of differing importance in the house purchase decision, depending on certain characteristics of the householder. The following list, as

determined from the literature (Butler, 1969; Hempel, 1970; Menchik, 1971; Hinshaw, 1973; Michelson, 1977 and Yeates, 1971), contains householder characteristics hypothesized to have the greatest strength in determining density importance to the householder.

Householder Characteristics: Income
Household Size
Number of Rooms
Tenure
Location
Race
Age
Value

These findings were used as the basis for a housing choice model describing the importance of density to householders of differing characteristics. Each relationship was stated in terms of a hypothesis with the general direction of each relationship being shown by a linear equation as well as a graphed line. As this model was set up on the basis of findings gathered in the United States, it was important to check its applicability to the Canadian situation.

The second stage of this investigation involved using housing choice data collected in Winnipeg by CMHC in its 1974 Survey of Housing Units. Using this data, the validity of the housing choice model to the City of Winnipeg was verified. The main findings were that the number of rooms in a householder's residence and the household size are the strongest predictors of the importance of density to the householder in a subsequent house purchase.

Although some discrepancies between the model and the data findings exist, none was so great as to invalidate the model. The main deviation was that the householder characteristic of income, hypothesized to be a strong predictor of importance of density, was found not to be very strong

for the Winnipeg population. Possible reasons for this were discussed.

These results indicate that the housing choice model is definitely applicable to Winnipeg and since it is valid for this situation, it is probably applicable to other North American cities. This implies that density is an important consideration for many householders when they are purchasing a single family detached dwelling. This model also shows that the ranking of density with respect to other final choice criteria varies depending on householder characteristics. It was shown that households whose previous residence had between one and four rooms inclusive were most likely to cite density as being important. Those with a small amount of space in a previous residence value space very highly when selecting a new dwelling.

The results of this examination of the housing choice process, through the literature and data analysis, confirm the validity of Chapin's (1968) householder activity pattern based housing choice theory. He stated that the choice of a place of residence may involve social accessibility considerations as well as accessibility to services and livability opportunities in the form of sought-after living qualities (Chapin, 1968). Table 1 shows that these three factors are three of the four most popular responses given by householders as their first reason for purchasing a house. These findings contradict Kain's (1975) housing choice theory whose basis is urban land market theory, where he states that accessibility to work is the key determinant of which house a householder will purchase.

This investigation is only a preliminary step in ascertaining the full impact of density in the housing choice process. Only one portion, homeowners, of all households seeking accommodation in a city, have been

investigated. To those who cannot afford to purchase a single family detached dwelling unit, space and the desire for it are just as crucial as to those who can afford it.

In order to properly examine city residents' views on the importance of density when selecting accommodation, ideally a longitudinal survey should be carried out interviewing a population at set stages in the housing choice process; when a decision is made to look for a new house, when a house has been selected and is being purchased, and a set period of time after the purchase. A householder's space perceptions and what constitutes privacy and crowding to them should be investigated. To best determine what amount of space is sufficient to what people, the survey must be of a population containing people of differing incomes, household sizes, ages, occupations, education levels and ethnicities. To conduct the survey over different seasons would indicate how changes in the environment due to the weather affect space perceptions.

Although it was not possible to include such socio-cultural and perceptual variables in this study, it nonetheless was able to show that density is important to many in the housing choice process. Almost 42% of the sample population used in this analysis cited 'density' as the first reason for selecting their present dwelling unit.

Ascertaining that most householders value space very highly and look for a certain amount of it as a requirement for selecting a new home, although solving one problem, that of this investigation, has created another. Householders want more residential space when cities are trying to find alternative forms of housing that are more land intensive, hence, of higher density. A move to redensify the housing in a city can go too

far and create living environments that do not provide the amount of space that most households accept as being necessary for comfortable living. Currently residential environments may be providing the amount of space that people feel is sufficient but such low densities are resource inefficient. The problem is to provide sufficient space for each dwelling, yet not be wasteful of precious land. The solution probably lies with the planners as well as with the householders. As sufficient residential space is a qualitative measure, a different amount of space to everyone is considered to be the amount required for their living needs. Thus, in order to keep cities to a manageable and economic size, householders will have to learn to accept less space as being sufficient. Planners can aid this learning process by providing viable alternative residential environments to those currently existing in suburbia.

At least the problem is known ... "For creators of environment, knowing the problem is most of the way to the solution" (Erickson, 1966: 29).

APPENDICES

APPENDIX A

DEFINITIONS

- Definition 1: The Housing Choice Process
The activities leading to the purchase of a single family detached dwelling unit by a householder.
- Definition 2: The Householder
The member of a household who is purchasing a house; the household head.
- Definition 3: The Household
Any person or group of persons occupying a dwelling unit as their usual place of residence.
- Definition 4: Final Choice Criteria
The reasons given by a householder for purchasing his/her dwelling unit.
- Definition 5: Housing Choice Outcome
The characteristics of the house that is purchased.
- Definition 6: Neighbourhood
A segment of a residential area identifiable by similar house and lot sizes as well as street character.
- Definition 7: Cost
The purchase price of the house that is bought.
- Definition 8: The Dwelling Unit
a. the overall quality of the unit.
b. the size of the house in terms of number of rooms.
- Definition 9: General Location
a. Neighbourhood condition/reputation.
b. Accessibility: time-distance to transportation, services and friends.
c. Time-distance to work.
d. Central city or not central city.

Definition 10: Lot or Grounds
Lot size/yard size.

Definition 11: Density
The number of single family detached dwelling units per gross acre of residential land.

Definition 12: Lot Size
The area of the lot on which a single family detached home is located.

Definition 13: House Size
The area in square feet of the house.

Definition 14: Yard Size
The area of the enclosed back portion of the lot on which is located a single family detached dwelling unit.

Definition 15: The Importance of Density
The ranking that a householder gives to the density criteria, a desire for more space (house and lot size) when buying a house with respect to other final choice criteria. The rankings being:
•very important
•moderately important
•low importance

Definition 16: Income
Total income of the household during the calendar year of the move.

Definition 17: Race
The race of the householder:
a. white, or
b. nonwhite.

Definition 18: Household Size¹
The number of members, both adults and children, in the household at the time of the move.

Definition 19: Age
The age in years of the householder at the time of the move.

Definition 20: Tenure

The tenure of the householder's residence:

- a. rental
- b. ownership

Definition 21: a. Value/Rent¹

The monthly rental of the householder's previous residence.

b. Value/Selling Price

The monetary value (selling price) of the householder's residence.

Definition 22: Number of Rooms

The number of rooms in the householder's previous residence which are finished and suitable for year-round living. Excluded are bathrooms, halls, garages, laundry and furnace rooms.

Definition 23: Location

The location of the householder's previous dwelling as indicated by its distance from the central city.

Definition 24: Dummy Variable IMPDEN

Importance of Density		IMPDEN
very important	=	4
moderate importance	=	2
low importance	=	0

ASSUMPTIONS

Assumption 1: The House Purchased

The house purchased by the householder reflects a realization of buyer preferences and specifications.

Assumption 2: Housing Densities

Housing densities (dwelling units per acre) decline with increasing distance from the downtown area of the city.

Assumption 3: The Sex of the Householder

The effect of the sex of the householder on the ranking of housing choice criteria is insignificant when compared to the effects of other householder characteristics.

Assumption 4: Density Preference

A householder states his density preference in terms of wanted exterior (lot/yard size) and interior (house size) space.

Assumption 5: Density/House-Lot Sizes

The lower the density of a residential area, the larger the houses and lots, the higher the density the smaller the houses and lots.

APPENDIX B

DEFINITION OF VARIABLES USED FROM 1974 SURVEY OF HOUSING UNITS

ITEM NUMBER 80

NAME Language

DESCRIPTION This field indicates the language in which the questionnaire was completed.

<u>Code</u>	<u>Description</u>
1	English only.
2	French only.
3	Both languages.
4	Not stated.

ITEM NUMBER 127, 128

NAME Reasons for Selecting Present Dwelling

DESCRIPTION These fields indicate the two most important reasons for selecting this particular dwelling.

A First Most Important Reason

B Second Most Important Reason

<u>Code</u>	<u>Description</u>
1	Satisfied the need for less space
2	Satisfied the need for more space
3	Neighbourhood conditions
4	Quality of the unit
5	Closer to transportation, work, services, friends, etc.
6	Satisfactory financial arrangements
7	Other
8	Other
9	Not stated

ITEM NUMBER 131
NAME Type of Dwelling
DESCRIPTION This field indicates the structural type of the dwelling.

<u>Code</u>	<u>Description</u>
1	Single house
2	House attached to non-residential structure
3	Semi-detached or double house
4	Row house
5	Duplex
6	Apartment, flat or multiple dwelling
9	Not stated

DEFINITIONS A dwelling unit is a set of living quarters which is structurally separate and has a private entrance outside the building or from a common stairway or hall inside-- i.e., the entrance must be one which can be used without passing through anyone else's living quarters.

Classification of dwelling units by structural type:

Single house - A structure with one dwelling unit only, separated by open space from all other structures except its own garage or shed.

House attached to a non-residential structure - A single house attached to a non-residential structure (a store, church or school, etc.) but separated from it by a wall extending from ground to roof.

Semi-detached or double - A dwelling unit joined to one other dwelling unit, separated from it by a wall extending from ground to roof, i.e., one of two dwelling units attached side by side having no other dwelling units either above or below and separated by open space from all other structures.

Row house - A dwelling unit in a row of three or more dwelling units sharing common walls extending from ground to roof and in which there are no other dwelling units either above or below.

Duplex - One of two dwelling units, one on top of the other, separated by open space from all other structures. This includes any dwelling unit originally built as a single house in which the basement or upper storey has been converted to form another separate dwelling unit.

Apartment, flat or multiple dwelling - A dwelling unit in a triplex, quadruplex or apartment building that is separated from all other dwelling units by a horizontal division or by both horizontal and vertical divisions. This includes dwellings in duplexes or triplexes that are attached in rows, dwelling units that are flats above or within a non-residential structure (school, church, store, etc.), and structurally separate dwelling units in a converted house if they number more than two.

Exclusions - Dwelling units such as mobile homes, rooming houses (containing more than 10 lodgers), tents and trailers, etc., were not included in this survey.

ITEM NUMBER	135
NAME	Number of Rooms
DESCRIPTION	This field indicates the number of rooms in the dwelling.
DEFINITION	A room is an enclosed area within a dwelling which is finished and suitable for year-round living. Included are kitchen, bedroom(s), finished rooms in attic or basement, servants' or lodgers' rooms, rooms with dividing partitions. "L"-shaped rooms such as living and dining rooms are considered to be two rooms. Not counted as rooms are bathrooms, halls, garages, vestibules, laundry rooms, furnace rooms, unfinished rooms in basement or attic.

ITEM NUMBER	142
NAME	Tenure
DESCRIPTION	This field indicates whether the dwelling is owned or rented by a member(s) of the household.

<u>Code</u>	<u>Description</u>
1	Owned or being bought as a condominium by a member(s) of this household
2	Owned or being bought by a member(s) of this household
3	Rented for money by a member(s) of this household
4	Other
0	Not stated or not applicable - no previous dwelling data present for this household.

ITEM NUMBER 143

NAME Monthly Rent Payment

DESCRIPTION This field indicates the amount (in dollars) paid monthly for rent by the household.

ITEM NUMBER 146

NAME Selling Price

DESCRIPTION This field indicates the selling price of the dwelling, if it was sold.

ITEM NUMBER 194

NAME Household Size

DESCRIPTION This field indicates the number of members in the household.

ITEM NUMBER 195

NAME Household Income

DESCRIPTION This field indicates the total income received from all sources during the calendar year in which the move was made by all members of the household who were 14 years of age and over at the time of the move. The following sources of income are included in the total:

- 1) Wages and salaries before deductions, commissions, bonuses, tips, etc.
- 2) Net income from operating a farm on his own account or in partnership
- 3) Family and youth allowances
- 4) Old age security and guaranteed income supplement
- 5) Canada or Quebec pension plan benefits
- 6) Net income from self-employment or from operating his/her own non-farm business or professional practice
- 7) Unemployment insurance benefits
- 8) Canada manpower training allowance
- 9) Social assistance
- 10) Other income from government sources
- 11) Gross income from roomers and boarders
- 12) Interest on bonds, deposits and savings certificates

- 13) Dividends and other investment income
- 14) Retirement pensions, superannuation, annuities
- 15) Other money income

NOTE If the year of the move is 1974, income is reported for the calendar year 1973.

ITEM NUMBER 199

NAME Age of Head

DESCRIPTION This field indicates the age, at the time of the move, of the head of the household.

- NOTE
- 1) Individuals reported as being 76 or more years old will show 76.
 - 2) The head of the household will always be 14 years of age or older.
 - 3) The head of the household, for the purposes of this survey, is that member of the household who contributed the largest amount of money for the operation of the household.

ITEM NUMBER 200

NAME Sex of Head

DESCRIPTION This field indicates the sex of the head of the household.

<u>Code</u>	<u>Description</u>
1	Male
2	Female
9	Not stated

NOTE The head of the household, for the purposes of this survey, is that member of the household who contributed the largest amount of money for the operation of the household.

ITEM NUMBER 201

NAME Marital Status

DESCRIPTION This field indicates the marital status of the head of the household.

<u>Code</u>	<u>Description</u>
1	Single
2	Married
3	Other
9	Not stated

DEFINITIONS

Single - A person who has never been married, including all persons less than 14 years.

Married - A person who is married and is not a widow, widower, legally separated or divorced.

Other - A person who has been married and is a widow, widower, legally separated or divorced.

NOTE

The head of the household, for the purposes of this survey, is that member of the household who contributed the largest amount of money for the operation of the household.

APPENDIX C

COMPUTER RESULTS: ANALYSIS OF VARIANCE AND
MULTIPLE CLASSIFICATION ANALYSIS OF FIVE
STRONGEST PREDICTOR VARIABLES

Key to Variable Names Used in Computer Program

Computer Program Variable Name	Corresponding Householder Characteristic
IMPDEN	importance of density
PNOROOMS	number of rooms
PAGEHEAD	age of householder
PHHSIZE	household size
PSSELPRIC	value/selling price
PHHINCOM	household income

IMPDEN by PNOROOMS (independent variable) with
PAGEHEAD, PHHSIZE, PSELPRIC, PHHINCOM (covariates)

ANALYSIS OF VARIANCE					
Source of variation	sum of squares	degrees of freedom	mean square	F	significance of F
Covariates	50.370	4	12.593	3.860	.005
PAGEHEAD	15.377	1	15.377	4.714	.032
PHHSIZE	22.568	1	22.568	6.918	.010
PSELPRIC	10.801	1	10.801	3.311	.071
PHHINCOM	1.624	1	1.624	.498	.482
Main effects					
PNOROOMS	50.475	2	25.238	7.737	.001
Explained	100.845	6	16.808	5.152	.000
Residual	417.546	128	3.262		
Total	518.391	134	3.869		

MULTIPLE CLASSIFICATION ANALYSIS					
Grand Mean = 1.60					
Variable + Category	N	Unadjusted Deviation	Unadjusted Eta ²	Adjusted for Covariates: Deviation	Adjusted Eta ²
PNOROOMS					
1 - 4	29	0.74		0.95	
5 - 8	100	-0.12		-0.13	
9 - 12	6	-1.60		-2.41	
			.06		.12

Multiple R¹ = .441

Multiple R Squared² = .195

(Source: 1974 Survey of Housing Units)

¹Multiple R indicates the overall relationship between IMPDEN and the independent variable.

²Multiple R squared is the total amount of variance in IMPDEN explained by the independent variable and covariates.

IMPDEN by PHHSIZE with PNOROOMS,
PAGEHEAD, PSELPRIC, PHHINCOM

ANALYSIS OF VARIANCE					
Source of variation	sum of squares	degrees of freedom	mean square	F	significance of F
Covariates	55.991	4	13.998	4.307	.003
PNOROOMS	31.319	1	31.319	9.635	.002
PAGEHEAD	15.737	1	15.737	4.842	.030
PSELPRIC	3.433	1	3.433	1.056	.306
PHHINCOM	5.503	1	5.503	1.693	.196
Main effects					
PHHSIZE	46.351	2	23.176	7.130	.001
Explained	102.343	6	17.057	5.248	.000
Residual	416.049	128	3.250		
Total	518.391	134	3.869		

MULTIPLE CLASSIFICATION ANALYSIS

Grand Mean = 1.60

Variable + Category	N	Unadjusted Deviation	Unadjusted Eta ²	Adjusted for Covariates: Deviation	Adjusted Eta ²
PHHSIZE					
1 - 3	51	-0.74		-0.81	
4 - 6	76	0.51		0.48	
7 - 9	8	-0.10	.09	0.58	.10

Multiple R = .444

Multiple R squared = .197

(Source: 1974 Survey of Housing Units)

IMPDEN by PSELPRIC with PNOROOMS,
PAGEHEAD, PHHSIZE, PHHINCOM

ANALYSIS OF VARIANCE					
Source of variation	sum of squares	degrees of freedom	mean square	F	significance of F
Covariates	93.600	4	23.400	7.230	.000
PNOROOMS	31.319	1	31.319	9.676	.002
PAGEHEAD	15.737	1	15.737	4.862	.029
PHHSIZE	44.396	1	44.396	13.717	.000
PHHINCOM	2.148	1	2.148	.664	.417
Main effects					
PSELPRIC	20.209	5	4.042	1.249	.290
Explained	113.809	9	12.645	3.907	.000
Residual	404.582	125	3.237		
Total	518.391	134	3.869		

MULTIPLE CLASSIFICATION ANALYSIS

Grand Mean = 1.60

Variable + Category	N	Unadjusted Deviation	Unadjusted Eta ²	Adjusted for Covariates: Deviation	Adjusted Eta ²
PSELPRIC					
Up to \$10,000	10	1.20		0.90	
\$10,000 - \$19,999	54	-0.19		-0.27	
\$20,000 - \$29,999	46	0.31		0.33	
\$30,000 - \$39,999	17	-0.42		-0.33	
\$40,000 - \$49,999	6	-0.93		-0.47	
Over \$50,000	2	-1.60		-0.52	
			.07		.04

Multiple R = .469

Multiple R squared = .220

(Source: 1974 Survey of Housing Units)

IMPDEN by PAGEHEAD with PNOROOMS,
PHHSIZE, PSELPRIC, PHHINCOM

ANALYSIS OF VARIANCE

Source of variation	sum of squares	degrees of freedom	mean square	F	significance of F
Covariates	91.504	4	22.876	6.961	.000
PNOROOMS	31.319	1	31.319	9.530	.002
PHHSIZE	54.220	1	54.220	16.499	.000
PSELPRIC	.685	1	.685	.208	.649
PHHINCOM	5.280	1	5.280	1.607	.207
Main effects					
PAGEHEAD	12.809	4	3.202	.974	.424
Explained	104.313	8	13.039	3.968	.000
Residual	414.078	126	3.286		
Total	518.391	134	3.869		

MULTIPLE CLASSIFICATION ANALYSIS

Grand Mean = 1.60

Variable + Category	N	Unadjusted Deviation	Unadjusted Eta ²	Adjusted for Covariates: Deviation	Adjusted Eta ²
PAGEHEAD					
20 - 29	24	0.40		0.64	
30 - 39	48	0.15		-0.09	
40 - 49	26	0.25		-0.00	
50 - 59	20	-0.40		-0.30	
60 - 75	17	-0.89		-0.29	
			.04		.02

Multiple R = .449

Multiple R squared = .201

(Source: 1974 Survey of Housing Units)

IMPDEN by PHHINCOM with PNOROOMS,
PAGEHEAD, PHHSIZE, PSELPRIC

ANALYSIS OF VARIANCE					
Source of variation	sum of squares	degrees of freedom	mean square	F	significance of F
Covariates	92.255	4	23.064	7.059	.000
PNOROOMS	31.319	1	31.319	9.586	.002
PAGEHEAD	15.737	1	15.737	4.817	.030
PHHSIZE	44.396	1	44.396	13.589	.000
PSELPRIC	.803	1	.803	.246	.621
Main effects					
PHHINCOM	11.214	3	3.738	1.144	.334
Explained	103.469	7	14.781	4.524	.000
Residual	414.923	127	3.267		
Total	518.391	134	3.869		

MULTIPLE CLASSIFICATION ANALYSIS

Grand Mean = 1.60

Variable + Category	N	Unadjusted Deviation	Unadjusted Eta ²	Adjusted for Covariates: Deviation	Adjusted Eta ²
PHHINCOM					
0 - \$9,999	39	0.04		-0.08	
\$10,000 - \$19,999	78	-0.16		-0.12	
\$20,000 - \$29,999	16	0.65		0.81	
\$30,000 - \$45,000	2	0.40		-0.18	
			.02		.02

Multiple R = .447

Multiple R squared = .200

(Source: 1974 Survey of Housing Units)

BIBLIOGRAPHY

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Sources Cited

- Altman, Irving (1975), The Environment and Social Behaviour. California: Brook/Cole Publishing Co.
- Bird, Caroline (1972), The Crowding Syndrome. New York: David McKay Company Inc.
- Butler, E. W. et al. (1969), Moving Behaviour and Residential Choice: A National Survey. National Cooperative Highway Research Report 81. Washington: Highway Research Board.
- Carvalho, M., K. Sahay, D. Hum and D. Falconer (1974), Housing in Winnipeg. Departments of City Planning and Economics, University of Manitoba.
- Casetti, Emilio (1967), "Urban Population Density Patterns: An Alternate Explanation". Canadian Geographer 11: 96-100.
- Central Mortgage and Housing Corporation (1974), Documentation Package: 1974 Survey of Housing Units. Ottawa: 1974 Survey of Housing Units Project Team.
- _____ (1974a), Questionnaire, Survey of Housing Units. Ottawa: 1974 Survey of Housing Units Project Team.
- Chapin, F. Stuart Jr. (1965), "A Model For Simulating Residential Development". Journal of the American Institute of Planners 31: 120-125.
- _____ (1968), "Activity Systems and Urban Structure: A Working Schema". Journal of the American Institute of Planners 34: 11.
- Course Team (1973), The City as a Social System. Great Britain: The Open University Press.
- De Chiara, J., and L. Koppelman (1969), Planning Design Criteria. New York: Van Nostrand Reinhold Co.
- Delos Three (1972), "Living at High Densities", in Bell, G. and J. Tyrwhitt (eds.), Human Identity in the Urban Environment, pp. 218-223. Great Britain: Butler and Tanner Ltd.
- Erickson, A. (1966), Habitation: Space Dilemma and Design. Ottawa: Canadian Housing Design Council.
- Ermuth, F. (1974), Residential Satisfaction and Urban Environmental Preferences. Toronto: York University, Atkinson College, Department of Geography.

- Foote, N., J. Abu-Lughod, M. M. Foley and L. Winnick (eds.) (1960), Housing Choices and Constraints. New York: McGraw-Hill.
- Gans, H. J. (1968), People and Plans: Essays on Urban Problems and Solutions. New York: Basic Books Inc.
- Hall, E. T. (1966), The Hidden Dimension. New York: Doubleday and Co.
- _____ (1971), "Environmental Communication" in Esser, A. (ed.), Behaviour and Environment, p. 247. New York: Plenum Press.
- Hempel, D. J. (1970), A Comparative Study of the Home Buying Process in Two Connecticut Housing Markets. Storrs, Connecticut: Centre for Real Estate and Urban Studies.
- Hinshaw, M. L. and K. J. Allott (1973), "Environmental Preferences of Future Housing Consumers", in Pynoos, J., R. Schafer and C. W. Hartman (eds.), Housing Urban America. Chicago: Aldine.
- Hoover, E., and R. Vernon (1959), Anatomy of a Metropolis. New York: Anchor.
- James, J. R. (1968), "Residential Density". Architectural Design 38: 30.
- Kain, J. F. (1975), Essays on Urban Spatial Structure. Massachusetts: Ballinger Publishing Co.
- Menchik, M. D. (1971), Residential Environmental Preferences and Choice: Some Preliminary Empirical Results Relevant to Urban Form. R.S.R.I. Discussion Paper Series No. 46. Pennsylvania: Regional Science Research Institute.
- Michelson, W. (1977), Environmental Choice, Human Behaviour and Residential Satisfaction. New York: Oxford University Press.
- Michelson, W., D. Belgue and J. Stewart (1973), "Intentions and Expectations in Differential Residential Selection". Journal of Marriage and the Family 35: 189-196.
- Ministry of Housing and Local Government (1952), The Density of Residential Areas. London: Her Majesty's Stationery Office.
- Moriarty, B. M. (1974), "Socio-economic Status and Residential Locational Choice". Environment and Behaviour 6: 448-469.
- Murie, A. (1974), Household Movement and Housing Choice. Birmingham: University Centre for Urban and Regional Studies.
- Newman, O. (1973), Defensible Space: Crime Prevention Through Urban Design. New York: MacMillan Publishing Co. Inc.
- Nie, N. et al. (1975), Statistical Package For the Social Sciences (2nd Ed.). New York: McGraw Hill.

- Paxton, E. T. (1955), What People Want When They Buy a House. (based on a study by the Survey Research Centre, University of Michigan for the Housing and Home Finance Agency) Washington: U.S. Department of Commerce.
- Porteous, J. D. (1977), Environment and Behaviour: Planning and Everyday Urban Life. Massachusetts: Addison-Wesley Publishing Co.
- Rossi, P. H. (1955), Why Families Move. New York: The Free Press.
- Schmitt, R. C. (1963), "Implications of Density in Hong Kong". Journal of the American Institute of Planners 29: 210-217.
- Sewell, J. (1977), "Why Suburbia Hasn't Worked", in Lorimer, J. and E. Ross (eds.), The Second City Book. Toronto: James Lorimer and Company, Publishers.
- Stegman, M. A. (1969), "Accessibility Models and Residential Location". Journal of the American Institute of Planners 35: 22-29.
- St. James - Assiniboia Zoning By-law #1558. Winnipeg.
- Werthman, C., J. S. Mandel and T. Dienstfray (1965), Planning and the Purchase Decision: Why People Buy in Planned Communities. A pre-publication of the Community Development Project, University of California, Berkeley: Institute of Regional Development, Centre for Planning and Development Research, Reprint No. 10.
- Yeates, M. H. and B. J. Garner (1971), The North American City. New York: Harper and Row.
- Ylvisaker, P. N. (1975), "An Overview of the Problems of Density", in Taeuber, C. et al., Density: Five Perspectives: A ULI Special Report, pp. 22-25. The Urban Land Institute.

General References

- Apps, P. (1971), A Residential Model: 1 Theory. Working Paper #59, Land Use and Built Form Studies, Cambridge: University of Cambridge.
- Armiger, L. E. Jr. (1966), "Toward a Model of Residential Location Decision Process: A Study of Recent and Prospective Buyers of New and Used Homes." Unpublished Master's Thesis: University of North Carolina.
- Berridge, J. (1971), The Housing Market and Urban Residential Structure: A Review. Research Paper #51. Centre for Urban and Community Studies: University of Toronto.

- Bodek, R. (1958), How and Why People Buy Houses: A Study of Subconscious Home Buying Motives. Philadelphia: Municipal Publications.
- Central Mortgage and Housing Corporation (1977), Canadian Housing Statistics, 1976. Ottawa: Data and Systems.
- Chadwick, B. A. (1972), "In Defense of Density: Its Relationship to Health and Social Disorganization", in Bahr, H. (ed.), Population, Resources and the Future, pp. 175-193. Utah: Brigham Young University Press.
- Chapin, F. and S. Weiss (eds.) (1962), Urban Growth Dynamics. New York: Wiley and Sons.
- Daly, M. (1968), "Residential Location Decisions", Australian and New Zealand Journal of Sociology 5: 36-48.
- Delos Six (1972), "Human Development, Densities and Scale", in Bell, G. and J. Tyrwhitt (eds.), Human Identity in the Urban Environment, pp. 210-217. Great Britain: Butler and Tanner Ltd.
- Fischer, C. (1976), The Urban Experience. New York: Harcourt Brace Jovanovich Inc.
- Freedman, J. (1975), Crowding and Behaviour. New York: Viking Press.
- Hall, E. T. (1973), The Silent Language. New York: Doubleday.
- Hammond, R. and P. McCullagh (1974), Quantitative Techniques in Geography: An Introduction. Great Britain: Clarendon Press.
- Jacobs, J. (1961), Death and Life of Great American Cities. New York: Random House.
- Lansing, J. and M. Barth (1964), Residential Location and Urban Mobility: A Multivariate Analysis. Ann Arbor, Michigan: Institute of Social Research, University of Michigan.
- Michelson, W. (1970), Man and His Urban Environment. Massachusetts: Addison-Wesley Publishing Co.
- Miller, M. (1961), "Residential Density: Relating People to Space Rather Than to Ground Area". Journal of the American Institute of Planners 27: 77-78.
- Muth, R. (1969), Cities and Housing: The Spatial Pattern of Urban Residential Land Use. Chicago: University of Chicago Press.
- Overall, J. and C. James Klett (1972), Applied Multivariate Analysis. New York: McGraw-Hill Book Co.

Palm, R. (1976), Urban Social Geography from the Perspective of the Real Estate Salesman. Research Report #38. Berkeley, California: Centre for Real Estate and Urban Economics.

Sartain, A. et al. (1973), Psychology: Understanding Human Behaviour. New York: McGraw-Hill Book Co.

Steffans, R. (1964), "Factors Influencing Consumer Choice of Residential Location". Unpublished Master's Thesis: University of North Carolina.

Tuan, Yi-Fu (1974), Topophilia. New Jersey: Prentice-Hall Inc.

Wohwill, J. and D. Carson (eds.) (197), Environment and the Social Sciences: Perspectives and Applications. Washington: American Psychological Association.