

Winnipeg Population: Structure and Process 1951-1981

Research and Working Paper No. 7

**by Tony J. Kuz
1984**

The Institute of Urban Studies





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WINNIPEG POPULATION: STRUCTURE AND PROCESS 1951-1981

During the past several decades there has been much political and academic concern about Manitoba's declining economy and the disproportionate out-migration of population to provinces of Alberta, British Columbia and Ontario. Inexorably Winnipeg is very closely linked to other processes in Manitoba as it constitutes such a large proportion of the total provincial economy and population. In 1981 approximately 58 percent of the total Manitoba population resided in the Winnipeg Census Metropolitan Area (CMA).

This research has a three-fold objective:

- i) to investigate at the macro level Winnipeg's population change between 1951 and 1981;
- ii) to establish for Winnipeg those factors of birth rate, death rate and net-migration which are contributing to population change; and
- iii) to establish the impact of net out-migration on Winnipeg's demographic structure by examining the population by age cohorts and noting their spatial distributions at the census tract level.

WINNIPEG POPULATION 1951 - 1981

Winnipeg's population in 1971 was 540,262 making it the 5th largest city in Canada. By 1981, with redefined and expanded boundaries, the population was 584,842 (Table 1). However its population ranking between

1971 and 1981 declined to 7th position with Winnipeg being surpassed by Edmonton and Calgary in the Canadian urban hierarchy.

The task of calculating Winnipeg's growth rates for the various years between 1951 and 1981 is made difficult by changing boundaries, so, for convenience, the 1971 boundaries were used. For the earlier periods, the 1971 census adjusted statistics to 1971 boundaries. For 1976 and 1981, the populations for the municipalities of Richot, St. Francois Xavier and Springfield were subtracted from total CMA figures.¹

The growth rate for each five year period has been declining steadily since 1956 from a high of 15.5 percent to a low of 1.7 percent between 1976 and 1981. This rate of growth can be best appreciated if compared to growth of all Canadian metropolitan areas during this same time period (Table 2). For all time periods concerned the growth of Metropolitan Canada surpassed that of Winnipeg, and in many instances the growth of metropolitan Canada was twice that of the Winnipeg CMA. Interestingly, in the most recent period Winnipeg's growth is farther from the national rate than for any period since the 1950s.

To best represent Winnipeg's rate of population growth, exponential rates were calculated. In addition the number of years necessary to double population was calculated. Winnipeg since 1951 has steadily declined in its rate of population growth (Table 3), from a high of 2.88 percent per year between 1951 and 1961 to a low of .35 percent between 1976 and 1981. The impact of present rates of growth is well illustrated by noting doubling time in years. At the present rate it would take Winnipeg approximately 200 years to double its 1976 population. However the trend in the growth rate, ceterus paribus, suggests further declines

in the growth rate can be expected possibly resulting in zero growth or even absolute decline in the total population sometime in the future.

In summary, the following observations are appropriate regarding Winnipeg's population growth during the past several decades:

- i) the growth rate has been steadily declining since 1951;
- ii) the rate of growth has been substantially below that exhibited by metropolitan Canada; and
- iii) the rates of growth indicate a very slow growth and the trend appears to be toward zero and possibly even negative growth.

WINNIPEG MIGRATION 1966-1976

To help determine why Winnipeg's population growth rate lags behind that for metropolitan Canada, it would be useful to examine those demographic factors which are contributing to this slow rate. To do so it is necessary to disaggregate population growth into its component parts of natural increase and net-migrations.²

In birth and death rates, Winnipeg compares very closely with metropolitan Canada.³ The rates per thousand for each in 1971 were:

	Winnipeg	Metropolitan Canada
Birth rate	17.2	16.3
Death rate	8.1	7.0
Natural increase	9.1	9.3

It is obvious that population growth rate differences between Winnipeg and Metropolitan Canada cannot be attributed to natural increase differentials.

Immigration

Winnipeg received 67 percent of all the immigrants settling in Manitoba between 1966 and 1971.⁴ This amounted to 23,780 people coming to live in Winnipeg from outside Canada (Table 4). The immigration figure for 1971 - 1976 dropped slightly to 22,670; however, the percentage coming to Winnipeg increased to 71.3 percent. From 1976 - 1981 immigration into Winnipeg totalled 19,135, showing a slight absolute decline from the other two time periods but remained relatively constant at 71.3 percent of total. Immigration has been a very important factor in Winnipeg's growth. From 1966 to 1981, approximately 25 percent of all in-migrants to Winnipeg were from outside Canada. Winnipeg would have suffered a net population loss of approximately 2,000 in each five year time period, between 1966 - 1976 and a net population loss of 19,000 between 1976 - 1981, had there been no immigration to Winnipeg.

Emigration

There are no emigration figures available for Winnipeg, just for Manitoba. If one assumes that Winnipeg accounts for almost 60 percent of the emigration from Manitoba, i.e., the city share of the Manitoba population, the total emigration from Winnipeg was approximately 9,000 between 1966 and 1971, 7,500 between 1971 and 1976 and 5,000 between 1976 and 1981. These figures represent the following proportions of total out-migration for Winnipeg during the same periods; 10.1, 8.27, and 6.26 percent. Even if all provincial out-migration were from Winnipeg in 1976 to 1981 it would represent approximately 10 percent of total out-migration from the city. Consequently emigration is not the most important factor

in contributing towards Winnipeg's slow rate of growth.

Intraprovincial Migration

Statistics on migration between Winnipeg and the rest of the province are available for three time periods 1966 - 1971, 1971 - 1976, and 1976 - 1981. The 26,045 people who moved to Winnipeg from the rest of the province between 1966 and 1971 constituted 29.2 percent of total in-migration. The 16,130 moving from Winnipeg to the rest of the province for the same period constituted 24% of Winnipeg's out-migration. The net gain was 9,915 for the five year period.

For the 1971 to 1976 time period migration into Winnipeg from Manitoba was 25,105 or 27.7 percent of total in-migration. Out-migrants to the province totalled 23,595 or 33.8 percent of the total out-migration. For this time period Winnipeg registered a net migration gain of 1,509. This is a considerable decline from the previous five year period and was an important factor in a lowered growth rate for Winnipeg. A detailed examination shows a net loss of people from Winnipeg to the Census Subdivisions surrounding the city (Figure 1). Considerable numbers of people from Winnipeg are moving outside the city boundary to the surrounding rural area.

For the 1976 to 1981 period migration from Manitoba into the Winnipeg CMA was 23,255 of 28.8 percent of total in-migration. For the same period out-migration totalled 20,585 or 25.5 percent of the total for a net gain of 2,670. Trends in in-migration between 1966 and 1981 are noticeable in that absolute totals are declining; however out-migration totals are fluctuating giving rise to variable net migration gains.

Intermetropolitan Migration

Intermetropolitan migration constitutes one of the major streams of people movement in Canada and is very important in trying to understand population growth for Winnipeg. Out-migration to other CMAs⁵ from Winnipeg accounted for 56.4 percent (38,075) of all Winnipeg's out-migrants from 1966 to 1971, 44 percent (30,620) from 1971 to 1976, and 52.7 percent (42,475) from 1976 to 1981. On the other hand, in-migration to Winnipeg from other CMAs accounted for only 22 percent (19,835) of the total in-migration from 1966 to 71, and 22.3 percent (20,230) from 1971 to 1976, and 27.5 percent (22,150) from 1976 to 1981. The absolute and relative numbers for each CMA are displayed in Tables 5, 6, and 7. During the 1966 - 1971 period Winnipeg suffered a net migration loss of 18,240 to other CMAs. The largest out-migration, in order, was to Vancouver, Toronto, Calgary and Edmonton which together accounted for over 60 percent of the total. Major in-migrant streams were from Toronto, Vancouver, Regina, Montreal, Edmonton and Calgary. Together these six cities contributed over 65 percent of the total in-migrants to Winnipeg.

By the 1971 - 1976 period the net migration deficit was reduced to 10,390. Compared to the 1966-71 figures the out-migration total declined while the in-migration total increased. Once again the primary destinations of Winnipeg out-migrants were Vancouver, Calgary, Edmonton and Toronto. The major source of in-migrants were Toronto, Vancouver, Edmonton, Calgary and Regina.

The net migration deficit was 20,325 for the 1976 to 1981 period. The out-migration for this period was higher than for any of the other two

periods while the in-migration was fairly constant. The largest out-migration was to Vancouver, Calgary, Edmonton and Toronto which together accounted for over 70 percent of the total. Major in-migration occurred from Toronto, Montreal, Vancouver, Calgary, Ottawa, and Edmonton. Together they accounted for 57 percent of total Winnipeg in-migrants.

By analysing the data longitudinally those CMAs that are major sources of in-migrants may be identified. The stability of in-migration streams may also be ascertained. During all three time periods major sources of in-migration are the CMAs of: Toronto, Montreal, Vancouver, Calgary, Ottawa, and Edmonton (Table 8). In 1966 - 1971 they contributed 60.2 percent of all in-migrants, 60.7 percent in 1971-1976, and 67 percent in 1976 - 1981. One highly notable change is Regina with a decline from 10.2 to 5.1 percent.

Out-migration is also highly concentrated. Major destinations are Vancouver, Calgary, Edmonton, and Toronto. In 1966 - 1971 these CMAs were the destination of 63.4 percent of the out-migrants, 61.5 percent in 1971 - 1976 and 71.2 percent in 1976 - 1981. Vancouver has been a very consistent destination while Toronto has shown decline and both Calgary and Edmonton have shown major increases.

During the decades some shifts took place, especially in out-migration flows. One way to analyze the flows is to use a gravity model which assumes that size and distance are major factors affecting out-migration. In this case the use of the gravity model is in its simplest form as the intent is to order the data and interpret the residuals rather than derive the highest coefficient of determination. The potential out-

migration from Winnipeg to some j^{th} city is

$$\frac{\frac{P_j}{d_{ij}}}{\sum_{j=1}^n \frac{P_j}{d_{ij}}} \times 100$$

where P_j = population of the j^{th} city, and d_{ij} = airline distance of the j^{th} city from Winnipeg. Because a time interval is used, e.g., 1966 - 1971, the average of the 1966 and 1971 populations was used to calculate potential. Total potential is calculated by summing all of the $\frac{P_j}{d_{ij}}$ for all cities concerned. From these data potential or predicted out-migration was calculated as a percentage for each city.⁶ Separate calculations were done for each time period (Tables 5, 6 and 7).

In the 1966 - 1971 analysis when out-migration actual was regressed against out-migration expected the correlation coefficient (r) generated was +0.78. Slightly over 60 percent of the variance in actual out-migration is associated with the size and distance of destination cities leaving almost 40 percent of the out-migration pattern unexplained.⁷ While the statistical results are inconclusive the analysis is very useful in identifying those destinations which receive greater than expected numbers of Winnipeg out-migrants. Figure 2 clearly demonstrates that Western Canadian cities generally attracted more migrants than expected whilst Eastern Canadian, with the exception of Ottawa, attracted fewer than anticipated.

A similar analysis for the 1971 - 1976 period demonstrates an even weaker correlation between actual and expected out-migration with an r of +0.58. Again, however, the deviations from the expected trend are of

particular interest (Figure 3). The dichotomy between East and West is even more clearly demarcated--all Western cities attracted more migrants than predicted.

The analysis for the 1976 - 1981 period shows a correlation of +0.69 with an r-squared of .47. This leaves over 50 percent of the variance in out-migration unexplained by population size and distance. The residuals again emphasize the major attraction of Western Canadian cities for Winnipeg out-migrants. Vancouver has remained as the primary destination with large, sharp increases for Calgary and Edmonton. Some border line changes are evident for Ottawa, Regina and Thunder Bay while ever decreasing interaction with Montreal is evident (Figure 4).

Several hypothesis can be generated in an attempt to explain the out-migration patterns defined for Winnipeg. Economic opportunities found to the west and the lack of them in Manitoba are critical pull-push factors for selected Winnipeg residents. This results in a selective out-migration where the relatively young are the first to leave seeking employment in rapidly growing centres further west. No doubt other critical factors in determining out-migration flows are the environmental amenities found especially in British Columbia. Again the response to this characteristic is age specific in that in addition to the young, there are many older people moving to the coast to retire. These amenities attract primarily the young and the older retirement-age groups. The high out-migration from Winnipeg to western destinations is typical of inter-metropolitan migrations in Canada generally, which likewise show a westward bias.⁸

But as people are leaving Winnipeg others are moving in! This

suggests that as vacancies are created by out-migration, at least some are filled by in-migrants. The findings by Cordey-Hayes and Cleave on out-migration and in-migration in England and Wales can be applied to understanding the population dynamics experienced by Winnipeg. They found that out-migration and in-migration rates are positively correlated.⁹ In addition Cordey-Hayes concluded that in-migrants tend to respond to job opportunities created by economic growth or vacancies created by high levels of out-migration.¹⁰ The greater the out-migration the greater the in-migration to fill the resulting vacancies. As these differentials in economic opportunity and physical amenities persist, Winnipeg will continue to experience high rates of population turnover.

POPULATION STRUCTURE COMPARISON

A question of interest at this point in the analysis is how does the distribution of the population by age groups and sex for Winnipeg compare to that of Canada? So far it has been emphasized that Winnipeg's population is growing very slowly and much of this can be attributed to out-migration. If the out-migration is primarily in the 15-30 age group and in-migration some other age group then the population pyramid should indicate these deviations and establish the uniqueness of Winnipeg's population structure.

Comparison of 1976 population pyramids for Winnipeg and Canada shows very similar profiles (Figure 5). When the age distribution for Winnipeg and Canada are correlated the r value generated is +0.93 attesting to the close correspondence between the age pyramids. Both pyramids show a declining birth rate with smaller percentage in the 0-9 age groups than in

the 10-29 age group. With population ages greater than 30 there is a steady relative decline for each cohort except in the 50-54 age group.

Only very slight differences are apparent in the two pyramids. In the 0-14 age groups Winnipeg has relatively less population than Canada--23.3 percent for Winnipeg and 25.3 percent for Canada. The relative distributions in the 15-24 and 25-34 age groups are almost identical. In the 35-44 age groups Winnipeg has slightly less population--10.6 percent for Winnipeg and 11.5 percent for Canada. In the 45-64 and 65 plus age groups Winnipeg has a slightly larger proportion than Canada. The respective percentages are 30.3 for Winnipeg and 28.5 for Canada.

A comparison between Winnipeg's population structure and that of Metropolitan Canada generates the same type of results as noted above. In fact the profiles are even more similar. The correlation between the two distributions is +0.97. So in spite of the population processes affecting Winnipeg's population the structure remains highly similar to the national one. It appears that the same population processes are affecting Winnipeg and Canada.

WINNIPEG POPULATION: STRUCTURE AND CHANGE 1951 - 1981

Population analysis in the aggregate does not reveal the nature of the population composition and how that composition changes over time. To achieve greater insight into demographic dynamics, the population was disaggregated into eleven and fifteen age groups for the time periods 1951, 1961, 1971 and 1981 and absolute and relative values calculated (Table 9). The population data were then analyzed on the basis of absolute and relative declines, absolute and relative increases and

absolute increases but relative declines (Table 10, Figure 6).

The largest and most noteworthy changes in Winnipeg's population are those noted for the age groups 0-4, 35-44, and 70+. The 0-4 age group has been steadily decreasing absolutely and relatively since 1961, while the 35-44 age group has been declining absolutely from 1961 to 1971 but declining relatively since 1951. Between 1971 and 1981 this group showed absolute and relative gains. In 1951 this age group comprised 14.79 percent of the population but by 1981 this percentage decreased to only 11.39. The 70+ age group has been steadily increasing absolutely and relatively since 1951. Demographically Winnipeg is becoming an older city closely reflecting the national trend. Other interesting changes are noted especially for the 25-34 age groups. Absolutely this age group has shown increases since 1951 and relatively has shown a steady decline between 1951 and 1971 with an increase between 1971 and 1981. In light of the heavy out-migration of Winnipeg's population, and the susceptibility of this age group to move, it is surprising to note this rather abrupt reversal in the declining trend. Undoubtedly this reversal is closely associated with the economic boom in the building industry during the seventies resulting in substantial labour in-migration into the city. With the exception of absolute and relative decreases in the younger cohorts and absolute and relative increases in the older cohorts, the remaining population composition in 1981 is relatively very similar to that in 1951.

SPATIAL DISTRIBUTION OF AGE GROUPS

Theory and empirical evidence indicate that areas within cities

differ in their population age characteristics. These differences are due to variations in the stage of the family life cycle. Variations in age, marital status, and size of family result in different housing needs (which tend to be spatially segregated) for each group and result in areas with different demographic characteristics. F.I. Hill suggests the following age groups should be expected to be found together:¹¹

- a) the young family, ages 0-4 and 25-34;
- b) the middle stage family, ages 5-14 and 35-44;
- c) the mature family, ages 15-19 and 45-54; and
- d) the older households, ages 55 and greater.

Which age groups cluster together in the same census tracts in Winnipeg? To answer this question the eleven age group breakdown at the census tract level was used for the four time periods of 1951, 1961, 1971 and 1981. Each age distribution was correlated statistically with every other and the direction and strength of the correlation coefficient (r) was noted (Tables 11, 12, 13, 14). For each time period the correlation matrix was subjected to linkage analysis, a classification technique which groups like age groups together.¹² In 1951 a total of four groups are defined (Figure 7). The first group is indicative of the young family distribution with age groups 0 to 14 and 25 to 34 being highly correlated. The second group is comprised of all age groups 45 and greater. The third group has only two age groups correlating moderately ($r = 0.52$). These are the 15 to 19 and 20 to 24 age groups. The fourth group, comprising only the 35 to 44 age groups, has a distinctive spatial expression in that it doesn't correlate highly with any of the other distributions.

In 1961 only three groups are defined (Figure 8). The first group is

primarily defined by those ages greater than 45. Extremely high correlations exist between ages 55 to 64 and 65 to 69 as well as 70 plus and 65 to 69. A very weak correlation exists between the age group 15-19 and the rest of the cluster ($r = 0.27$) and probably should be considered an independent distribution. The second cluster is composed of young and middle stage family groups. Children ages 0-14 are highly correlated with age groups 25 to 34 and 35 to 44. The third cluster is defined by only one age group—20-24. This age group distribution is independent of all other groups.

In 1971 as in 1961 only three clusters are defined. The clusters are the same as those defined in 1961 except the age group 15 to 19 groups most closely with the 10 to 14 distribution (Figure 9).

In 1981 only two clusters are defined (Figure 10). Cluster I is defined by all age groups from 0-4 to 45-54, however there are some very loose associations between groups such as the one between ages 20-24 and 25-34 with a correlation of 0.44. The situation is equally demonstrated with a correlation of only 0.47 between ages 45-54 and 15-19. This group can be conveniently disaggregated into a more meaningful classification. The second group is well defined and shows strong correlations between the members. It includes those cohorts aged 55 and greater.

Thus the data for 1961, 1971 and partially for 1981 support Hill, but those for 1951 show a distinctly different pattern. However of paramount interest are the dynamics of change that have occurred over the thirty year period in the age groupings. In the 1951 period, the age groups 15-19 and 20-24 are moderately correlated (+0.52). By 1971 the correlation is in fact negative (-0.19) and remains so into 1981. The 15-19 age group

instead of being an independent distribution as in 1951 is in 1971 and 1981 positively correlated with the distribution of the 45-54 year age groups. This suggests that many in this age group are still residing at home with their parents instead of setting up individual households as was evident in 1951.

Of greater social consequences is the apparent increased segregation of the older population. In both 1951 and 1961 the 70+ age group was highly correlated with the 65-69 age cohort (0.81 in 1951 and 0.89 in 1961). However by 1971 the correlation is only 0.51. By 1981 the correlation has increased to 0.73 still considerably below the 1951 and 1961 levels. The results suggest especially for 1971 and partially for 1981 a greatly modified distribution of the aged. This is largely substantiated by the high degree of institutionalizing the group has undergone in the 1961-1971 period. By 1971 this age group shows the highest segregation index (.255)¹³ of all age groups in Winnipeg implying that its distribution is the most uneven.

General Patterns of Population Distribution

For the most part the linked age groups which were defined for each time period were aggregated into single arrays of percentage value and then mapped to show their spatial distributions. The clusters defined above are not reproduced completely in that some age groups are treated separately. In the 1961 analysis, the age group 15-19 is mapped separately because of its weak correlation within the cluster. Other groups are separated to generate more detailed distributions. For each distribution five classes were defined using the calculated mean and

standard deviation.

Age groups in Winnipeg are distributed somewhat concentrically in each time period. The peripheral or suburban areas tend to be populated by age groups in the early stages of family formation. Suburbs closest to the central business district tend to have older age profiles and the inner city areas have a disproportionately higher share of the city's elderly, young people that have left home and set up independent households and the childless married couples (Figures 11-33).

This pattern of age distribution is quite stable over time. However the changes that do occur are either those of suburban expansion to accommodate an increasing population or development of existing residential areas. Some other general observations may be drawn regarding the distribution of all age groups during the four time periods are:

- a) People between the ages of 15 and 24 including students, young single, and married working people tend to cluster mainly in the central part of the city for all four time periods.
- b) People between the ages of 25 and 34, most of them married with families, concentrate at the urban periphery. As the suburbs expand outward so does this age group. Those in this age group who are probably single or married with no family are also concentrated in the central part of the city.
- c) Age groups 35 and over are more concentrated toward the city centre. The older the age group, the closer they are to the central business district. This pattern appears to be more a reflection of the aging of an area than of intra-urban movements.
- d) Over time areas of concentration of old (70+) and young (15-19, 24-24)

in the central city appear to be increasingly segregated.

Population Projections: Some Scenarios

It was noted earlier that population growth is comprised of natural increase and net-migration. It was established that natural increase in Winnipeg is very similar to that exhibited by metropolitan Canada, however, the rate of population growth of Winnipeg is substantially below that of metropolitan Canada. This slow rate of growth can largely be attributed to net out-migration to other provinces in Canada. The growth exhibited by Winnipeg over the last several decades is due to immigration and intra-provincial movements of people.

What then are the future population growth prospects for Winnipeg? While this is a very important question the answer is replete with assumptions and ifs. Only two scenarios follow. One is based on the assumption that economically and politically things will remain relatively the same in Manitoba while the other assumes substantial changes in the provincial economy. The first is labelled "surprise free" while the second is labelled "Mega Projects" scenario.

Surprise Free Scenario:

During the past several decades the birth rate has steadily declined. This trend has largely been attributed to a greater female participation rate in the labour force, later family starts, and greater family planning. There is no reason to assume that this trend will not continue; therefore even lower birth rates can be expected in the future. The natural increase component of population growth for Winnipeg should

decrease in the years to come.

Economically Manitoba should continue to perform below the national level with rapid growth in the provinces of Saskatchewan, Alberta, and British Columbia. This push-pull factor should continue to draw Winnipeg and other Manitoba young people farther west. However the trend of out-migration should decline and become more age selective as current economic realities are not conducive to family out-migration. Several factors are at work here. Housing price differentials between Winnipeg and growing western centres is very large and increasing. House prices in 1980 for comparable properties were at least 50 percent greater in Vancouver than in Winnipeg. Coupling this with exorbitant mortgage rates, families with property will have to consider carefully the economic advantages of migrating out of Winnipeg.

However the trend of heavy out-migration for the 20-30 age group should continue as lack of economic opportunities here will drive them out. This age group is one of the most mobile in the population structure and will likely continue to be so. Housing cost differentials are really not an issue with this group as they are at present generally not property owners.

The flow of people from the urban and rural areas of Manitoba into Winnipeg should decline. Declining rural densities means less surplus population migrating into Winnipeg. Because of its present importance to Winnipeg's growth this trend should have a severe impact on Winnipeg's future growth.

Taken together, and assuming that immigration will continue at the 1981 rate, the projection indicates a very modest increase in population

for Winnipeg over the next decade. Growth rates of half-a-percent per year should not be unexpected. Applying this growth rate to the 1981 population of 584,842 would forecast a population by 1986 of 599,610 and by 1991 a population of 615,000.

The demographic structure of the population will change with relatively smaller proportions in the young age groups and relatively larger numbers in the older age groups. By 1991, it is estimated that 14-16% of Winnipeg's population will be aged 65 and over compared to only 11.5% today. Demographically Winnipeg will be an older city comparing very closely with the proportion of aged today in such other cities as Victoria and Vancouver.

Mega Projects Scenario:

It is probable that within the next decade construction will begin on two large industrial developments in the province. Energy intensive industries i.e. Aluminum Company of Canada are presently doing feasibility studies on locating smelters in Manitoba. If this materializes considerable construction would occur. Anticipated expenditure is in the 500 million to 1 billion dollar range (1981 dollars) with permanent employment for 500. Closely allied with these projects is the continued hydroelectric development of the Nelson River in Northern Manitoba. The potential on this river remains outstanding as millions of kilowatts remain to be harnessed. At present only about 40 percent of the hydroelectric potential has been developed. A development of the next stage on the Nelson would involve billions of dollars and as many as 4,000 personnel for a period of 3-4 years. Even though the project is far

removed from Winnipeg the "spin-off" effects would be quite substantial.

These projects are linked in that refining requires large amounts of electricity. If for example Alcan decides to locate here, the hydroelectric project would also follow. These projects in tandem would have a very significant impact on the Manitoba and Winnipeg economy as well as on Winnipeg's population growth and structure. Families of men employed on the projects would likely reside in Winnipeg. Certainly this would be the case with Alcan employees as the plant would likely be located within approximately 50 kilometers of the city. Similarly, families of Manitoba hydro employees would largely stay in Winnipeg. These two groups could potentially represent a total of 10,000 people which would add significantly to Winnipeg's population and its ultimate growth rate. Perhaps a growth rate in Winnipeg's population of one to one-and-a-half percent per year over the duration of the projects could be anticipated. Structurally the population would change with increases in the 20-40 age group. With a larger proportion of this age group increases due to natural increase would also rise.

This last scenario is highly speculative and in all probability will not materialize in the immediate future. Apparent surplus of fossil and hydro carbon energy will minimize the probability of extensive hydro developments in the North. The surprise free scenario has the highest probability of being enacted. It seems destined that Winnipeg will continue to grow slowly maintaining with it the high quality of life its residents now experience.

FOOTNOTES

1. Winnipeg CMA has experienced two boundary changes since 1951. In 1971 the rural municipalities of East and West St. Paul were added and in 1976 the rural municipalities of St. Francois Xavier, Springfield and Ritchot were also added.

In this analysis all changes are expressed in terms of 1971 boundaries. To calculate population growth between 1976 and 1981, the population in the three municipalities added in 1976 was subtracted from the total. The 1981 population for the three municipalities is 14,028. Subtracting this from the total population of 584,842 leaves a population of 570,814 for the area as defined in 1971.

2. To avoid confusion some definitions of terms as used by Statistics Canada are presented here.

Population growth. Change in population size from one date to another.

Natural increase. Change in population size resulting from the difference between the number of births and deaths.

International migration. Movement of population between Canada and a foreign country which involves a change in residences. A distinction is made between immigrants from other countries who settle in Canada and emigrants who leave Canada.

Internal migration. Movement of population involving a change in residence when the place of origin and place of destination are both

in Canada. Internal migration includes interprovincial movement (from one province to another) and intraprovincial movement (within the same province).

3. Canada, Statistics Canada, Vital Statistics Volume I - Births: 1971, Cat. No. 84-204 (Ottawa: Information Canada, 1974).
4. All immigration and emigration statistics were obtained from: Canada, Statistics Canada, International and Interprovincial Migration in Canada. Cat. No. 91-208 (Ottawa: Minister of Supply and Services Canada, 1982).
5. The Canadian CMAs in 1976 are: Calgary, Chicoutimi-Jonquiere, Edmonton, Halifax, Hamilton, Kitchener, London, Montreal, Ottawa-Hull, Quebec, Regina, St. Catharines-Niagara, St. John's, Saint John, Saskatoon, Sudbury, Thunder Bay, Toronto, Vancouver, Victoria, Windsor, Winnipeg. By 1981 Oshawa and Trois Rivieres have been designated as CMAs.
6. For example, in the case of Calgary for the 1966-71 period the total potential for out-migration is $366,947 \div 725 = 506.13$. The total potential for out-migration from Winnipeg to all of the CMAs is 11,414. The expected out-migration to Calgary is $506.13 \div 11,414 = .044$. Expressed in percent the value is 4.4. Based on Calgary's size and distance from Winnipeg, 4.4 percent of Winnipeg's out-migrants would be expected to go to Calgary.

The analysis for the 1971-1976 and 1976-1981 periods was done in

exactly the same way. However new values of population were substituted in the analysis.

7. The scattergrams indicated a heteroscedastic distribution so the X and Y variables were both transformed using natural logarithm. The best estimating equation for each time period is $Y_{1966-71} = .35X^{1.47}$, $Y_{1971-76} = .74X^{.92}$ and $Y_{1976-81} = .13X^{1.85}$.
8. This process is well illustrated in the following research: J.W. Simmons, "Migration in the Canadian Urban System," and L.S. Bourne, "Some Myths of Canadian Urbanization: Reflections on the 1976 Census and Beyond," in R.M. Irving (ed.), Readings in Canadian Geography (Toronto: Holt, Rinehart and Winston of Canada, Ltd., 1978), pp. 47-67 and 124-138.
9. Cordey-Hayes, M. and D. Cleave, "Migration Movements and the Differential Growth of City and Regions in England and Wales," Papers, Regional Science Association, Vol. XXXIII, 1974, pp. 99-123.
10. Cordey-Hayes, Martin, "Migration and the Dynamics of Multi-regional Population Systems," Environment and Planning, Vol. VII, November, 1975, pp. 793-814.
11. Hill, F.I., "The Family Life Cycle," in D. Michael Ray (ed.), Canadian Urban Trends (Ottawa, Minister of Supply and Services Canada, 1976), p. 28.
12. McQuitty, L.L., "Elementary Linkage Analysis for Isolating Orthogonal and Oblique Types and Typal Relevancies," Education and Psychological

Measurement, Vol. 17, 1957, pp. 207-229.

13. The segregation index represents the proportion of an age group's population which would have to relocate to another census tract in order for that group's spatial distribution to be the same as the distribution of the rest of the population in that metropolitan area. The value of .255 for Winnipeg for the 70+ age group for 1971 is found in D. Michael Ray, Canadian Urban Trends, Op. Cit., pp. 28-29.

TABLE 1. Winnipeg Population 1951-1981

<u>Date</u>								
1981**	1981	1976*	1976	1971	1966	1961	1956	1951
<u>Population</u>								
584,842	570,814	578,200	560,875	540,262	508,759	476,543	412,741	357,229

All populations up to 1976 are on the basis of 1971 CMA boundaries. The Winnipeg CMA in 1971 included Winnipeg City and rural municipalities of St. Paul West and St. Paul East. By 1976 the Winnipeg CMA was expanded to include municipalities of St. Francois Xavier, Springfield and Richot. The latter in 1981 had a combined population of 14,028.

* 1976 population based on 1976 boundaries.

** 1981 population based on 1976 boundaries.

SOURCES: Canada, Statistics Canada, Census Tracts, Winnipeg, Cat. No. 95-940 (Ottawa: Minister of Supply and Services Canada, October, 1982).

Canada, Statistics Canada, 1976 Census of Canada: Population: Demographic Characteristics Five Year Age Groups, Bulletin 2.4, Cat. No. 92-823 (Ottawa: Information Canada, 1978).

Canada, Statistics Canada, 1971 Census of Canada: Population: Census Subdivision (Historical), Bulletin 1.1-2, Cat. No. 92-702 (Ottawa: Information Canada, 1973).

Canada, Statistics Canada, Census Division, "Population by Census Metropolitan Areas," revised, (July, 1973). Canada, Statistics Canada, 1971 Census of Canada: Population: Census Subdivision (Historical), Bulletin 1.1-2, Cat. No. 92-702 (Ottawa: Information Canada, 1973).

TABLE 2. Population Growth of Winnipeg and Metropolitan Canada 1951-1981

CMA	Population*							Growth Rate					
	1981	1976	1971	1966	1961	1956	1951	1976-81	1971-76	1966-71	1961-66	1956-61	1951-56
Winnipeg	570,814	560,875	540,262	508,759	476,543	412,741	357,229	1.7	3.8	6.2	6.8	15.5	15.5
Metropolitan Canada	13,658,944	12,910,492	11,874,748	10,684,482	9,291,305	7,747,301	6,397,680	5.8	8.7	11.1	15.0	19.9	21.1

* For Winnipeg all population and growth rates up to 1976 are based on 1971 CMA boundaries. The 1981 population and growth rate is adjusted by subtracting the population for the three municipalities (14,028) from the total of 584,842. The growth rate based on 1976 boundaries is 1.1 percent.

SOURCES: Canada, Statistics Canada, Census Metropolitan Areas and Census Agglomerations with Components, Cat. No. 95-903, Vol. 3-Profile Series A, (Ottawa: Minister of Supply and Services Canada, Oct., 1982).

Canada, Statistics Canada, Census Division "Population by Census Metropolitan Areas," revised, (July, 1973). Canada, Statistics Canada, 1971 Census of Canada: Population: Census Subdivision (Historical). Bulletin 1.1-2, Cat. No. 92-702 (Ottawa: Information Canada, 1973).

TABLE 3. Exponential Rates of Population Growth, Winnipeg 1951-1981

Year	Population	Rates of growth*	Doubling time in years**
1951	357,224		
		2.88	24
1961	476,543		
		1.25	56
1971	540,262		
		.75	93
1976	560,875		
		.35	200
1981	570,814		

* Exponential growth rates have been derived using the equation $N_t = N_0 e^{rt}$ where N_t is the final population value in time t , N_0 , initial population value, e the base of the natural logarithm, r the growth rate and t the time elapsed. The r value is derived as follows: $r = \frac{\ln N_t - \ln N_0}{t}$.

** Doubling times are calculated by dividing 70 by rates of growth.

SOURCE: Calculated by the author.

TABLE 4. Winnipeg 1966-1971, 1971-1976, and 1976-1981, In-, Out- and Net-Migration

Place of Residence in 1966, 1971, 1976 (for in-migrants) or 1971, 1976, 1981 (for out-migrants)	In			Out			Net		
	1966-71	1971-76	1976-81	1966-71	1971-76	1976-81	1966-71	1971-76	1976-81
Other CMA	19,830	20,230	26,890	38,070	30,620	42,475	-18,240	-10,390	-15,585
Non-metropolitan	38,760	43,085	30,625	29,380	39,220	38,101	9,380	3,865	-7,385
Same province	26,045	25,105	23,255	16,130	23,596	20,585	9,915	1,509	2,670
Different province	12,715	17,980	7,370	13,250	15,624	17,425	-535	2,356	-10,055
Sub total	58,590	63,315	57,515	67,450	69,840	80,485	-8,860	-6,525	-22,970
Outside Canada	23,780	22,670	19,135						
Municipality of residence not stated	6,920	4,610							
Within Same CMA			3,955						
Total	89,290	90,595	80,600				21,840	20,755	115

SOURCES: Canada, Statistics Canada, Population, Mobility Status Cat. No. 92-907 Vol. I
(Ottawa: Minister of Supply and Services Canada, Oct., 1983).

Canada, Statistics Canada, Population Demographic Characteristics Cat. No. 92-828
(Ottawa: Minister of Supply and Services Canada, Dec., 1978).

Canada, Statistics Canada, 1971 Census of Canada: Population: Characteristics of Migrants
in Census Metropolitan Areas, Bulletin 1.506, Cat. No. 92-746 (Ottawa: Information Canada, 1974).

TABLE 5. Migration Between Winnipeg and other CMA 1966-1971

Census Metropolitan Area of Residence	In-migrants Winnipeg 1971	%	Out-migrants Winnipeg 1966	%	Expected* Out-migration %
Calgary	1,620	8.2	4,590	12.1	4.4
Chicoutimi-Jonquiere	150	.7	90	.2	1.0
Edmonton	1,780	9.0	3,445	9.0	5.4
Halifax	595	3.0	480	1.3	1.2
Hamilton	545	2.7	840	2.2	4.6
Kitchener	285	1.4	400	1.1	2.3
London	460	2.3	655	1.7	2.7
Montreal	2,010	10.1	2,440	6.4	20.7
Ottawa-Hull	1,015	5.1	2,515	6.6	4.9
Quebec	75	.4	335	.9	3.4
Regina	2,015	10.2	1,350	3.5	3.7
St. Catharines-Niagara	335	1.7	395	1.0	2.7
St. John's	145	.7	15	.0	.6
Saint John	75	.4	90	.2	.6
Saskatoon	1,345	6.8	995	2.6	2.5
Sudbury	230	1.2	145	.4	1.7
Thunder Bay	1,065	5.4	820	2.1	2.6
Toronto	3,345	16.9	5,670	14.9	23.2
Vancouver	2,170	10.9	10,435	27.4	7.8
Victoria	390	2.0	2,095	5.5	1.4
Windsor	185	.9	275	.7	2.6
Total	19,835	100.0	38,075	100.0	

* Based on gravity model. See footnote 6.

SOURCE: D. Michael Ray (ed.), Canadian Urban Trends, "Metropolitan Perspective," Vol. 2 (Toronto: Copp Clark Publishing, 1976), pp. 8-9.

TABLE 6. Migration Between Winnipeg and other CMA 1971-1976

Census Subdivision*	In-migrants Winnipeg 1976	%	Out-migrants Winnipeg 1971	%	Expected** Out-migration %
Division 6 (Calgary)	1,760	8.7	5,205	17.0	4.9
Chicoutimi	110	.5	50	.2	.9
Division 11 (Edmonton)	1,780	8.8	4,345	14.2	5.6
Halifax	530	2.6	685	2.2	1.3
Hamilton-Wentworth	300	1.5	225	.7	4.5
Waterloo (Kitchener)	295	1.5	360	1.1	2.3
Middlesex (London)	460	2.3	415	1.4	2.5
Isle de Montreal (Montreal)	1,595	7.9	1,260	4.1	19.9
Ottawa-Carlton & Hull	1,565	7.7	2,050	6.7	5.1
Quebec	80	.4	40	.1	3.5
Division 6 (Regina)	1,760	8.7	1,710	5.6	3.6
Niagara (St. Catharines-Niagara)	410	2.0	225	.7	2.5
Division 1 (St. John's)	165	.8	175	.6	.6
St. John	15	.1	80	.3	.6
Division 11 (Saskatoon)	1,400	6.9	1,440	4.7	2.4
Sudbury Region	35	.2	170	.6	1.6
Thunder Bay	1,400	6.9	1,000	3.3	2.6
Toronto, Metropolitan	3,030	15.0	2,790	9.1	23.8
Greater Vancouver	2,545	12.6	6,500	21.2	8.0
Capital (Victoria)	705	3.5	1,595	5.2	1.4
Essex (Windsor)	290	1.4	300	1.0	2.4
Total	20,230	100.0	30,620	100.0	

* For some census metropolitan area the CMA total is not available for 1976, instead the region or county in which the CMA is located is given. The major city in each region is given in parentheses.

** Based on gravity model. See footnote 6.

SOURCE: Canada, Statistics Canada, "Migrants 5 years and over by Place of Residents in 1971 by age and by sex," (Microfilm) Table No. SDECOB 51 (Ottawa: Information Canada, June 13, 1978).

TABLE 7. Migration Between Winnipeg and other CMA 1976-1981

Census Metropolitan area of Residence	In-migrants		Out-migrants		Expected*	
	Winnipeg 1976	%	Winnipeg 1971	%	Out-migration	%
Calgary	1,980	8.9	9,235	21.8	2,294	5.4
Chicoutimi-Jonquiere	5	.0	20	.0	340	.8
Edmonton	1,890	8.5	6,660	15.8	2,549	6.0
Halifax	685	3.1	740	1.7	552	1.3
Hamilton	505	2.3	620	1.4	1,826	4.3
Kitchener	175	.8	380	.9	977	2.3
London	505	2.3	450	1.0	977	2.3
Montreal	2,450	11.1	980	2.3	7,932	18.7
Oshawa	135	.6	200	.5	467	1.1
Ottawa-Hull	1,945	8.8	1,690	4.0	2,166	5.1
Quebec	170	.7	75	.2	1,486	3.5
Regina	1,120	5.1	2,125	5.0	1,529	3.6
St. Catharines-Niagara	285	1.3	180	.4	977	2.3
St. John's	165	.7	110	.2	255	.6
Saint John	130	.6	60	.1	255	.6
Saskatoon	1,165	5.3	1,835	4.3	1,061	2.5
Sudbury	255	1.2	60	.1	637	1.5
Thunder Bay	1,305	5.9	755	1.8	1,019	2.4
Toronto	4,320	19.5	4,540	10.7	9,920	23.4
Trois Rivieres	5	.0	0	.0	297	.7
Vancouver	2,265	10.2	9,670	22.9	3,388	8.0
Victoria	460	2.1	2,000	4.7	637	1.5
Windsor	230	1.0	90	.2	934	2.2
Total	22,150	100.0	42,475	100.0	42,475	100.0

* Based on gravity model. See footnote 6.

Source: Canada, Statistics Canada, Census Metropolitan Areas and Census Agglomerations with Components, Cat. No. 95-903, Volume 3, Profile Series A (Ottawa: Minister of Supply and Services Canada, Oct. 1982).

TABLE 8. In- and Out-Migration to Winnipeg CMA From other Canadian CMAs
1966-1971, 1971-1976 and 1976-1981

	<u>In-migrants Percent</u>			<u>Out-Migrants Percent</u>		
	1971	1976	1981	1966	1971	1976
Calgary	8.2	8.7	8.9	12.1	17.0	21.8
Chicoutimi-Jonquiere	.7	.5	.0	.2	.2	.0
Edmonton	9.0	8.8	8.5	9.0	14.2	15.8
Halifax	3.0	2.6	3.1	1.3	2.2	1.7
Hamilton	2.7	1.5	2.3	2.2	.7	1.4
Kitchener	1.4	1.5	.8	1.1	1.1	.9
London	2.3	2.3	2.3	1.7	1.4	1.0
Montreal	10.1	7.9	11.1	6.4	4.1	2.3
Oshawa	-	-	.6	-	-	.5
Ottawa-Hull	5.1	7.7	8.8	6.6	6.7	4.0
Quebec	.4	.4	.7	.9	.1	.2
Regina	10.2	8.7	5.1	3.5	5.6	5.0
St. Catharines-Niagara	1.7	2.0	1.3	1.0	.7	.4
St. John's	.7	.8	.7	.0	.6	.2
Saint John	.4	.1	.6	.2	.3	.1
Saskatoon	6.8	6.9	5.3	2.6	4.7	4.3
Sudbury	1.2	.2	1.2	.4	.6	.1
Thunder Bay	5.4	6.9	5.9	2.1	3.3	1.8
Toronto	16.9	15.0	19.5	14.9	9.1	10.7
Trois Rivieres	-	-	.0	-	-	.0
Vancouver	10.9	12.6	10.2	27.4	21.2	22.9
Victoria	2.0	3.5	2.1	5.5	5.2	4.7
Windsor	.9	1.4	1.0	.7	1.0	.2

TABLE 9. Age Group Structure of Winnipeg 1951, 1961, 1971 and 1981

Age Group	Population				Per Cent			
	1951	1961	1971	1981	1951	1961	1971	1981
0 - 4	37,713	52,152	43,220	39,605	10.65	10.95	8.00	6.77
5 - 9	27,329	48,208	49,800	40,325	7.71	10.12	9.21	6.89
10 - 14	20,546	42,281	49,980	42,245	5.80	8.88	9.25	7.22
15 - 19	22,790	50,885	53,030	52,575	6.43	7.01	9.42	9.00
20 - 24	28,512	33,470	53,020	58,735	8.05	7.03	9.81	10.04
25 - 34	60,868	66,815	71,895	101,755	17.19	14.09	13.32	17.40
35 - 44	52,245	66,813	60,655	66,610	14.79	14.10	11.23	11.39
45 - 54	38,495	53,288	61,055	58,665	10.87	11.26	11.30	10.03
55 - 64	33,935	35,959	48,525	56,940	9.58	7.55	8.98	9.74
65 - 69	13,957	14,386	17,155	23,580	3.94	3.02	3.17	4.03
70+	17,679	28,516	34,095	43,815	4.99	5.99	6.31	7.49

SOURCE: Canada, Statistics Canada, Winnipeg, Census Tracts, Cat. No. 95-940 (Ottawa: Minister of Supply and Services Canada, Oct., 1982).

Canada, Statistics Canada, 1971 Census of Canada, Population and Housing Characteristics by Census Tract, Winnipeg, Cat. No. 95-723, (Ottawa: Information Canada, 1973),

Canada, Dominion Bureau of Statistics, 1961 Census of Canada, Population and Housing Characteristics by Census Tracts, Winnipeg, Bulletin CT-17, Cat. No. 95-532, (Ottawa: Queen's Printer, 1963).

Canada, Dominion Bureau of Statistics, 1951 Census of Canada, Population and Housing Characteristics by Census Tracts, Winnipeg, Bulletin CT-8, (Ottawa: Queen's Printer, 1953).

TABLE 10. Winnipeg Population Change by Cohorts 1951-1981

Age group	Time			
	1951	1961	1971	1981
0 - 4	X X X X X X X X X	—		
5 - 9	X X X X X X X X X	O O O O O O O O O		
10 - 14	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X	
15 - 19	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X	
20 - 24	O O O O O O O O O	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X
25 - 29	O O O O O O O O O	O O O O O O O O O	O O O O O O O O O	X X X X X X X X X
30 - 34	O O O O O O O O O	O O O O O O O O O	O O O O O O O O O	X X X X X X X X X
35 - 39	O O O O O O O O O	—	X X X X X X X X X	X X X X X X X X X
40 - 44	O O O O O O O O O	—		
45 - 49	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X	
50 - 54	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X	O O O O O O O O O
55 - 59	O O O O O O O O O	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X
60 - 64	O O O O O O O O O	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X
65 - 69	O O O O O O O O O	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X
70+	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X

— Absolute and relative decrease
 XXX Absolute and relative increase
 OOO Absolute increase but relative decrease

TABLE 11. Correlation Between Age Groups by Census Tracts, Winnipeg, 1951

Age group	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-69
5 - 9	0.89									
10 - 14	0.46	0.72								
15 - 19	-0.40	-0.22	0.24							
20 - 24	-0.63	-0.71	0.52	0.52						
25 - 34	0.60	0.28	-0.14	-0.40	-0.09					
35 - 44	-0.03	0.03	0.00	-0.29	-0.38	-0.15				
45 - 54	-0.89	-0.72	-0.34	0.25	0.36	-0.69	0.10			
55 - 64	-0.87	-0.76	-0.44	0.18	0.39	-0.59	-0.08	0.86		
65 - 69	-0.85	-0.80	-0.52	0.19	0.48	-0.51	-0.14	0.79	0.88	
70+	-0.78	-0.82	-0.62	0.08	0.51	-0.38	-0.15	0.68	0.73	0.81

TABLE 12. Correlation Between Age Groups by Census Tracts, Winnipeg, 1961

Age group	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-69
5 - 9	0.84									
10 - 14	0.51	0.82								
15 - 19	-0.19	0.01	0.23							
20 - 24	-0.34	-0.56	-0.66	0.16						
24 - 34	0.55	0.18	-0.23	-0.42	0.37					
35 - 44	0.34	0.61	0.68	-0.15	-0.66	-0.06				
45 - 54	-0.76	-0.53	-0.14	0.27	-0.14	-0.77	-0.07			
55 - 64	-0.84	-0.84	-0.62	-0.02	0.18	-0.51	-0.51	0.72		
65 - 69	-0.81	-0.87	-0.69	-0.16	0.25	-0.38	-0.52	0.57	0.93	
70+	-0.74	-0.85	-0.73	-0.17	0.31	-0.29	-0.57	0.43	0.83	0.89

TABLE 13. Correlation Between Age Groups by Census Tracts, Winnipeg, 1971

Age group	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-69
5 - 9	0.79									
10 - 14	0.54	0.88								
15 - 19	-0.03	0.28	0.48							
20 - 24	-0.30	-0.55	-0.62	-0.19						
25 - 34	0.55	0.30	0.02	-0.30	0.39					
35 - 44	0.44	0.74	0.76	0.28	-0.55	0.14				
45 - 54	-0.48	-0.13	0.18	0.56	-0.26	-0.49	0.11			
55 - 64	-0.72	-0.67	-0.52	-0.08	0.17	-0.41	-0.51	0.56		
65 - 69	-0.65	-0.81	-0.79	-0.40	0.26	-0.41	-0.71	0.14	0.81	
70+	-0.40	-0.63	-0.67	-0.46	0.09	-0.44	-0.54	-0.32	0.19	0.51

TABLE 14. Correlation Between Age Groups by Census Tracts, Winnipeg, 1981

Age group	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-69
5 - 9	0.77									
10 - 14	0.46	0.81								
15 - 19	0.07	0.34	0.68							
20 - 24	0.01	-0.34	-0.40	-0.01						
25 - 34	0.52	0.24	-0.12	-0.37	-0.44					
35 - 44	0.29	0.66	0.79	0.46	-0.36	0.07				
45 - 54	-0.52	-0.15	0.23	0.47	-0.39	-0.75	0.19			
55 - 64	-0.66	-0.65	-0.47	-0.21	-0.20	-0.59	-0.54	0.46		
65 - 69	-0.56	-0.73	-0.69	-0.51	-0.07	-0.38	-0.71	0.08	0.80	
70+	-0.52	-0.66	-0.71	-0.60	-0.10	-0.27	-0.63	-0.10	0.46	0.73

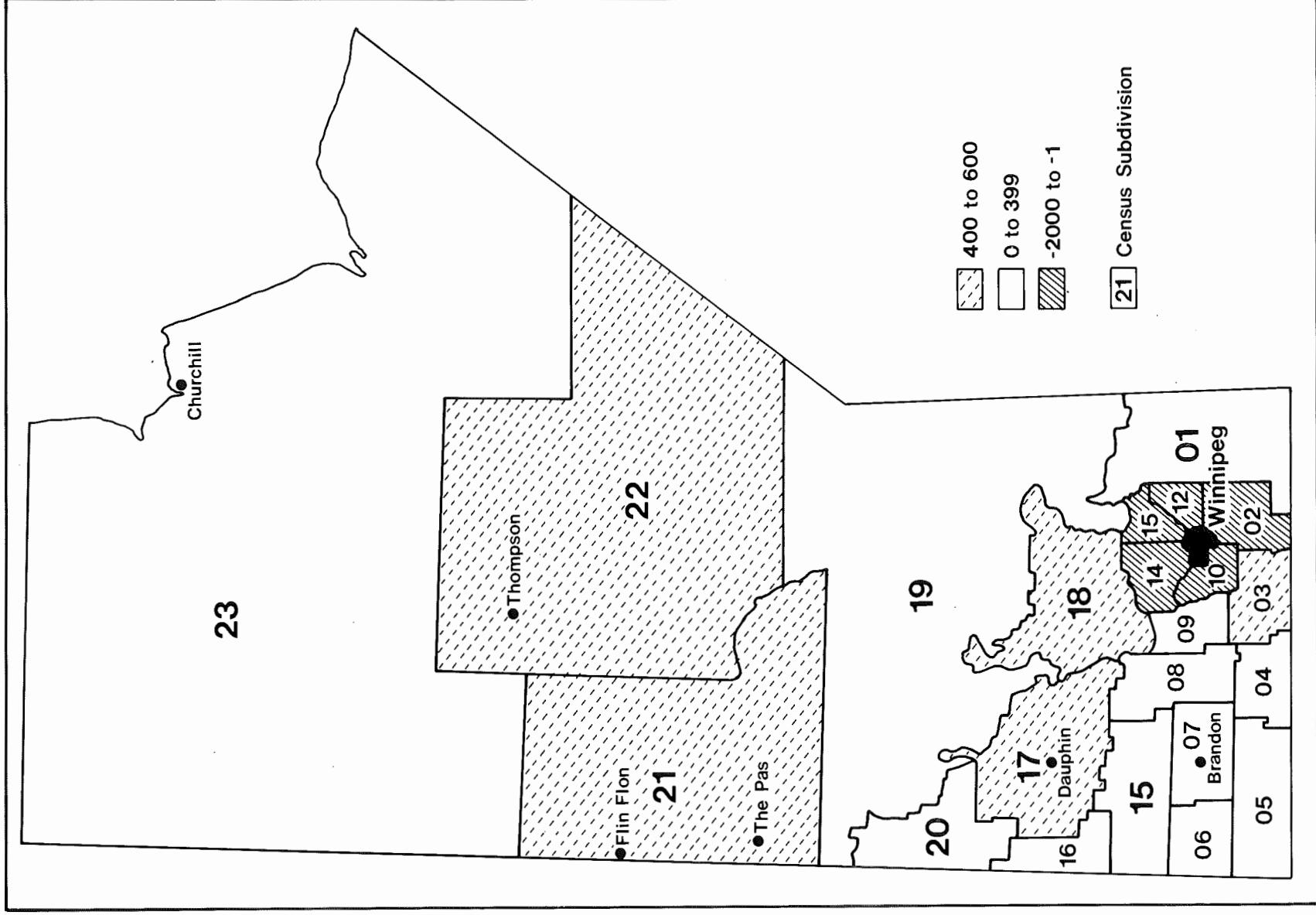


Figure 1: The City of Winnipeg Net Migration From Manitoba 1971-1976

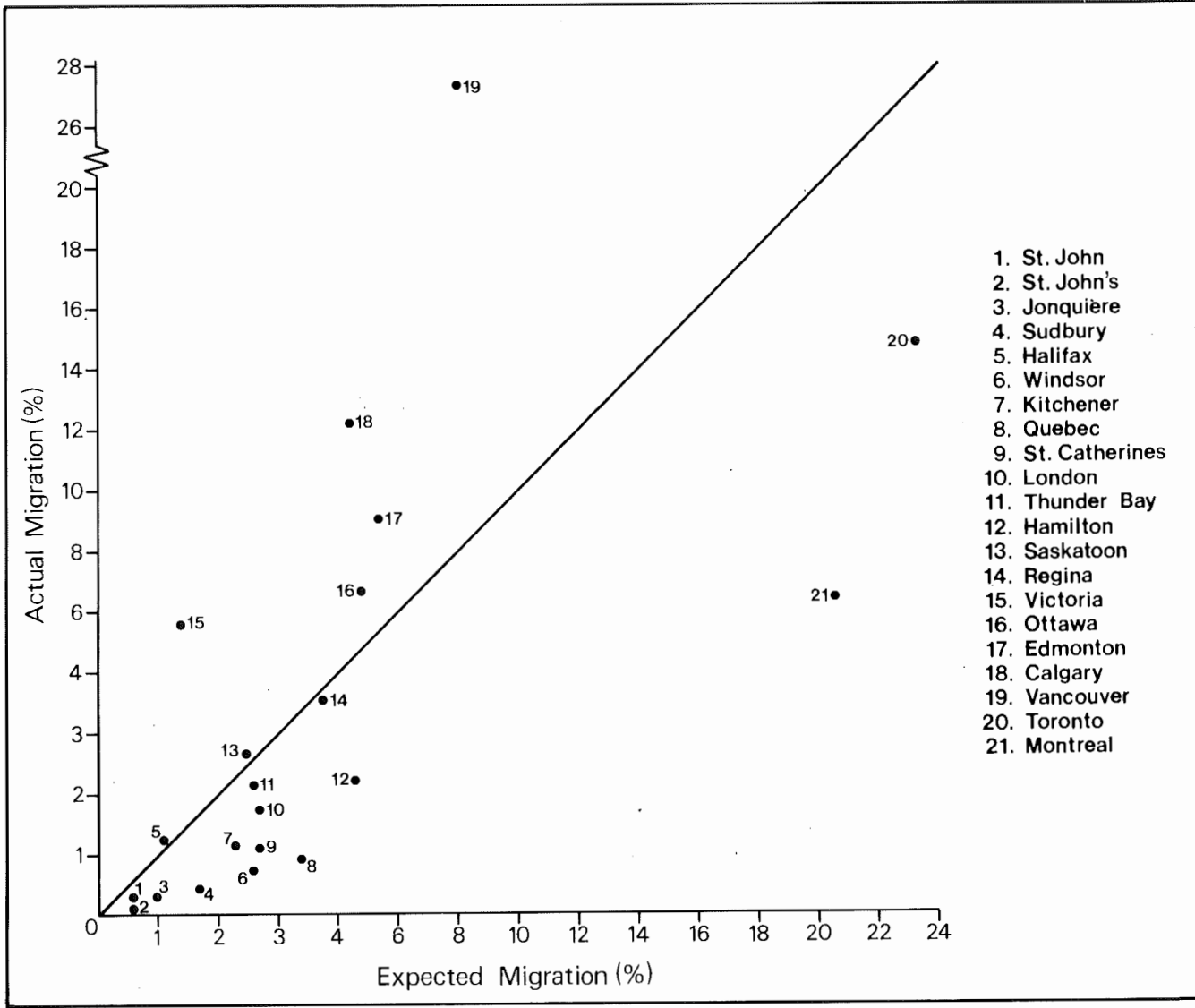


Figure 2: 1966-1971 Intermetropolitan Migration Winnipeg to Other CMA's

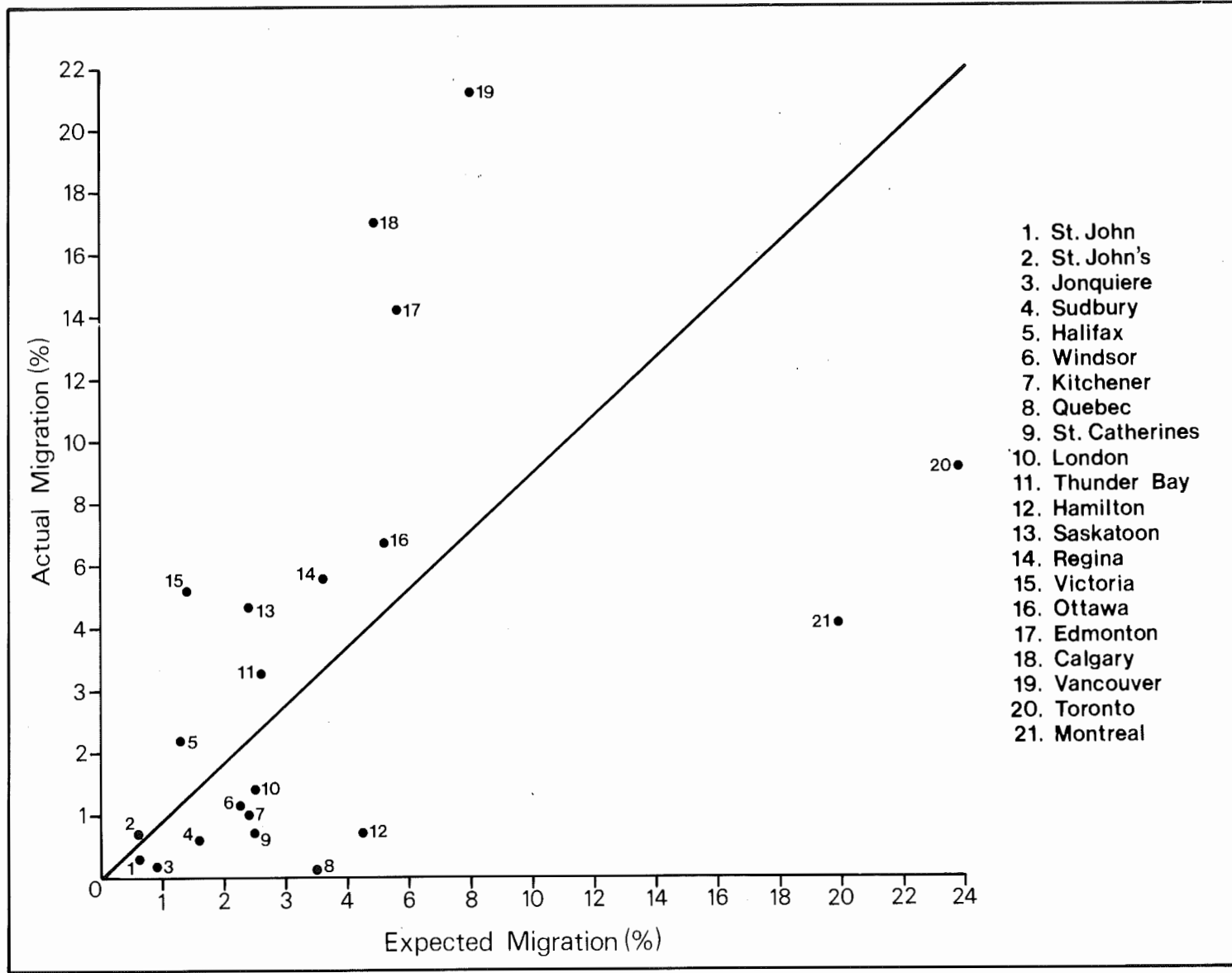


Figure 3: 1971-1976 Intermetropolitan Migration Winnipeg to Other CMA's

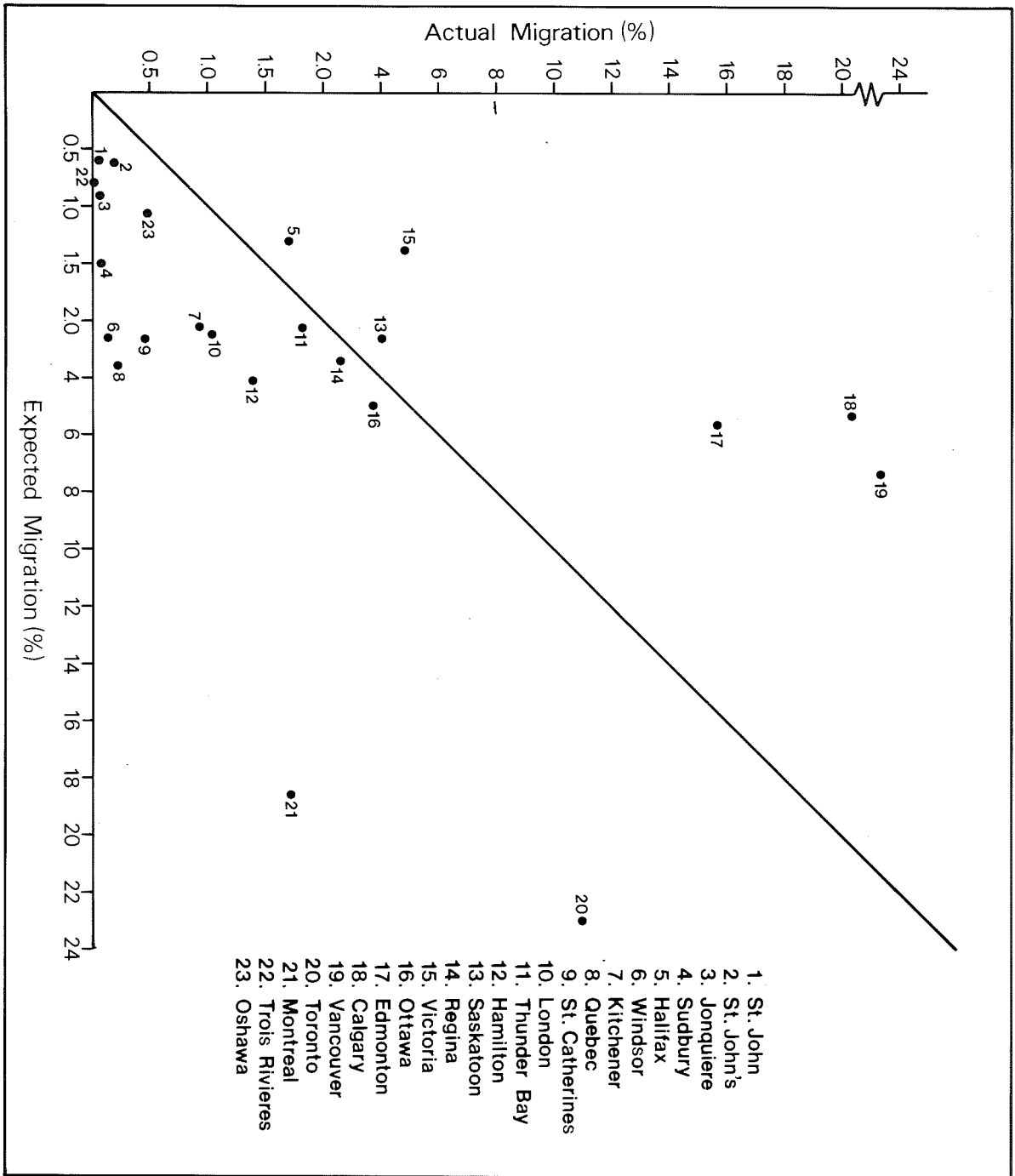


Figure 4: 1976-1981 Intermetropolitan Migration Winnipeg to Other CMA's

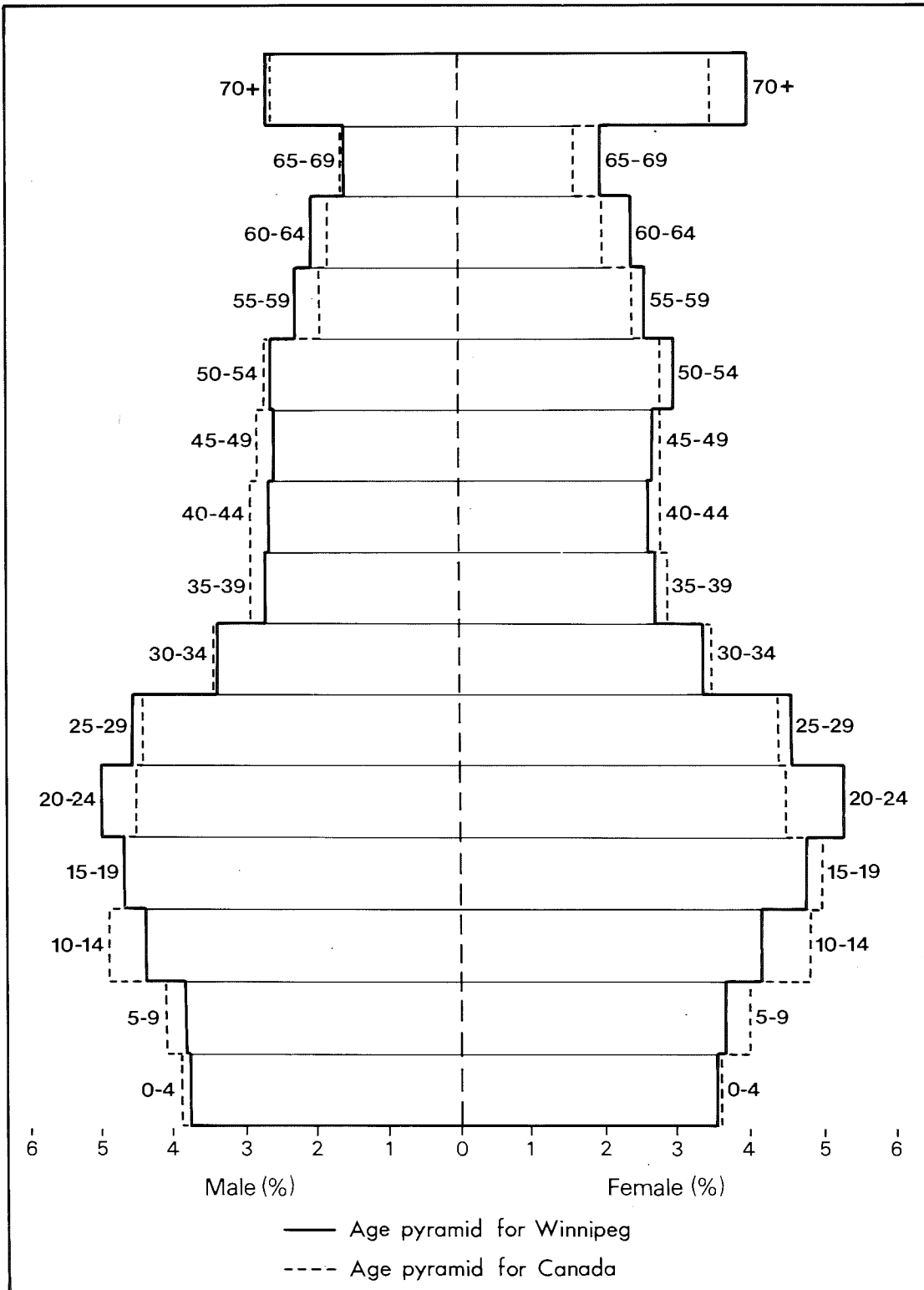


Figure 5: Percentage Distribution of the Population by Age Group and Sex, Winnipeg and Canada, 1976

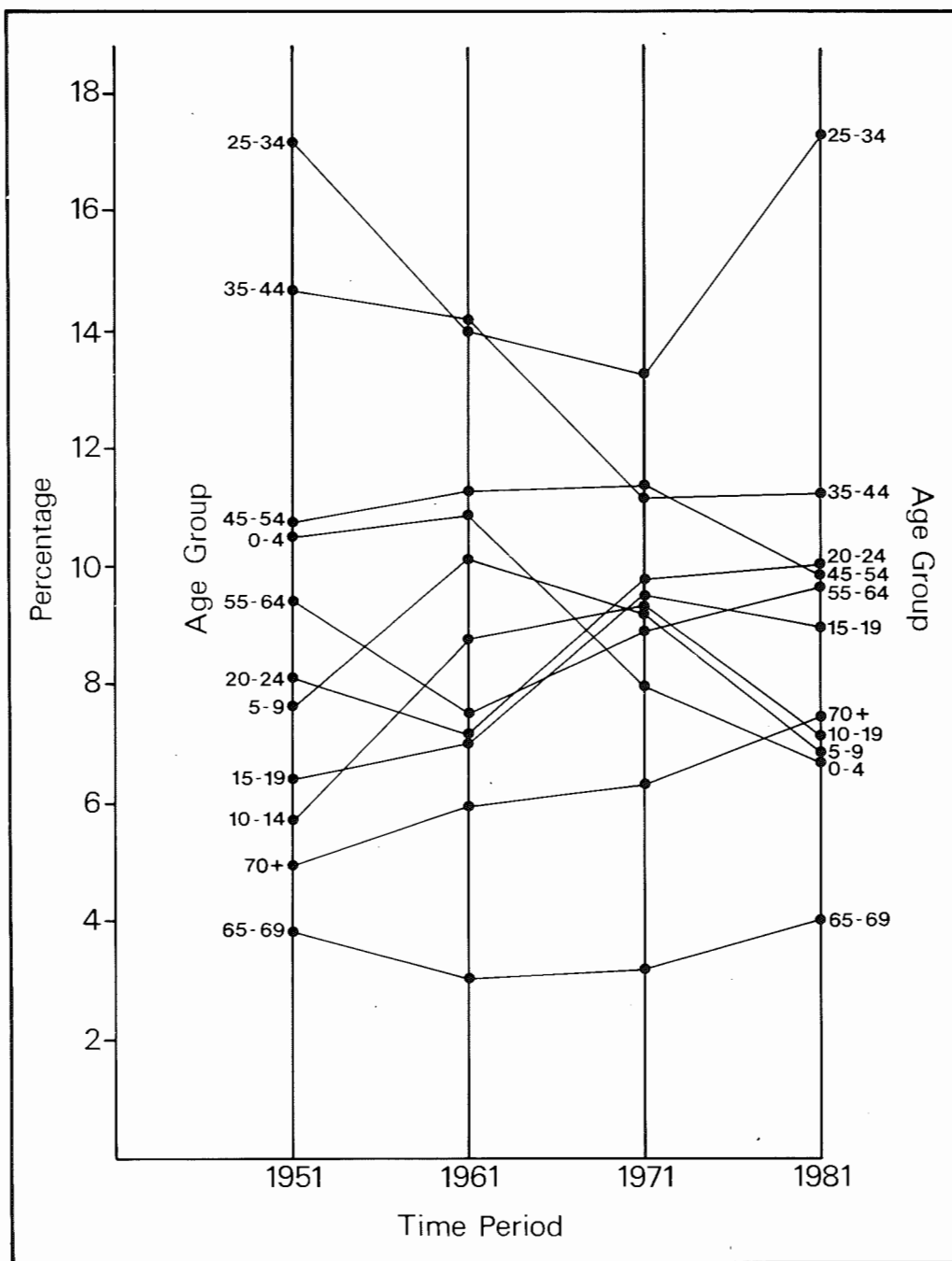


Figure 6: Age Group Structure of Winnipeg 1951, 1961, 1971, and 1981

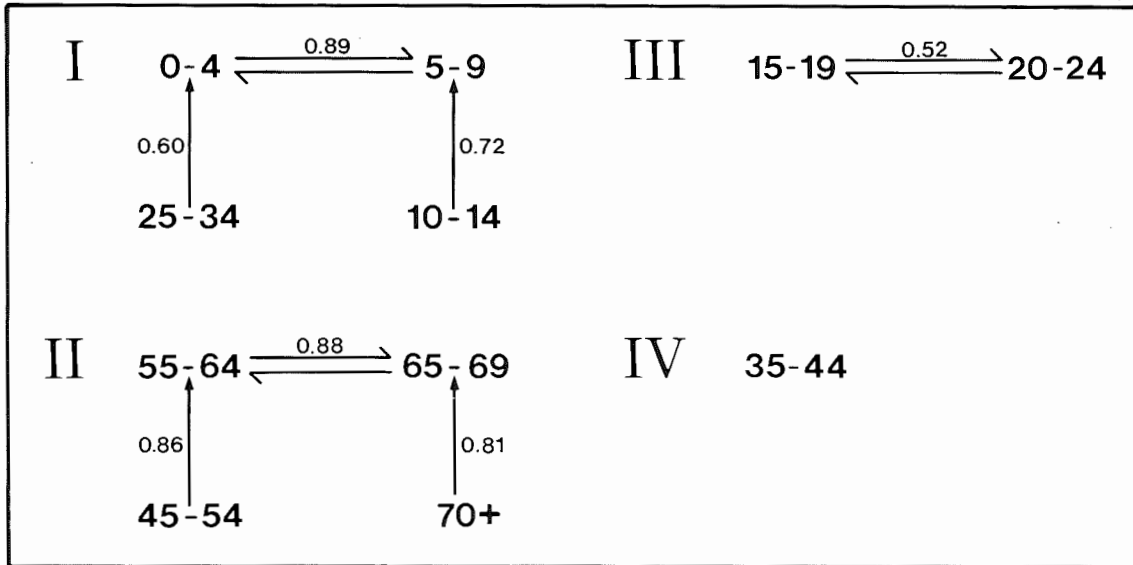


Figure 7: Linkage Analysis of Age Group Distribution Correlations: Winnipeg, 1951

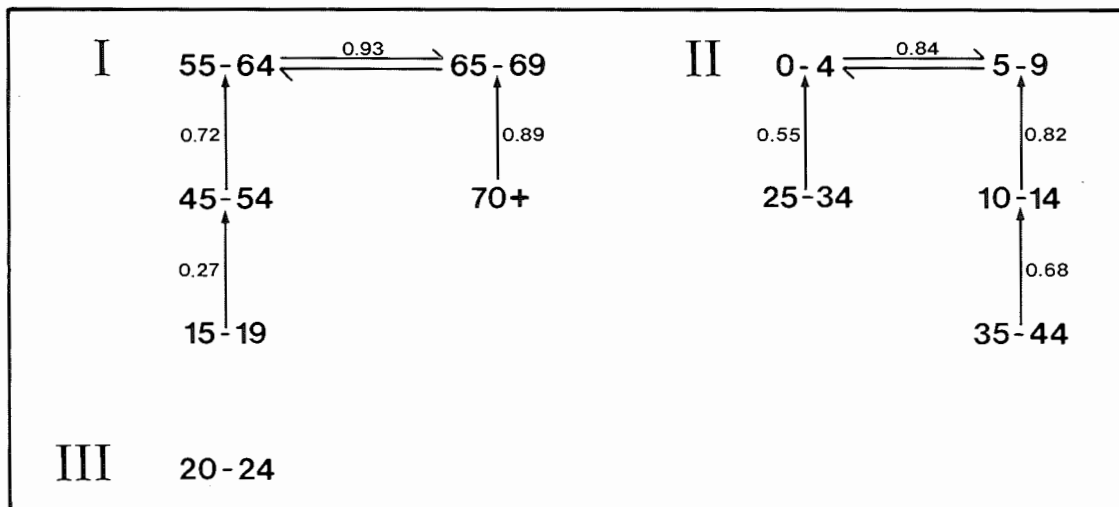


Figure 8: Linkage Analysis of Age Group Distribution Correlations: Winnipeg, 1961

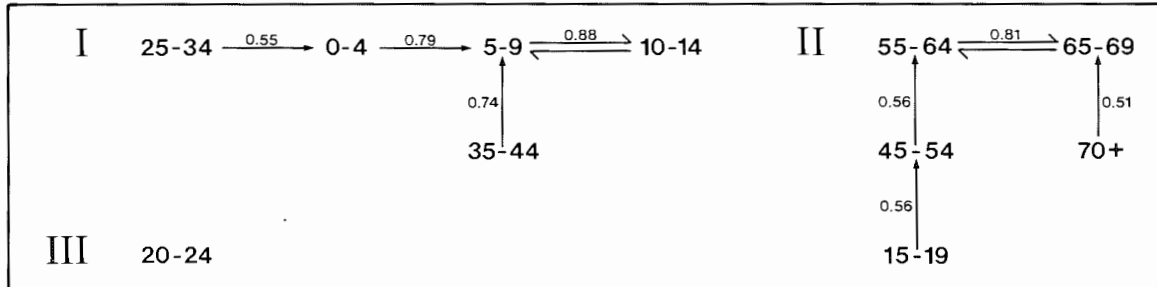


Figure 9: Linkage Analysis of Age Group Distribution Correlations: Winnipeg, 1971

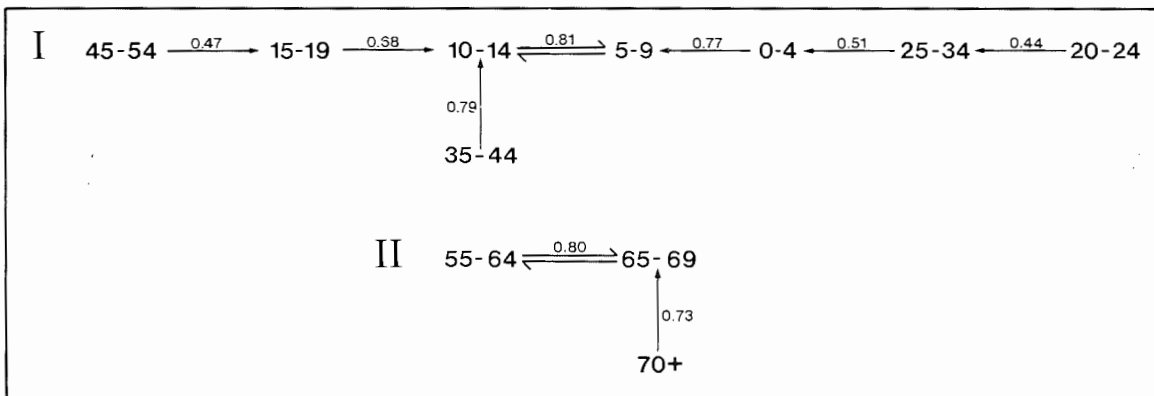


Figure 10: Linkage Analysis of Age Group Distribution Correlations: Winnipeg, 1981

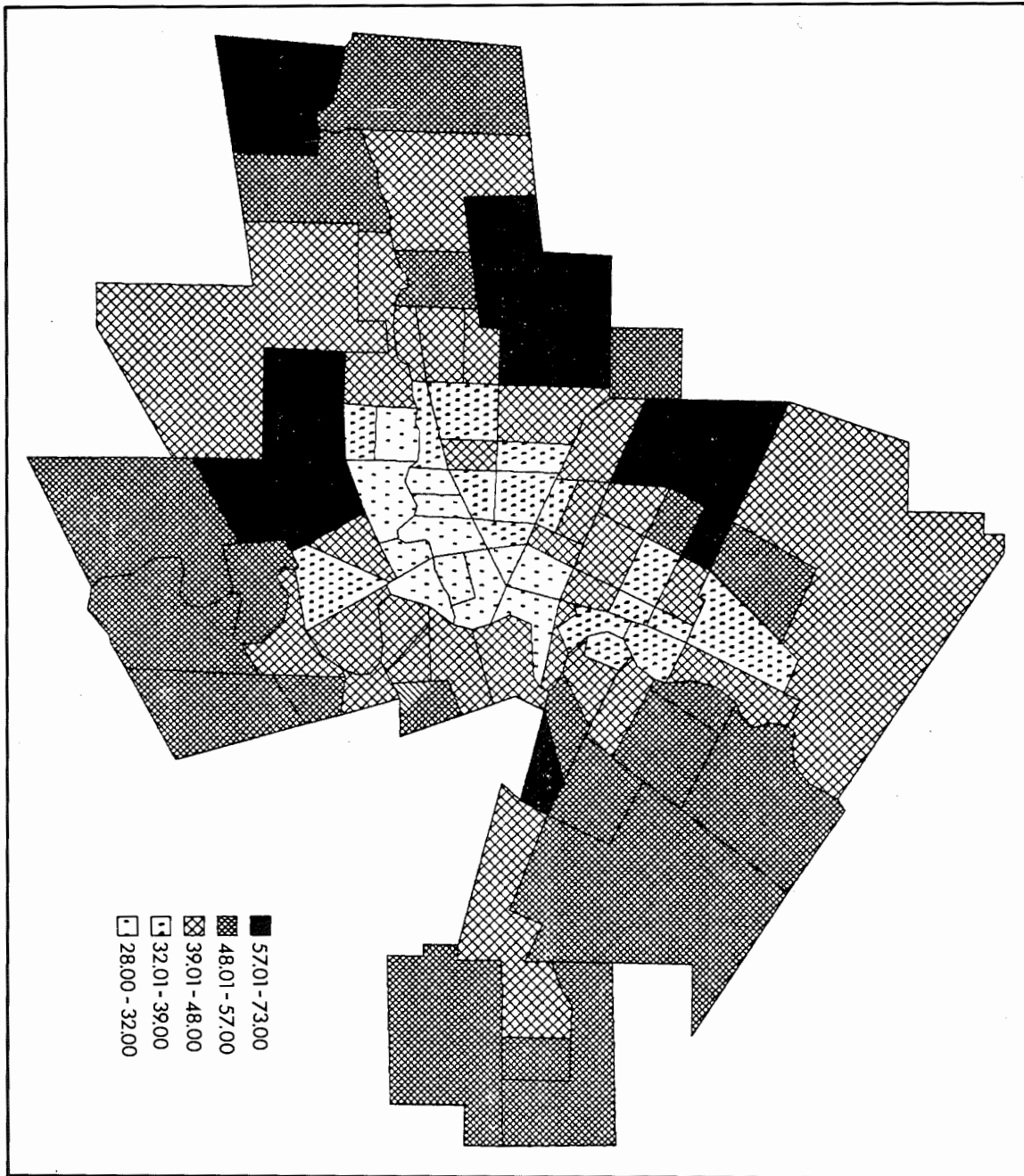


Figure 11: Winnipeg 1951: Percentage Ages 0-14 and 25-34

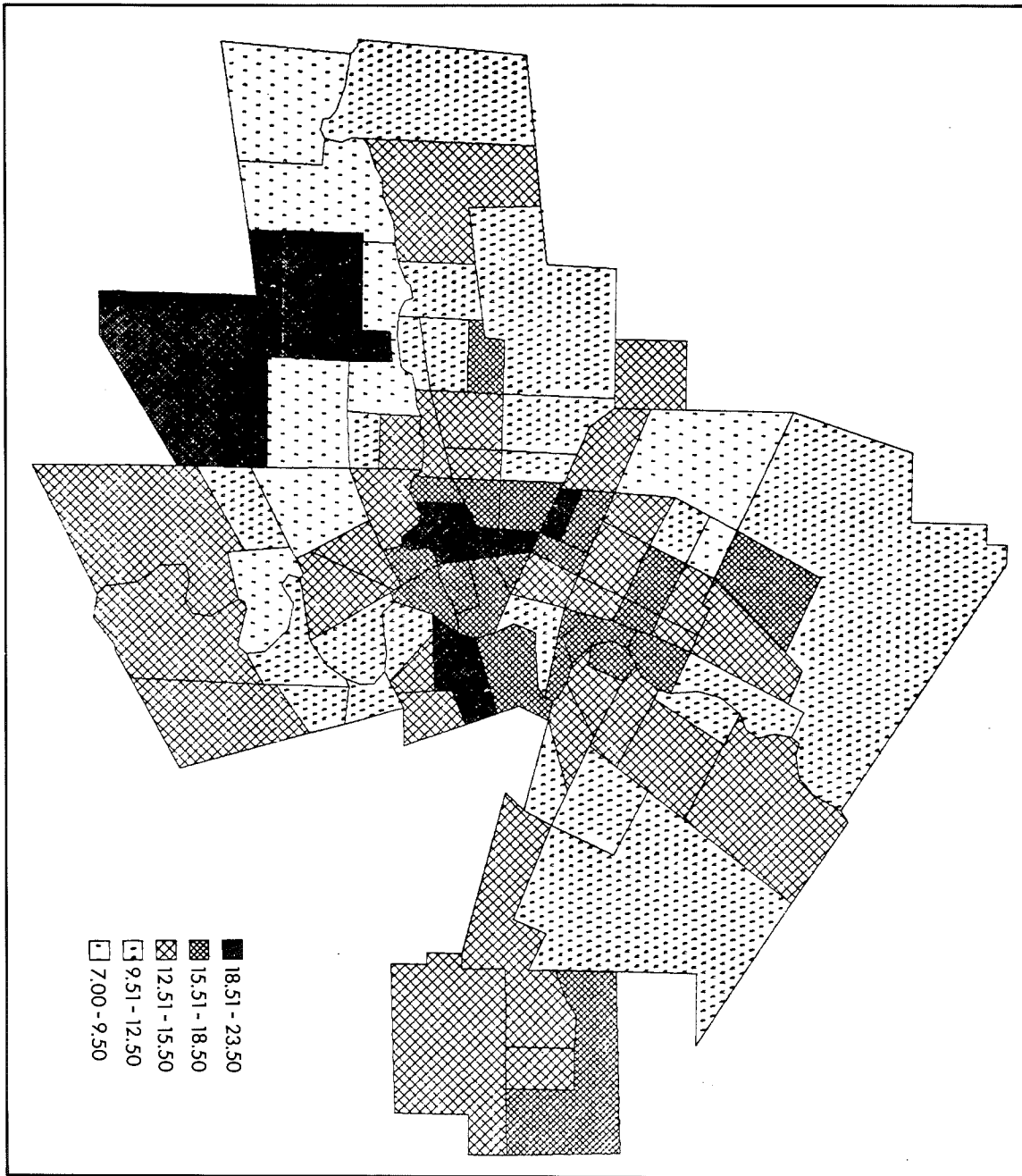


Figure 12: Winnipeg 1951: Percentage Ages 15-24

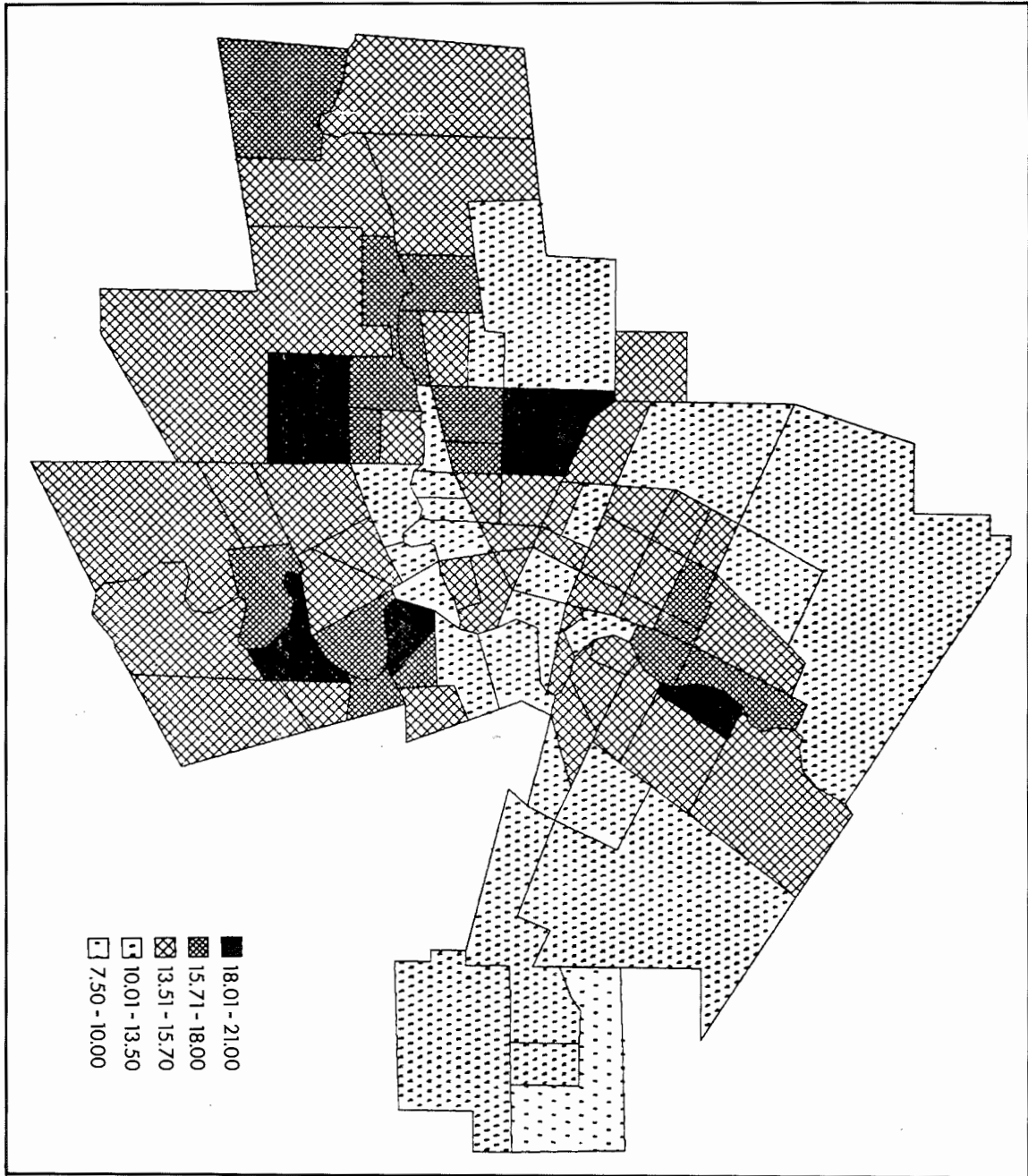


Figure 13: Winnipeg 1951: Percentage Ages 35-44

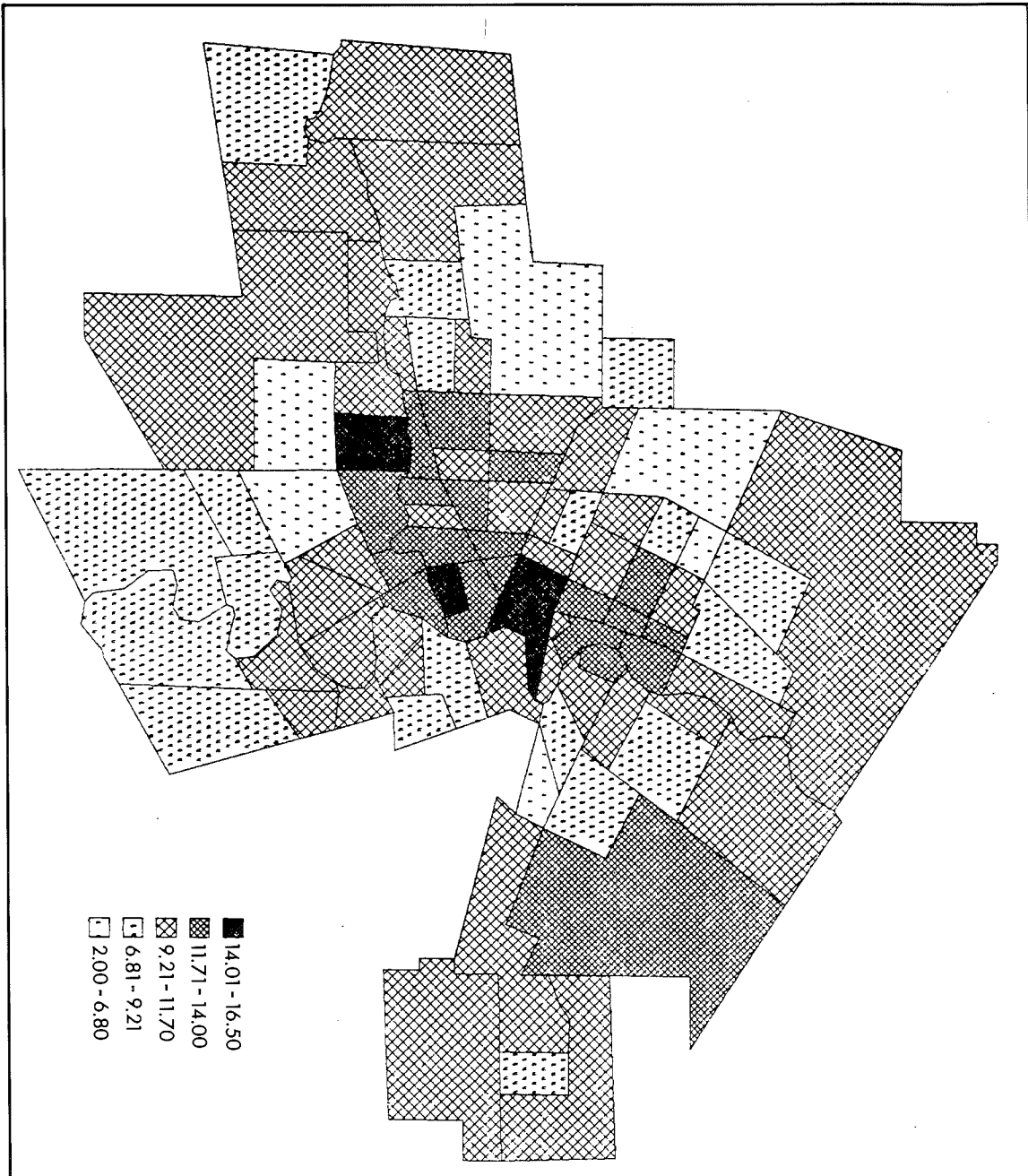


Figure 14: Winnipeg 1951: Percentage Ages 45-54

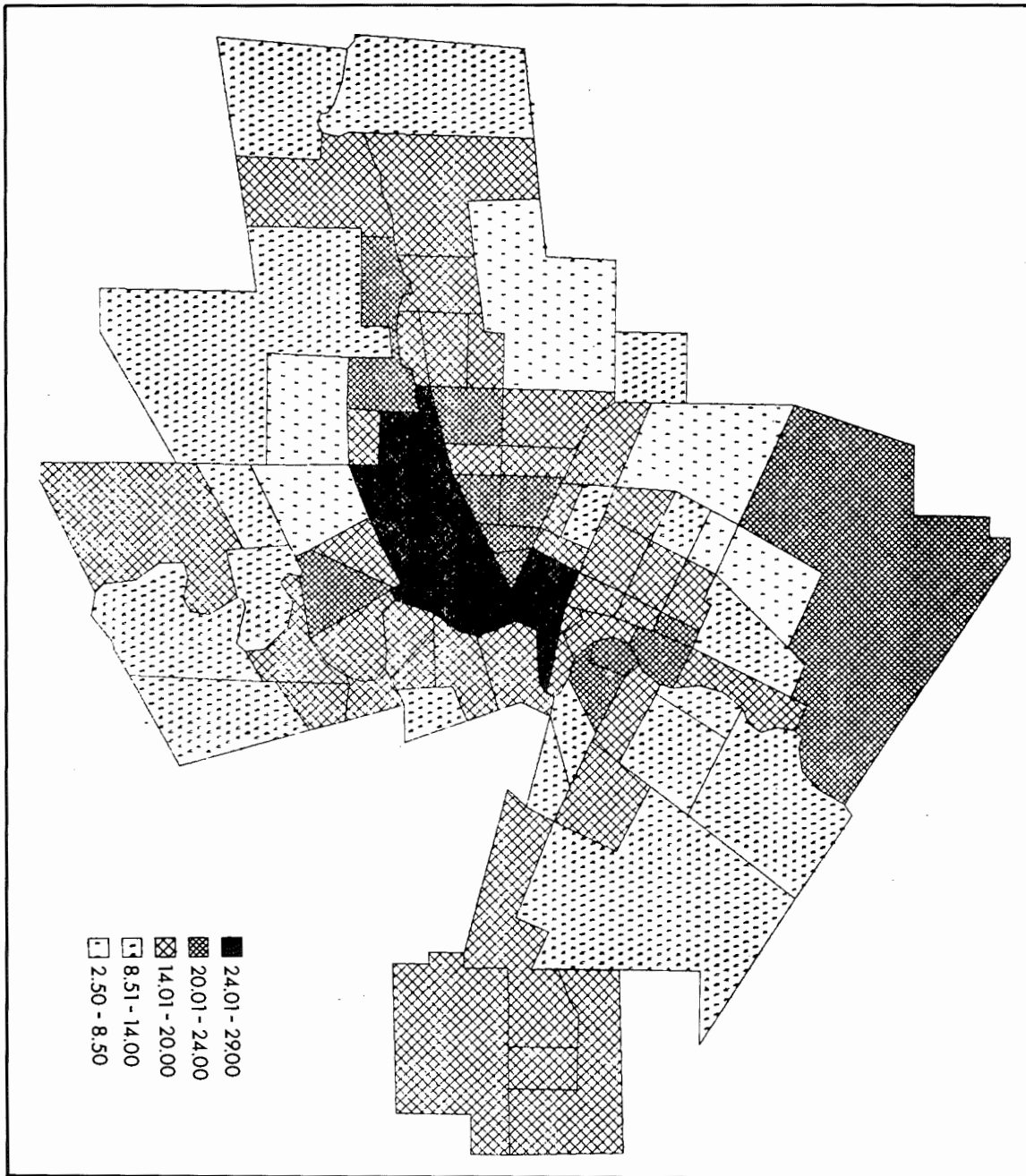


Figure 15: Winnipeg 1951: Percentage Ages 55 and over

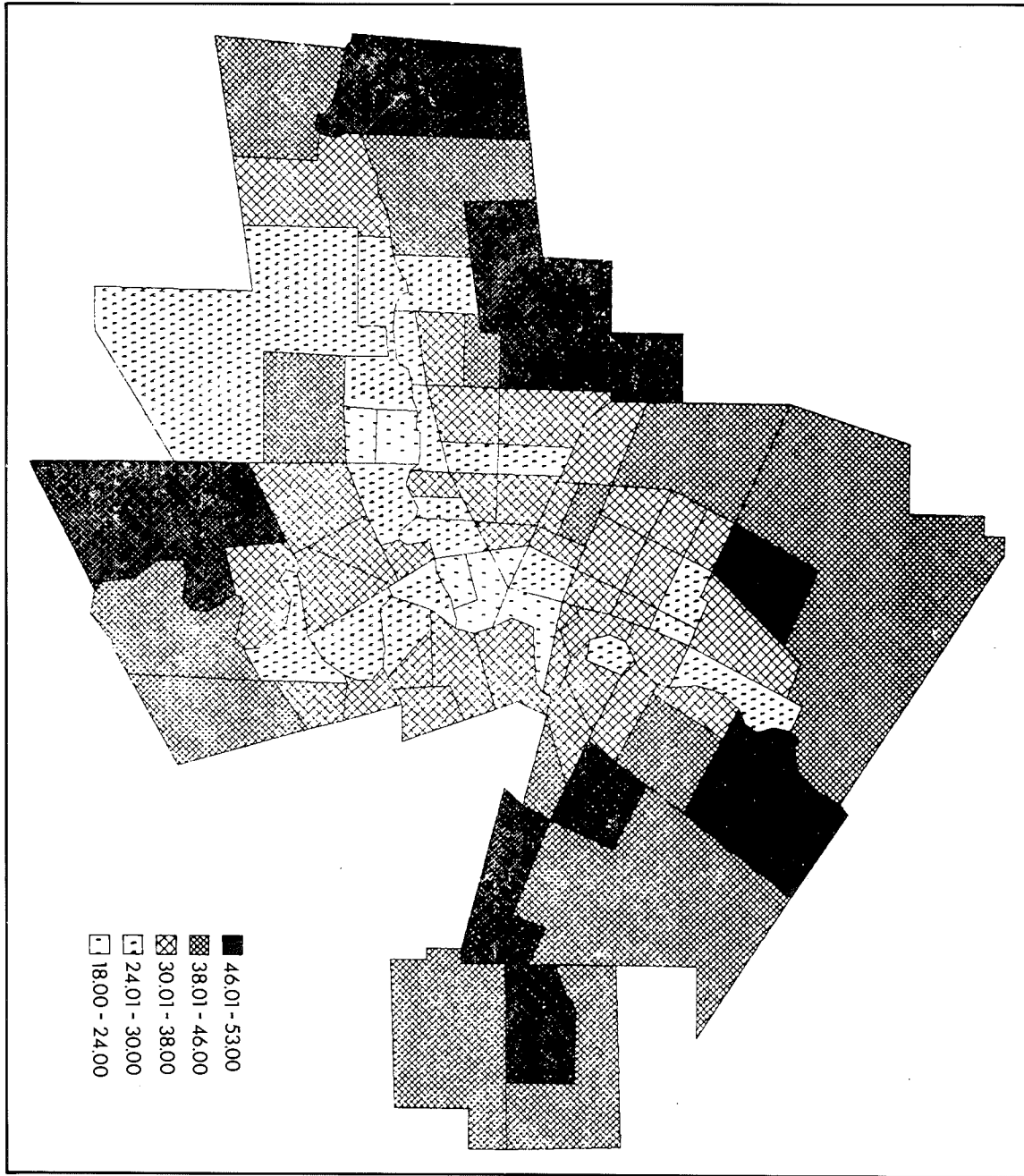


Figure 16: Winnipeg 1961: Percentage Ages 0-9 and 25-34

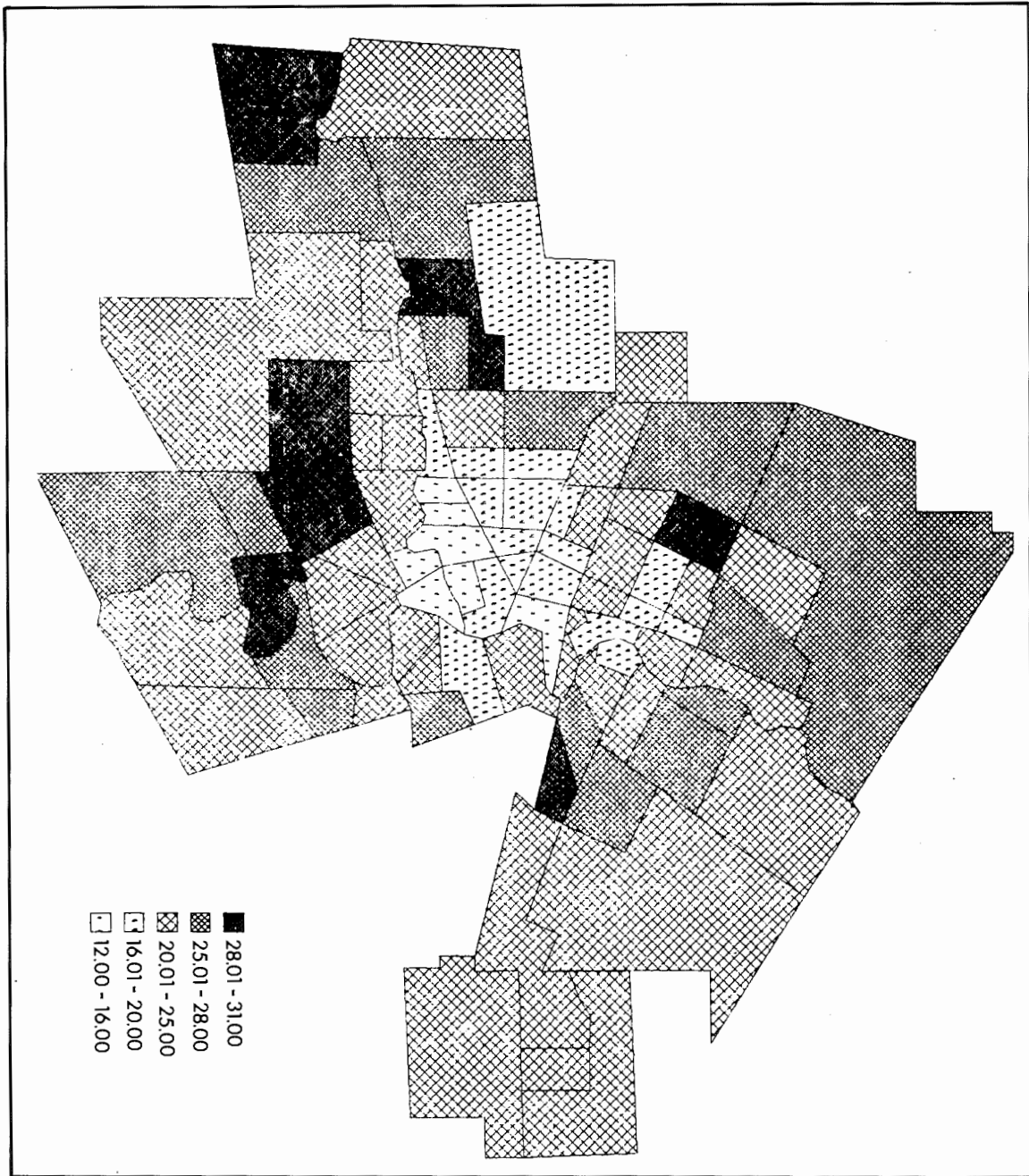


Figure 17: Winnipeg 1961: Percentage Ages 10-14 and 35-44

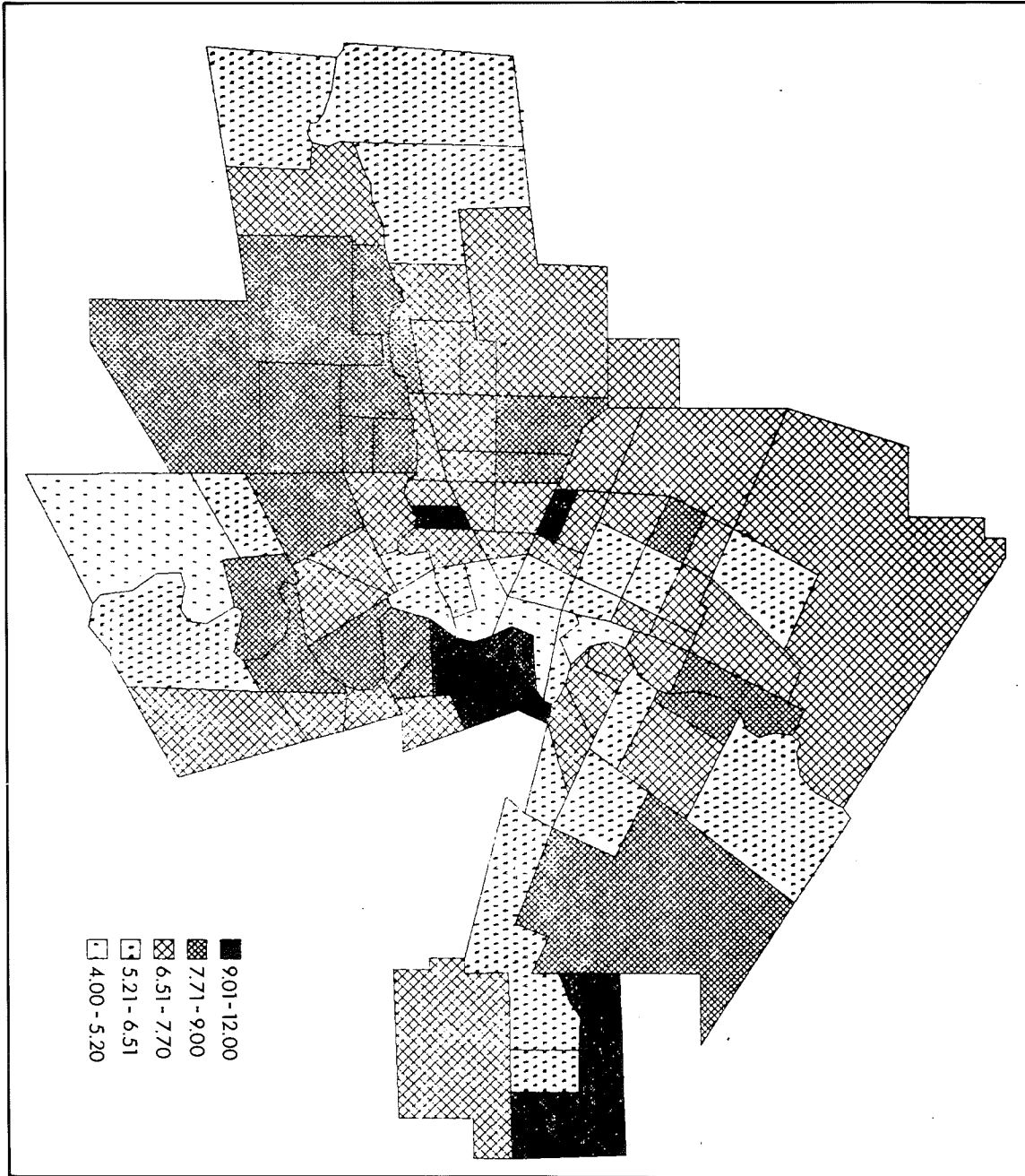


Figure 18: Winnipeg 1961: Percentage Ages 15-19

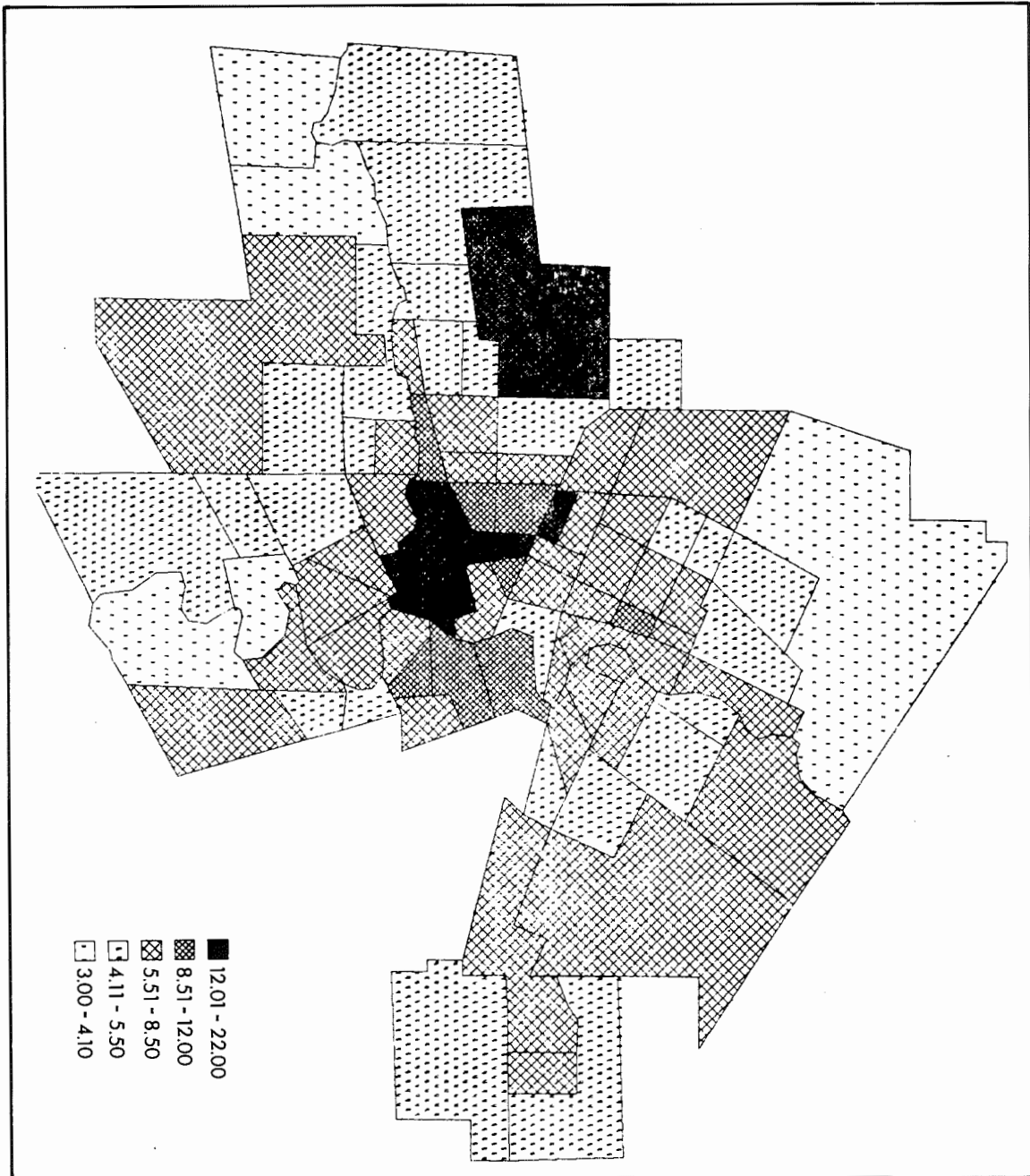


Figure 19: Winnipeg 1961: Percentage Ages 20-24

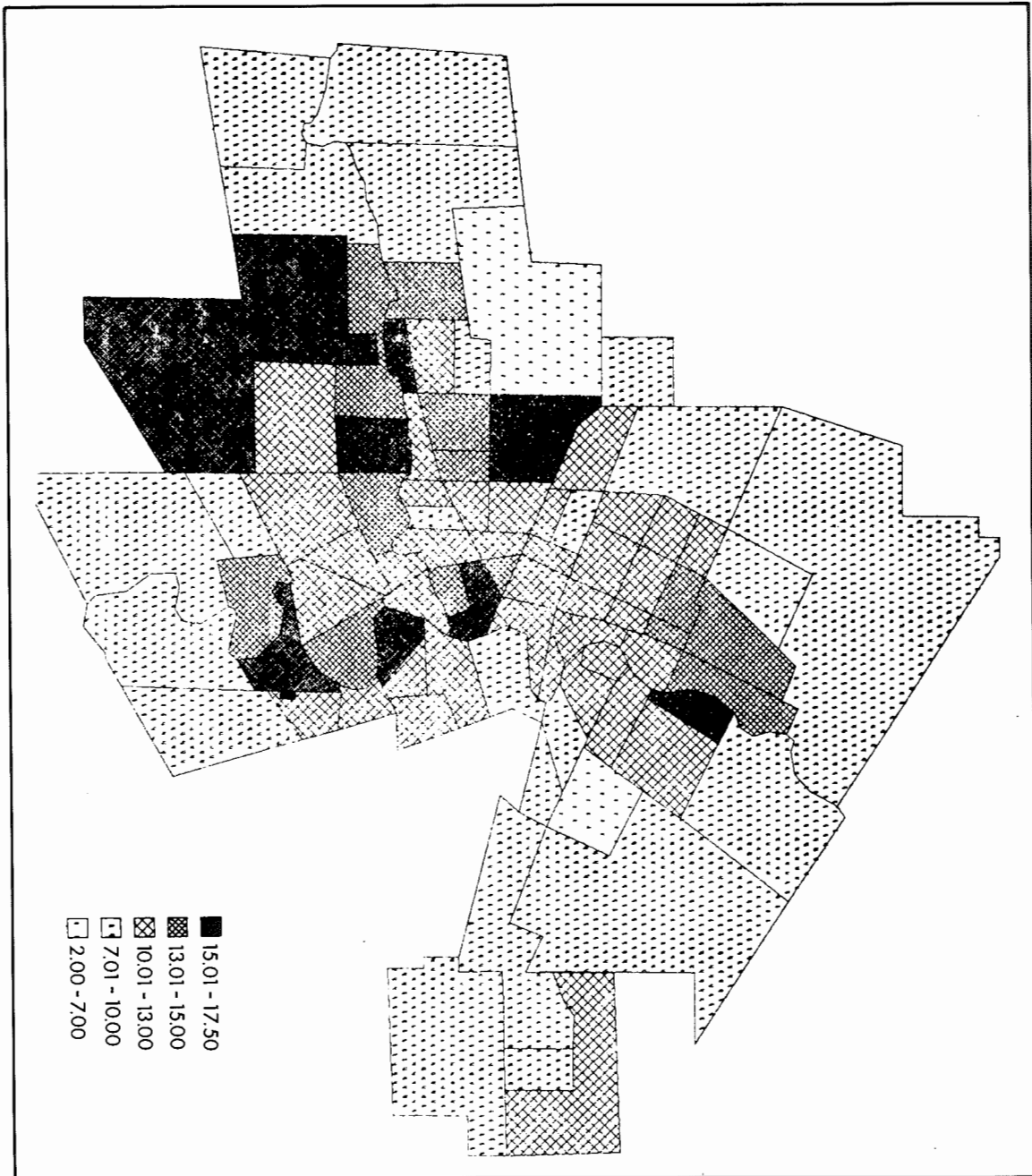


Figure 20: Winnipeg 1961: Percentage Ages 45-54

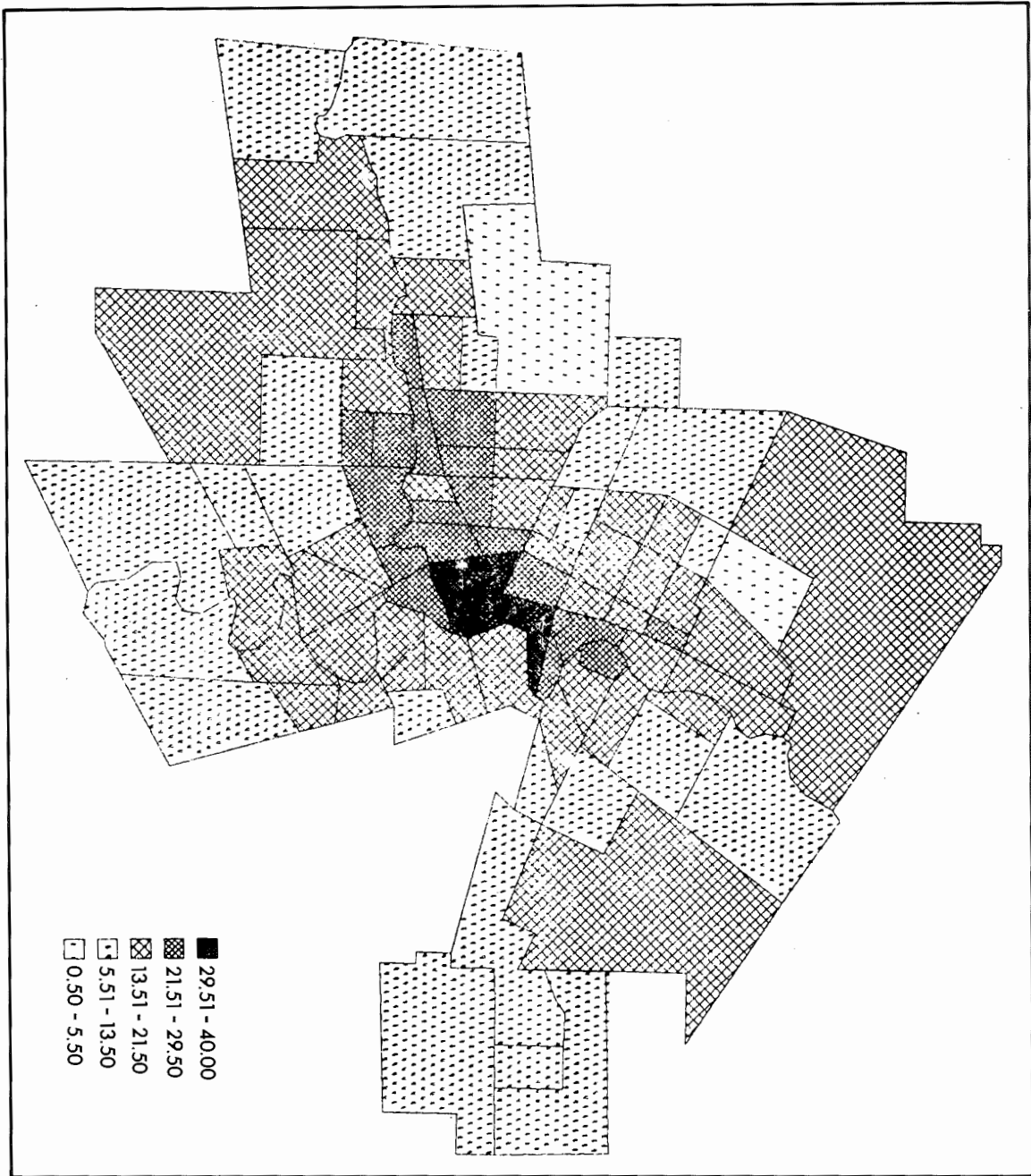


Figure 21: Winnipeg 1961: Percentage Ages 55 and over

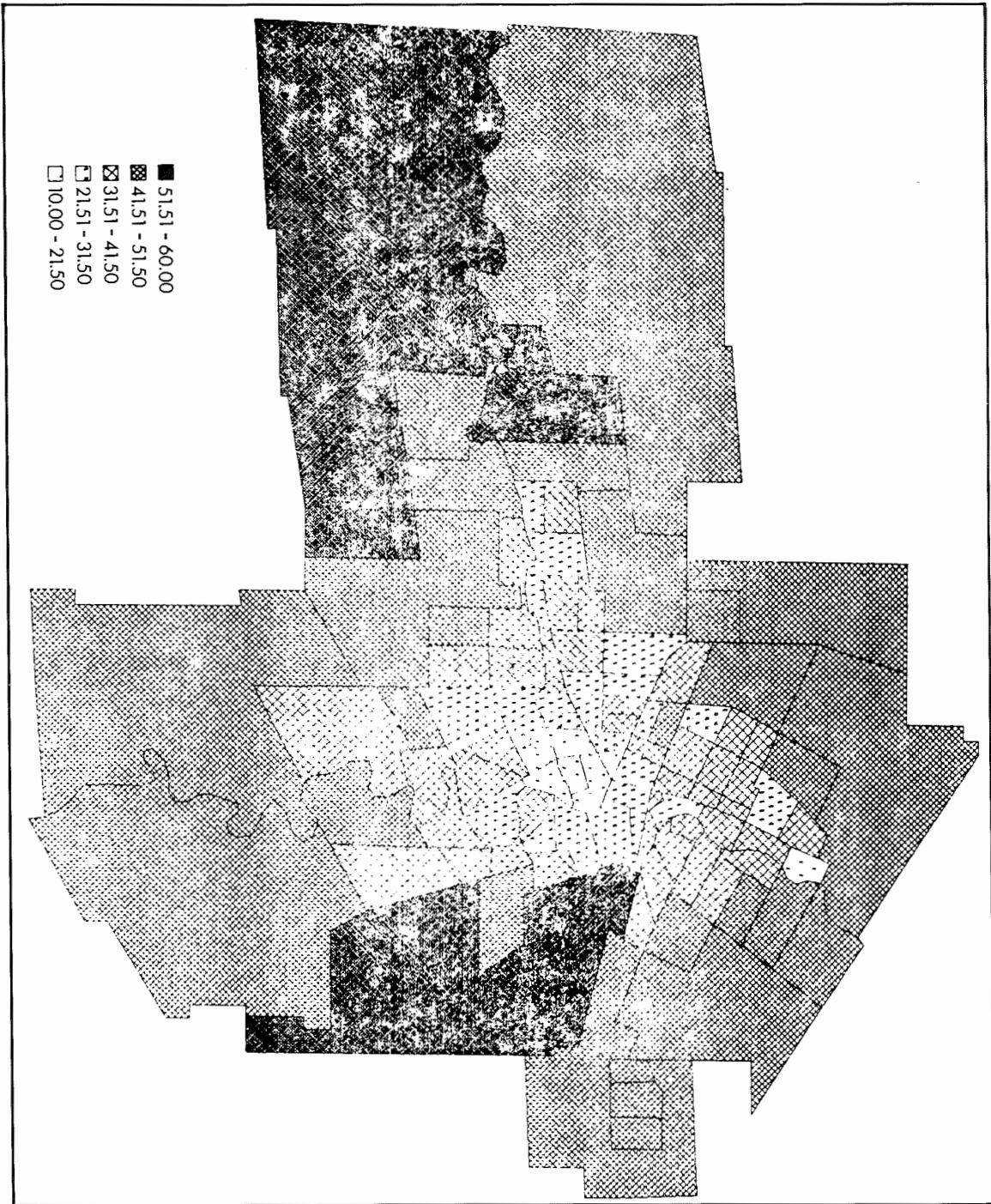


Figure 22: Winnipeg 1971: Percentage Ages 0-14 and 35-44

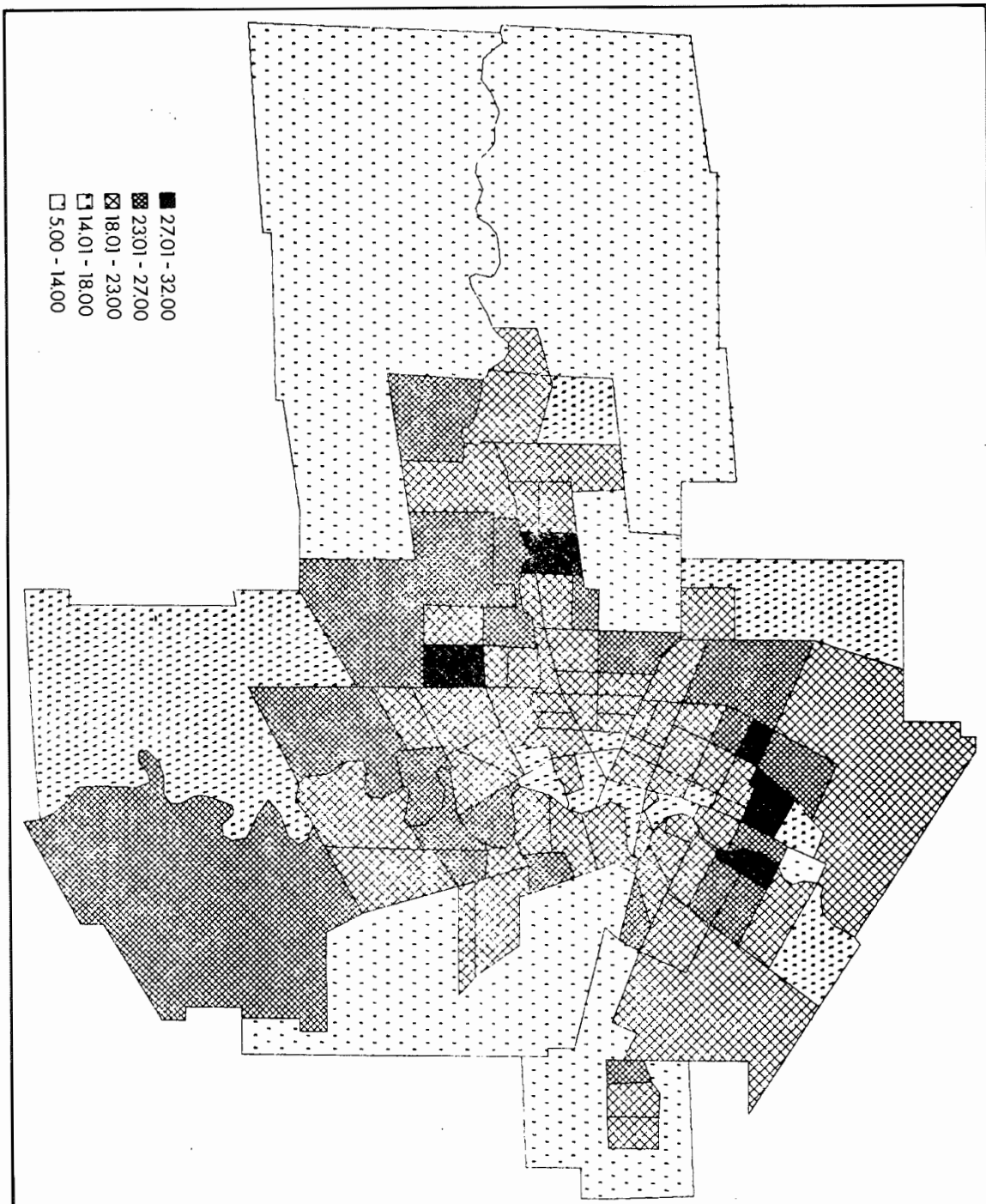


Figure 23: Winnipeg 1971: Percentage Ages 15-19 and 45-54

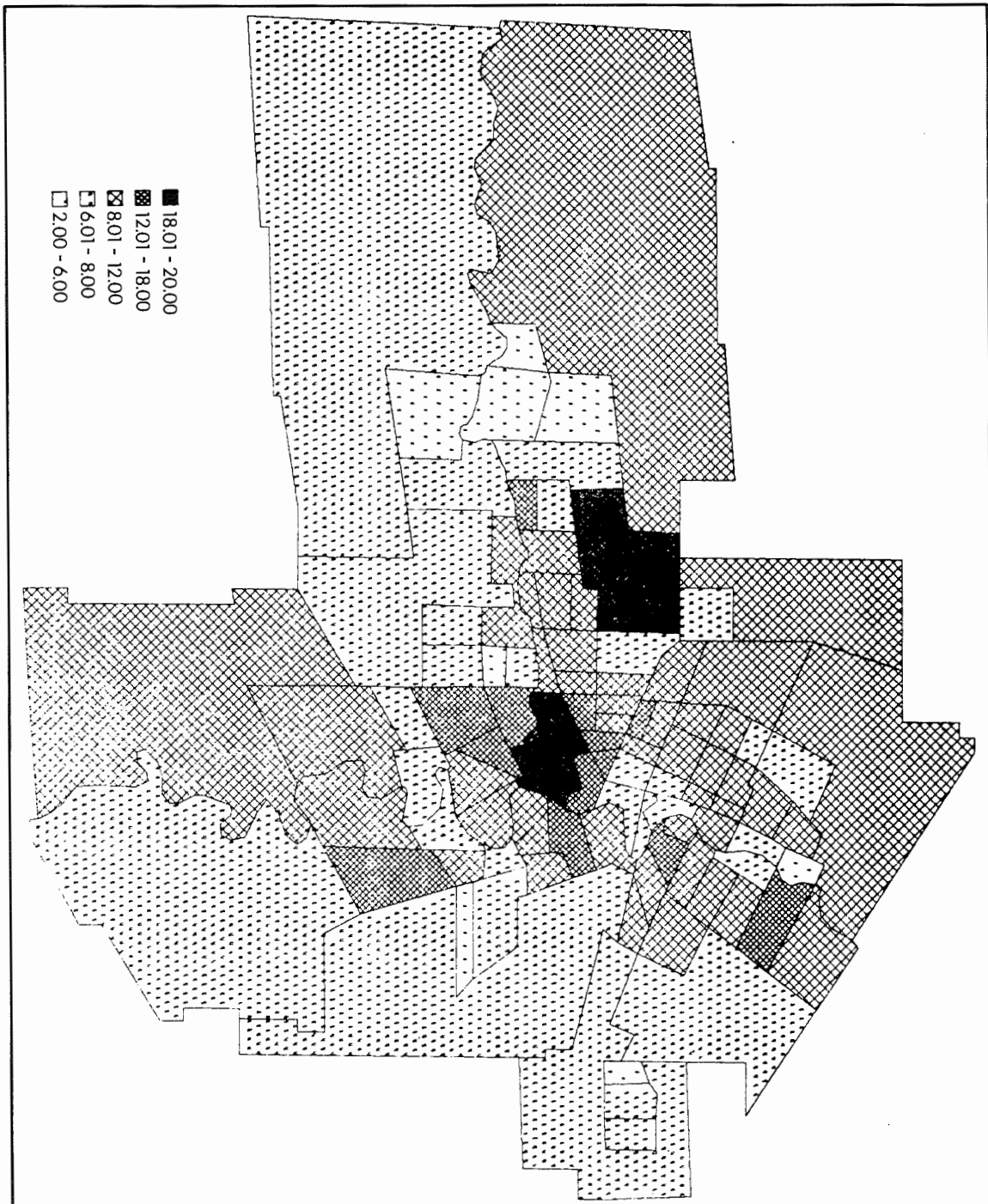


Figure 24: Winnipeg 1971: Percentage Ages 20-24

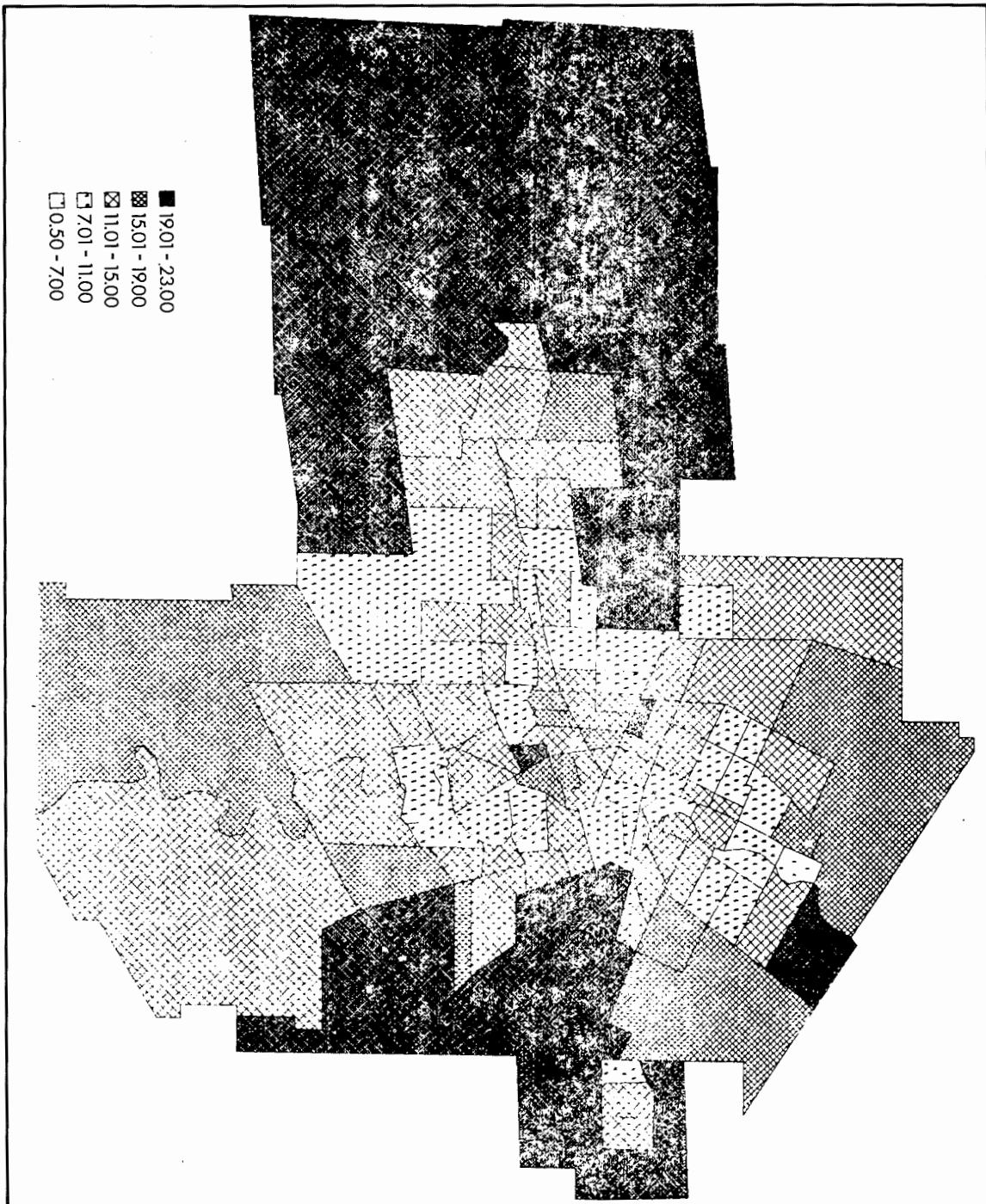


Figure 25: Winnipeg 1971: Percentage Ages 25-34

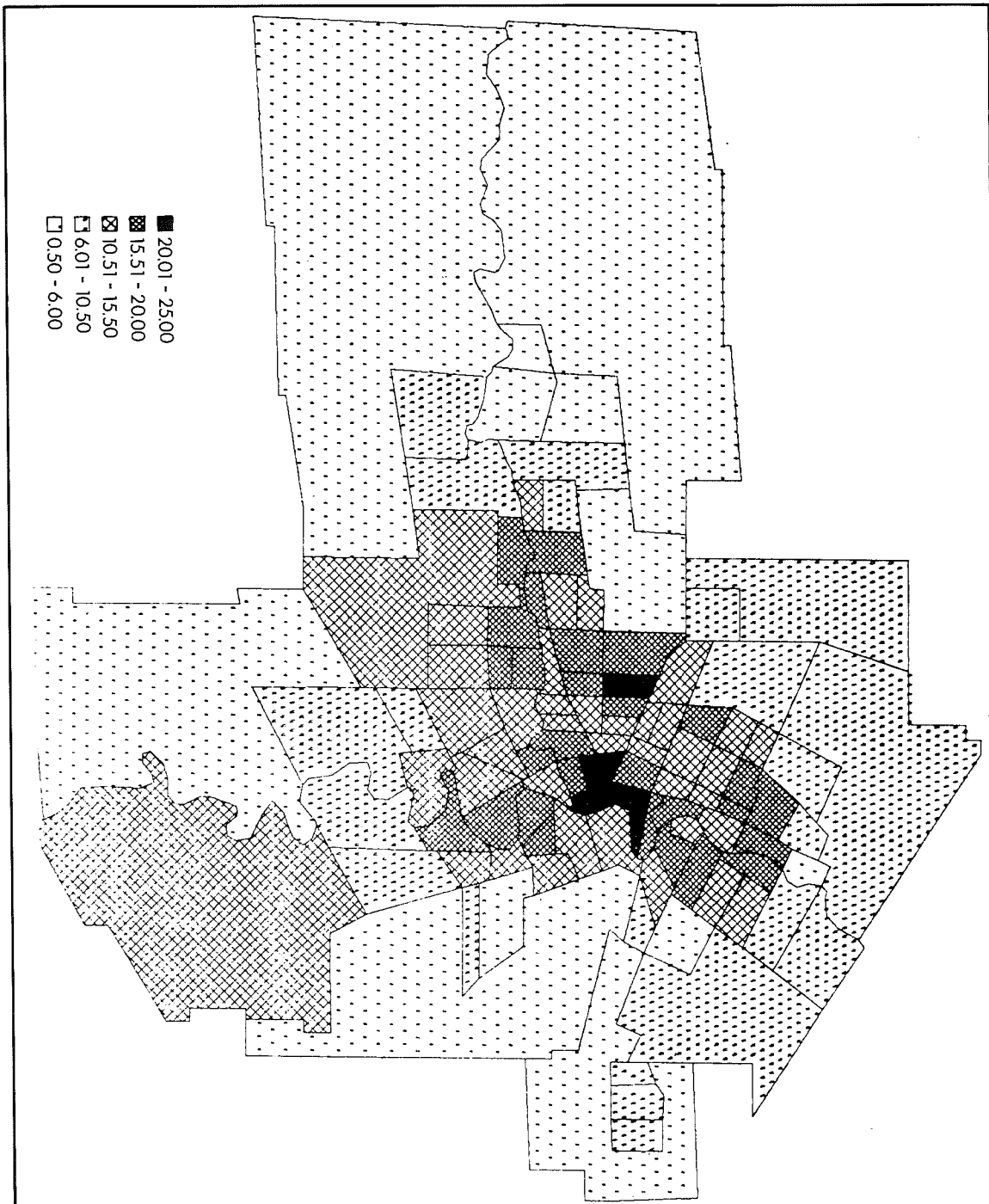


Figure 26: Winnipeg 1971: Percentage Ages 55-69

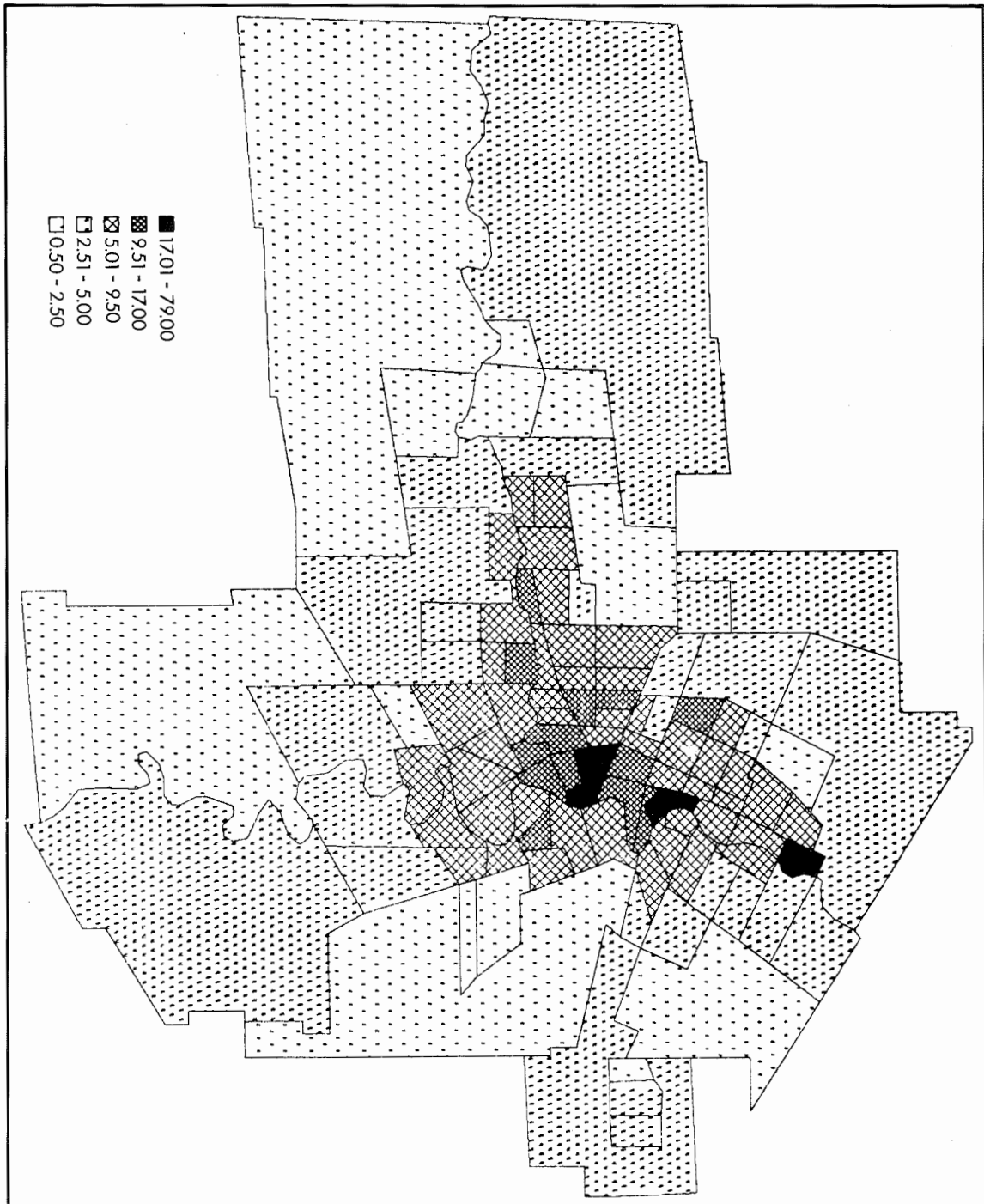


Figure 27: Winnipeg 1971: Percentage Ages 70 and over

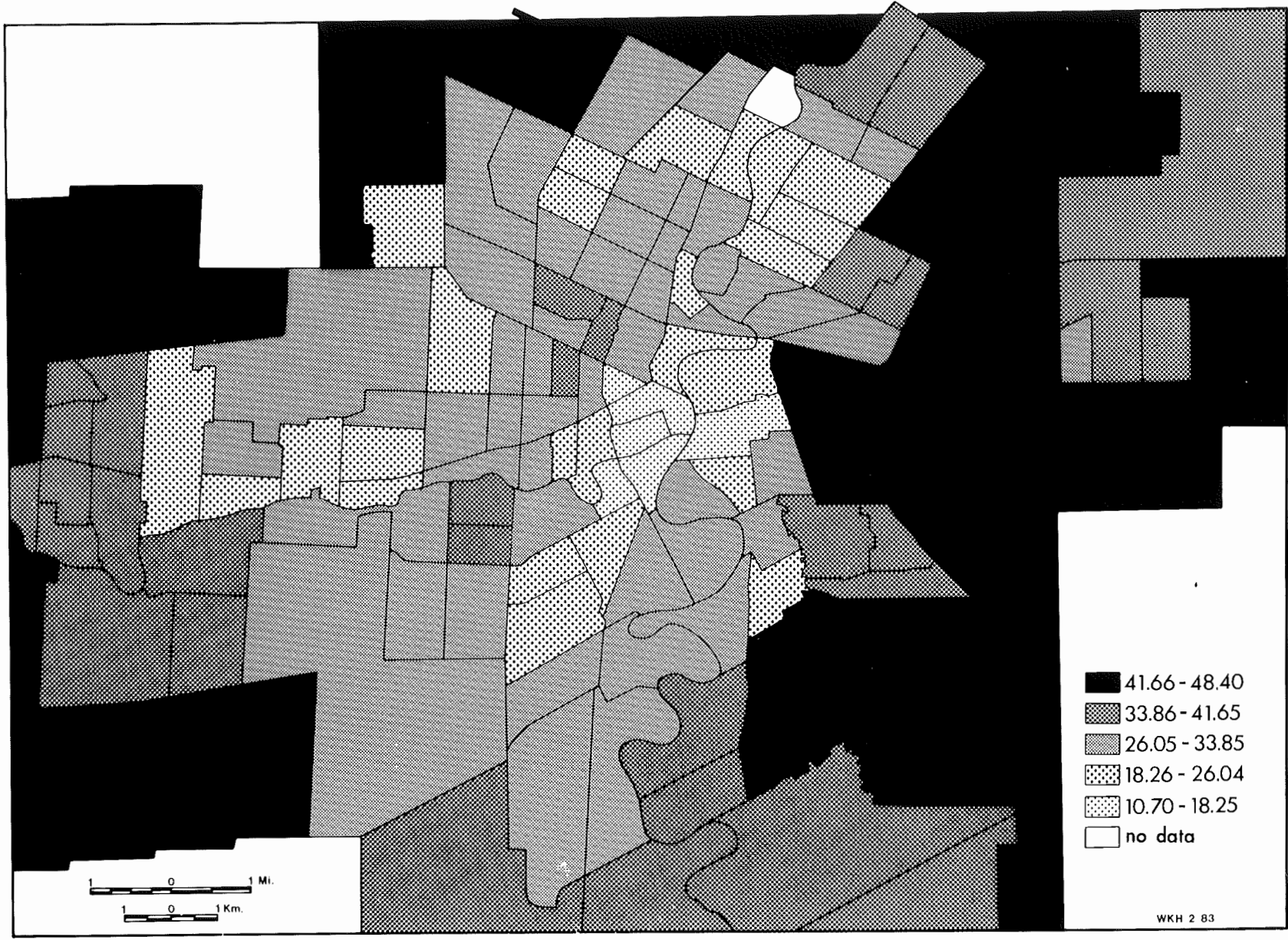


Figure 28: Winnipeg 1981: Percentage Ages 0-14, and 35-44



Figure 29: Winnipeg 1981: Percentage Ages 15-19 and 45-54



Figure 30: Winnipeg 1981: Percentage Ages 20-24



Figure 31: Winnipeg 1981: Percentage Ages 25-34

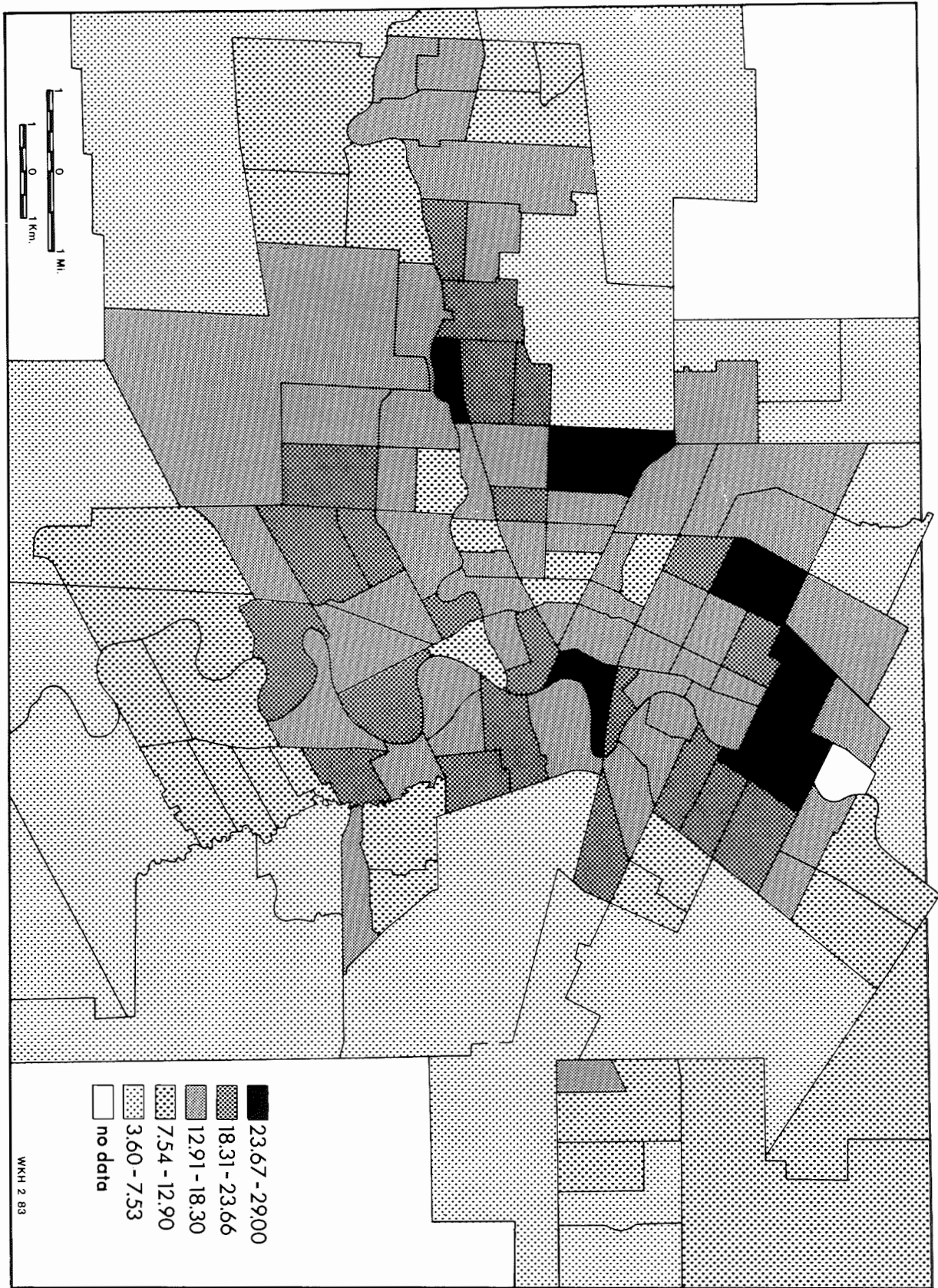


Figure 32: Winnipeg 1981: Percentage Ages 55-69

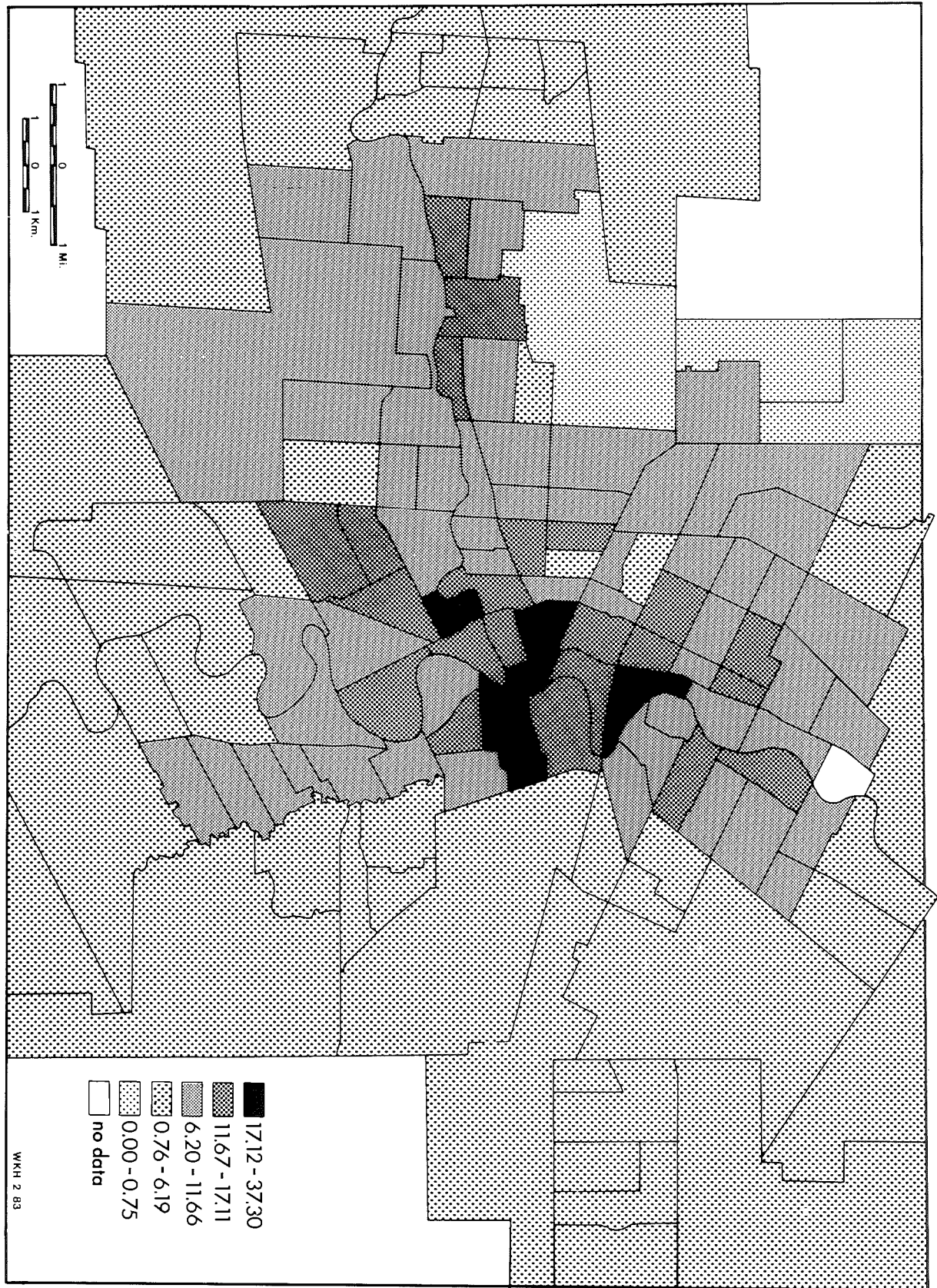


Figure 33: Winnipeg 1981: Percentage Ages 70 and over