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The Journey to Worship: A Case Study in Waterloo, Ontario

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THE JOURNEY TO WORSHIP:

A CASE STUDY IN WATERLOO, ONTARIO

by

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PREFACE

This paper examines religious spatial interaction within an urban environment and as such contributes to the sparse literature on the Geography of Religion. It is the specific purpose to illustrate the journey to worship of households in the City of Waterloo, Ontario and to explain the spatial pattern utilizing the Principle of Least Effort.

It is discovered that if historical tension and dimensional tension are considered, one is able to predict the actual pattern of the journey to worship with seventy per cent accuracy. The fact that a large per cent of the sample attend the closest church of their particular denomination at the time of entry into the earliest address in the Twin Cities appears to indicate that the distance to church is an important attraction factor. The travel patterns of all denominations are influenced similarly by the principle of least effort. This effect of the principle of least effort can be described mathematically using the Pareto function.

An analysis of the socio-economic factors that could effect the space preference of households indicates that income, age, trip frequency, the number of programs utilized and family size do not significantly explain the travel patterns of the journey to worship to any great degree.

In a final chapter the perception of households is analyzed

as to which factors are considered most important in attracting the household to church. It is discovered that a large percentage of the households indicated that proximity to church is the most important attraction factor. This subjective aspect verifies the objective conclusions on the important effect of the least effort principle on the journey to worship of Waterloo households.

Those individuals who are responsible for church location and planning may well find this paper useful in their task.

The author would like to express his appreciation to Dr. Herbert Whitney under whose direction this thesis was completed.

I would also like to thank Dr. Jim Linders for his assistance in the development of the computer program for the statistical tests and computer mapping.

I am especially indebted to my wife, Jean, for her co-operation and assistance in the preparation of this thesis.

DOUGLAS CRAIG WITMER

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CHAPTER ONE

THE JOURNEY TO WORSHIP AS A PROBLEM FOR INVESTIGATION

A. INTRODUCTION AND OBJECTIVE

> "...Among the phenomena forming or reflecting the areal differences in cultures...few are as potent and sensitive as religion...we must inevitably approach the areal patterns of religious characteristics and their interactions with other human activities and cultural traits."[1]

Although most cultural geographers recognize the importance of the study of religious phenomena, relatively few have concentrated their efforts in this important area of investigation.

Existing studies in the geography of religion have been generally concerned with three levels of investigation. Some geographers, recognizing that

> "religious customs, ...profoundly influence the fate and fortunes of societies and the forms of landscape,"[2]

have studied the impact of religion on particular areas. Bjorklund, for example, has studied the religious landscape of the Dutch Reformed community in Michigan and verified her hypothesis that

> "ideology is the heart and core of any culture. It is the intellectual framework for the ways people perceive their environment, the resources they develop from it, and the kinds of area organization they evolve."[3]

Sopher too points out that

> "a fairly full inventory has been made of the more conspicuous landscape features associated with historic and contemporary religious systems, but there have been few attempts to assess the intensity of religion's impress on the land."[4]

The second level of investigation is exemplified by the studies by Sopher[5] and Kariel and Kariel.[6] These works have drawn attention to the major religious regions on a world scale. In these studies, man's world religions have been identified and the area occupied by the adherents has been delineated. Zelinsky has studied the geographic aspects of religion on a smaller regional scale.[7] He was able to divide the United States into a number of religious regions based on church membership statistics. The emphasis in these studies has thus been upon regionalization.

The third level of investigation has an emphasis not so much upon regionalization but upon the religious phenomena being studied, commonly of an area of smaller size than the national and world regions described above. Stoddard, for example, has studied the location of individual churches in one county in Nebraska.[8] Other researchers have investigated the geographic elements of a single denomination. Ary J. Lamme III has studied the diffusion of the Christian Science denomination in the United States between 1870 and 1970.[9] Haag has investigated the trade areas of Lutheran Churches in the cities of Kitchener and Waterloo.[10]

The present study is not along one of the three lines mentioned, but rather, the emphasis will be on the spatial network of households travelling to church facilities. The objective will be to search for order and regularity in the behavior of households as demonstrated in lines of travel between home and church. In contrast to existing studies, the major emphasis will not be on areal extent but rather on the linear connection between churches and their members' residences.

More specifically, this paper will study whether the principle of least effort is evident in the travel to worship of Waterloo households. In order to isolate the effect of the least effort principle, the influence of certain socio-economic variables and personal perception factors will also be analyzed. Then the relationship between the choice of church and the distance travelled to use the chosen church facilities will be described mathematically so that the results will be in a form useful to other researchers and to any individuals or agencies responsible for future church planning and locating.

Because this aspect of religious spatial interaction has not previously been dealt with by geographers, this study will hopefully contribute to our knowledge of consumer travel in an urban environment and will add to the sparse literature on the geography of religion.

B. SCOPE

The study area will be limited to the legal cities of Kitchener and Waterloo. The analysis deals specifically with Waterloo households and the effect of the friction of distance upon their use of church facilities within the cities of Kitchener and Waterloo, Ontario.

For purposes of clarifying the terms used in the remainder of this study, the following must be defined.

household	residents of a detached or semi-detached building unit (regardless of whether renting or owning), but not with residents of multiple dwelling units.
church	"a body or organization of religious believers"[11] (For purposes of this study the location or meeting place of each church was obtained.)
denomination	"a religious organization uniting in a single legal and administrative body a number of local congregations".[12]
use of church facilities	use of church buildings or attendance at any church programme for any purpose.
church member	an official member of a church congregation.
Twin Cities	the legal cities of Kitchener and Waterloo, Ontario.

C. THE AREA INVOLVED

Kitchener and Waterloo, Ontario, are located in the county of Waterloo in the centre of southwestern Ontario. (Figure 1). Kitchener and Waterloo are the largest urban centres in the county of Waterloo (Figure 2), and, although legally distinct, they form one continuous built up urban area.

In 1971 there were 13,722 dwelling units in Waterloo composed of 8,663 detached or semi-detached dwelling units, 705 towne houses and 4,354 apartment units.[13] For this study, attention was limited to the householders in the detached and semi-detached units because interest was in the behavior of church-attending households and it was felt that apartment dwellers would be less likely to be church goers.

Selection of Waterloo as the particular urban area for research was based on several factors. One factor is that the growth of the population in the urban area is increasing rapidly, resulting in a number of new church congregations.

In the decade 1952 to 1962, thirty-four new churches were erected in the Twin Cities.[14] Between 1962 and 1972 at least another nineteen churches have been built. Figure 3 shows the present location of churches in the Twin Cities. In view of the

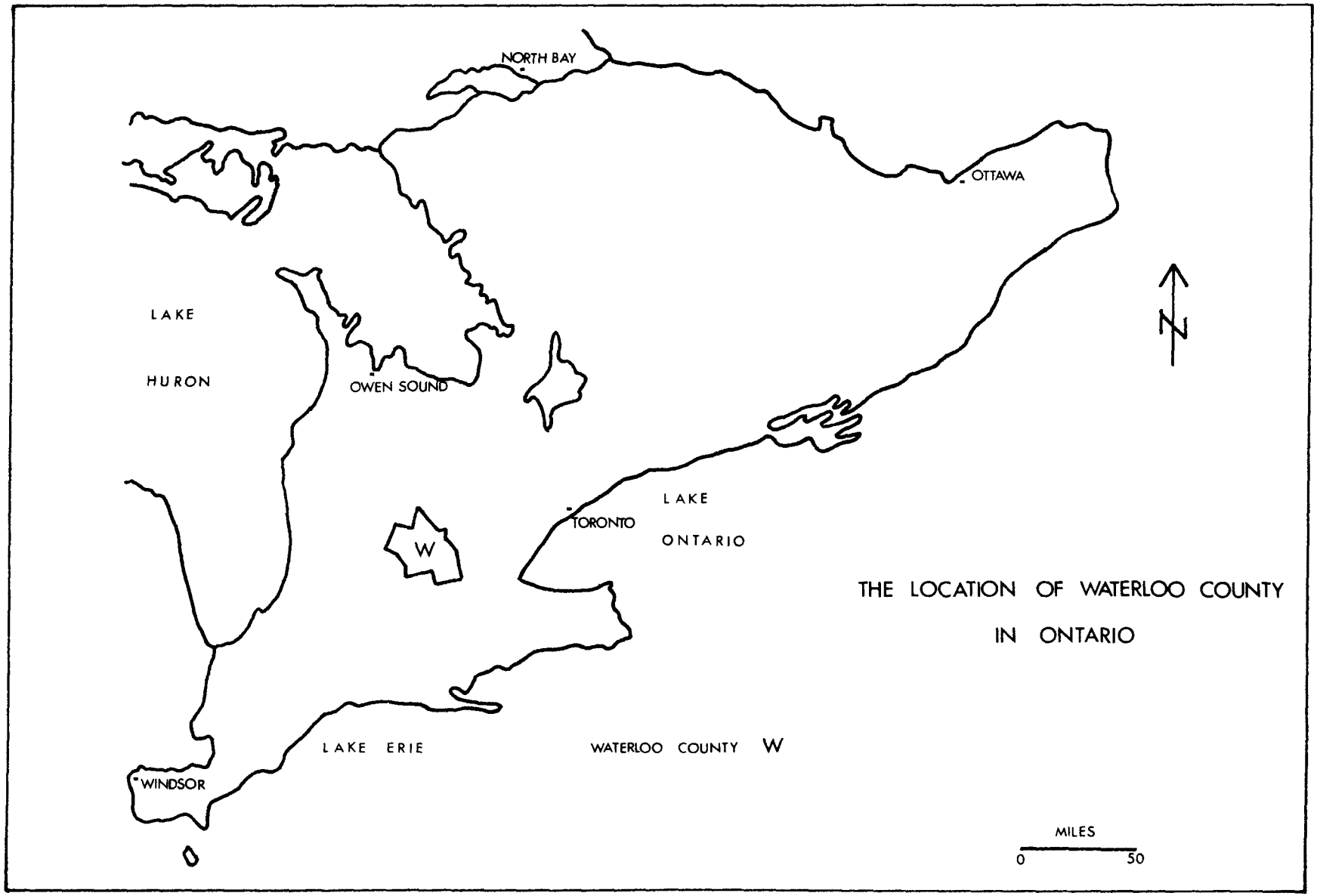

NORTH BAY
OTTAWA
LAKE
HURON
OWEN SOUND
N
LAKE
ONTARIO
TORONTO
W
THE LOCATION OF WATERLOO COUNTY
IN ONTARIO
LAKE ERIE
WATERLOO COUNTY W
WINDSOR
MILES
0
50

Figure 1

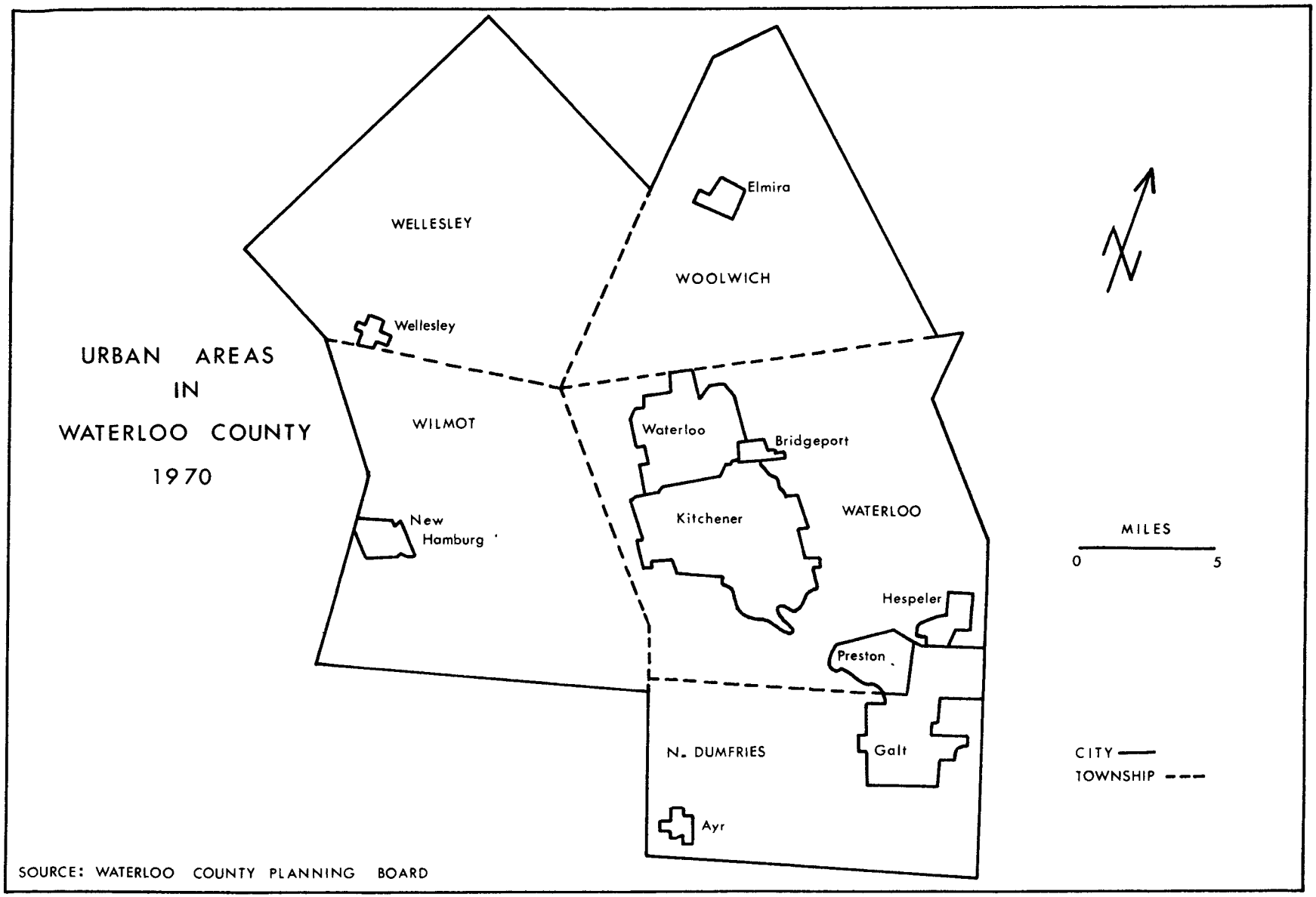

URBAN AREAS
IN
WATERLOO COUNTY
1970
WELLESLEY
WOOLWICH
WILMOT
WATERLOO
N. DUMFRIES
Elmira
Wellesley
Waterloo
Bridgeport
Kitchener
New Hamburg
Hespeler
Preston
Galt
Ayr
MILES
0
5
CITY
TOWNSHIP
SOURCE: WATERLOO COUNTY PLANNING BOARD

Figure 2

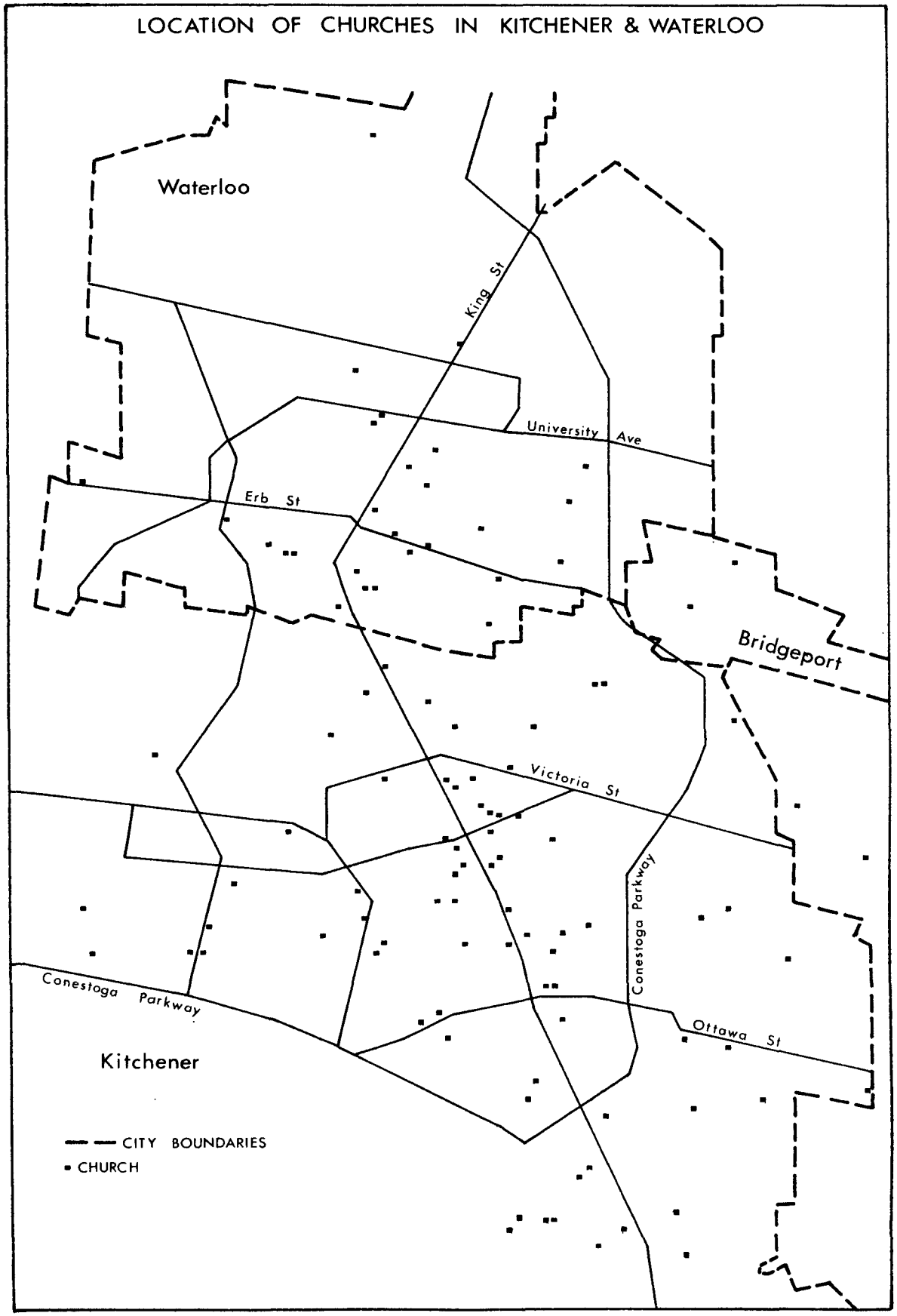

LOCATION OF CHURCHES IN KITCHENER & WATERLOO
Waterloo
King St
University Ave
Erb St
Bridgeport
Victoria St
Conestoga Parkway
Conestoga Parkway
Ottawa St
Kitchener
CITY BOUNDARIES
CHURCH

Figure 3

increase in the number of churches, the author feels strongly that there is a need for an investigation of the distance households travel to worship. If the friction of distance is a determining factor in the travel patterns of household journey to worship, then this study could have implications as to where new congregations should erect their buildings. If the friction of distance is not an important factor then perhaps new buildings will not be required but, rather, additions to existing structures may be sufficient. A study of this nature may be of use to church planners in other areas of North America where the population dynamics are similar.

A second factor that has influenced the choice of Waterloo for this research is that in recent years there have been complaints by city planners in the area that the churches are using up too much of the prime urban land.

> "You only have to go along any major artery and there's church after church after church. And it's ridiculous. It's an atrocious waste of land. The congregations are up to their ears in mortgages."[15]

The results of this study will be a beginning for measuring the need of acquisition of more land by church congregations in the cities of Kitchener and Waterloo.

A third reason for the choice of area of study is the fact that unlike other large urban centres where downtown churches are dying, the downtown churches in the Kitchener and Waterloo area are

thriving in spite of their parishioners moving to the suburbs.[16] This study will help to explain this anomaly.

Finally, the area studied provides a rich diversity of religious cultures. Twenty-two different denominations are considered in this study. (Table One) If the travel behavior proves to be basically the same for all or most of the denominations, then there would be reason to believe the behavior would occur similarly in cities other than Waterloo.

TABLE ONE

DENOMINATIONS REVEALED BY SAMPLE

1. Lutheran
2. German Lutheran
3. Catholic
4. United
5. Evangelical United Brethern (E.U.B.)
6. Presbyterian
7. Anglican
8. Fellowship Baptist
9. Convention Baptist
10. Mennonite (First Mennonite, Erb. St. Mennonite)
11. United Mennonite
12. Stirling Ave. Mennonite
13. Mennonite Brethern
14. Pentecostal
15. Missionary
16. New Apostolic
17. Christian Reform
18. Quaker
19. United Brethern
20. Christian Science
21. Jehovah Witness
22. Latter Day Saints

D. METHODOLOGY

Most of the data used in this study was obtained from interviews with a sample (243) of the households in the 8,663 semi-detached and detached dwelling units in the city of Waterloo. Four college women were hired to conduct the required interviews on a door to door basis during the months of January and February. House calls were made in the early afternoon when it was expected that most housewives would be home.

It was important for subsequent statistical analysis that the sample be random, and it was obtained as follows. A grid was drawn over a base map of the city of Waterloo. A random number table was then utilized to plot co-ordinates of interview locations on the base map of the city. Each interview location was allocated a number. The interviewers were instructed to have questionnaires filled out at the household which was nearest to the location indicated on the base map. (See Appendix 1 for copy of the questionnaire). If there was no answer at the household which was closest to the desired interview location, the next closest household was then interviewed. No location co-ordinates were recorded for households not utilizing church facilities. Figure 4 shows

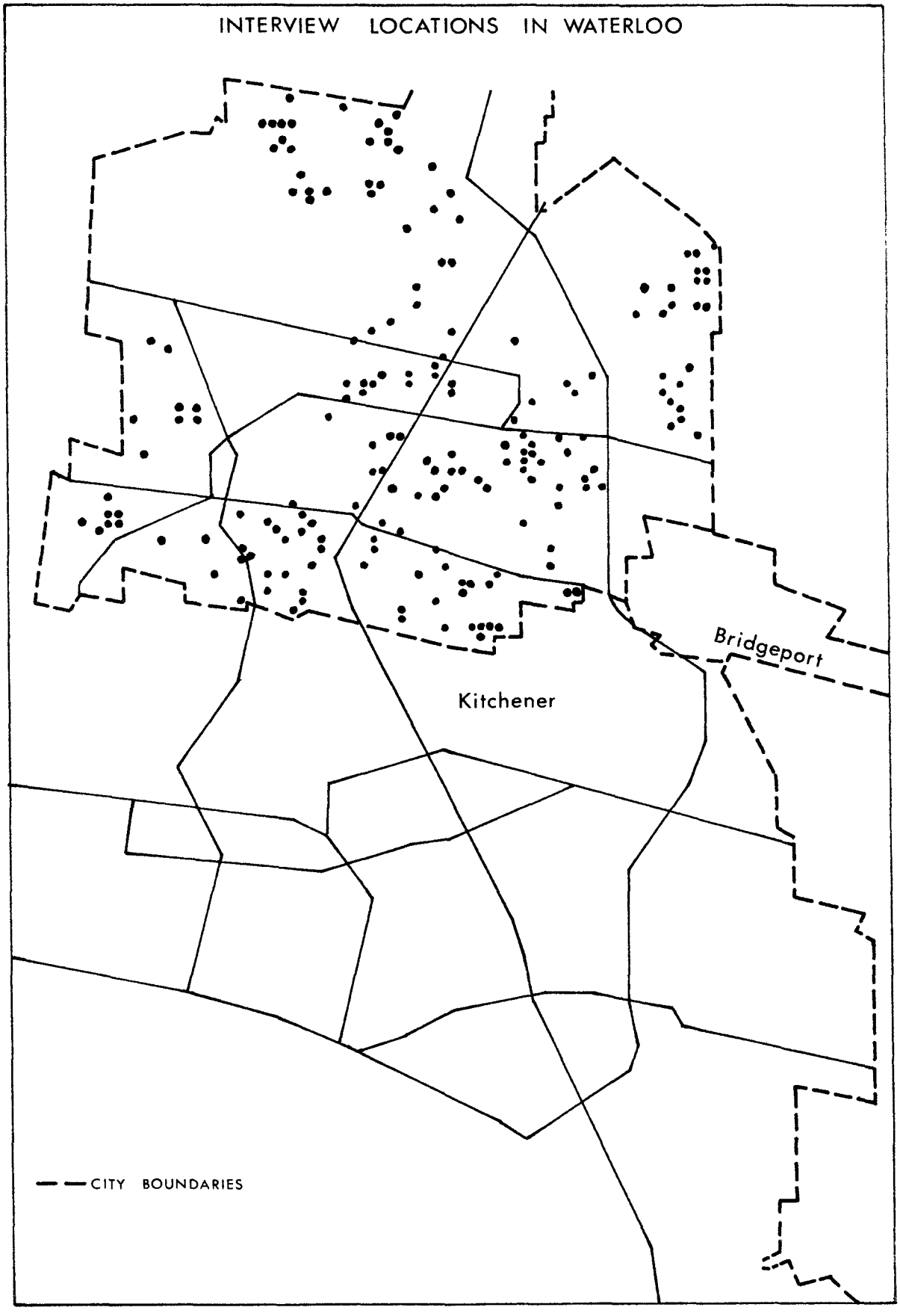

INTERVIEW LOCATIONS IN WATERLOO
Bridgeport
Kitchener
CITY BOUNDARIES

Figure 4

the actual interview locations. Using this sampling technique 243 questionnaires were filled out. This represents a 2.8 per cent sample of the 8,663 households eligible.

This sample showed the following:

Respondents using church facilities	195	80.25%
Respondents not using church facilities	48	19.75%
Total Response	243	100.00%

The denominational breakdown is similar to the actual percentage breakdown tabulated by the Waterloo Assessment Department. (Table 2).

Three important considerations should be mentioned, however, if Table 2 is to be used to compare the similarity of the sample data with the actual assessment figures. First, the sample was taken early in 1972; the assessment figures are for 1968, the last year for which this data is available.[17] It is likely that the slight differences in denominational breakdown of the population may be attributed to the fact that the two sets of figures were not for the same year.

Secondly it may be noted that there is a substantial difference between the two percentages of the population with no church affiliation. The sample data indicated that presently 19.75 per cent have no church affiliation or do not use church facilities whereas the corresponding 1968 figure was 6.36 per cent. It is interesting that the 1967 assessment in Waterloo reported only 499 individuals with no church affiliation as compared with

TABLE TWO

RELIGIOUS DENOMINATIONS IN WATERLOO

DENOMINATION	1972 SAMPLE DATA			1968 ASSESSMENT FIGURES		
	Number Households	%	Rank	Number Persons	%	Rank
Roman Catholic	55	22.63	1	9440	28.93	1=
Lutheran	42	17.28	2	6533	20.10	2
United	38	15.63	3	5832	17.88	3
Anglican	14	5.76	4.5	3029	9.28	4
Presbyterian	14	5.76	4.5	1983	6.08	5
Baptist	9	3.70	6	920	2.82	6
Mennonite	8	3.29	7	909	2.79	7
Penticostal	1	.41		283	.88	8
New Apostolic	3	1.28	8	249	.78	9
Greek Orthodox	-	----		172	.53	10
Hebrew	1	.41		158	.48	11
Hindu	-	----		126	.38	12
Christian Reform	1	.41		122	.37	13
Unitarian	-	----		120	.36	14
Missionary	2	.82	9.5	108	.33	15
Mennonite Brethern	1	.41		98	.30	16
Jehovah Witness	2	.82	9.5	93	.28	17
Salvation Army	-	----		63	.19	18
Swendenborgian	-	----		52	.15	19
Brethern	-	----		48	.14	20
Christian Scientist	1	.41		35	.10	21
Mormon	-	----		32	.09	22
Nazarene	-	----		26	.08	23
Moslem	-	----		25	.07	24
Seventh Day Adventist	-	----		22	.06	25
Dutch Reform	-	----		20	.06	26
Buddhist	-	----		15	.04	27
Church of Christ-Latter Day Saints	1	.41		12	.03	28
Methodist	-	----		11	.03	29
Pilgrim	-	----		6	.01	30
United Brethern	1	.41		4	.01	31
Bahai	-	----		3	.01	32
Quaker	1	.41		---	.00	--
No Affiliation	48	19.75		2076	6.36	--
TOTAL	243	100.00		32625	100.00	

2076 in 1968. The increasing number of people reporting no church affiliation in this area has been linked to an increasing honesty and an increasing mobility of the population.[18]

A possible source of the difference between percentages reporting no church affiliation could be the reluctance of households to answer positively to the interviewers in this study. The Waterloo assessment commissioner has reported some opposition in the past when assessors have asked people to declare their religious denominations.[19] Interviewers of this study, however, felt that in almost all cases, co-operation of households was excellent and that to their knowledge no false information was intentionally given.

Thirdly, the sample was randomly chosen from single family dwellings and semi-detached units and although the sample is relatively unbiased with respect to this particular type of dwelling unit, it is biased with respect to the total population of Waterloo. Perhaps this accounts for some of the difference between the percentages reporting no church affiliation.

Geographic studies of people's journeys have largely been on the journey to work and on the journey to shop and have had an economic and urban emphasis. These studies will be referred to repeatedly. Many of these studies have utilized the "principle of least effort" in explaining spatial behavior patterns and it is to this principle and the resulting effect upon the journey to worship that we may turn next.

CHAPTER TWO

THE JOURNEY TO WORSHIP AND THE PRINCIPLE OF LEAST EFFORT

A. REVIEW OF THE LITERATURE

Perhaps the first individual to recognize that man will minimize his effort whenever possible was George Zipf. He stressed the idea that

> "every individual's movement, of whatever sort, will always be over paths and will always tend to be governed by one single primary principle which, for the want of a better term, we shall call the Principle of Least Effort. ...In simple terms, the Principle of Least Effort means, for example, that a person in solving his immediate problems will view these against the background of his probable future problems...Moreover he will strive to solve his problems in such a way as to minimize the "total work" that he must expend in solving "both" his immediate problems "and" his probable future problems. ...Least effort, therefore, is a variant of least work."[1]

This idea of man's tendency towards minimal effort is the basis for the first question asked in this paper, that is "Do households attend the closest church to their residence?"

The principle has also been substantiated by others. Carroll, for example, researching in Massachusetts, discovered that industrial workers, whenever possible, preferred to live as close as possible to their place of employment.[2] Since this time, the principle has been tested empirically in studies of the journey to work and in consumer travel studies.

Schnore[3] proposed that residential location is a function of both rent and transport costs. Schnore points out that the farthest point away from work that a residence will locate is the fixed point beyond which further savings in rent are offset by higher transport costs.

The "least effort" principle was verified by Garrison and Marble. Both researchers working in separate locations discovered "that people frequent the nearest place offering the good or service they seek".[4]

Clark indicates that perhaps Christaller was the first to realize the orderliness in consumer spatial behavior--

> "namely that consumers minimize their distance travelled, that is, consumers purchase goods or services from the closest place which offers the good or service."[5]

Clark investigated Christaller's hypothesis in Christ Church, New Zealand in 1965. He found that his results did not support either Christaller's hypothesis or the results established by Garrison and Marble.

The literature thus reveals that researchers have had differing conclusions regarding the principle of least effort. The analysis to follow will investigate the importance of this principle as evidenced in the travel patterns of Waterloo households as they journey to worship.

B. THE JOURNEY TO WORSHIP IN WATERLOO AND THE PRINCIPLE OF LEAST EFFORT

The question can now be asked, "Does the least effort principle describe the travel patterns of Waterloo households as they travel to use church facilities?" Or, in other terms, "Do Waterloo households attend the closest church to their residence?" The answer to these questions will not only add to our knowledge of household travel in Waterloo, but will also add to the substantive literature on the principle of least effort as demonstrated in consumer travel.

First let us note how far households in Waterloo actually do travel to church. Figure 5 shows the distances and illustrates that as distance increases, the number of households decreases. The mean distance travelled to church by all households was 1.54 miles, while the standard deviation was 1.16 miles.

At this point it might be well to mention that the author had some question initially of the most satisfactory method of measuring distance to church from the residence. Distance can be measured in time units or in some spatial unit. It was decided not to measure distance in time units because of the difficulty in obtaining accurate data.

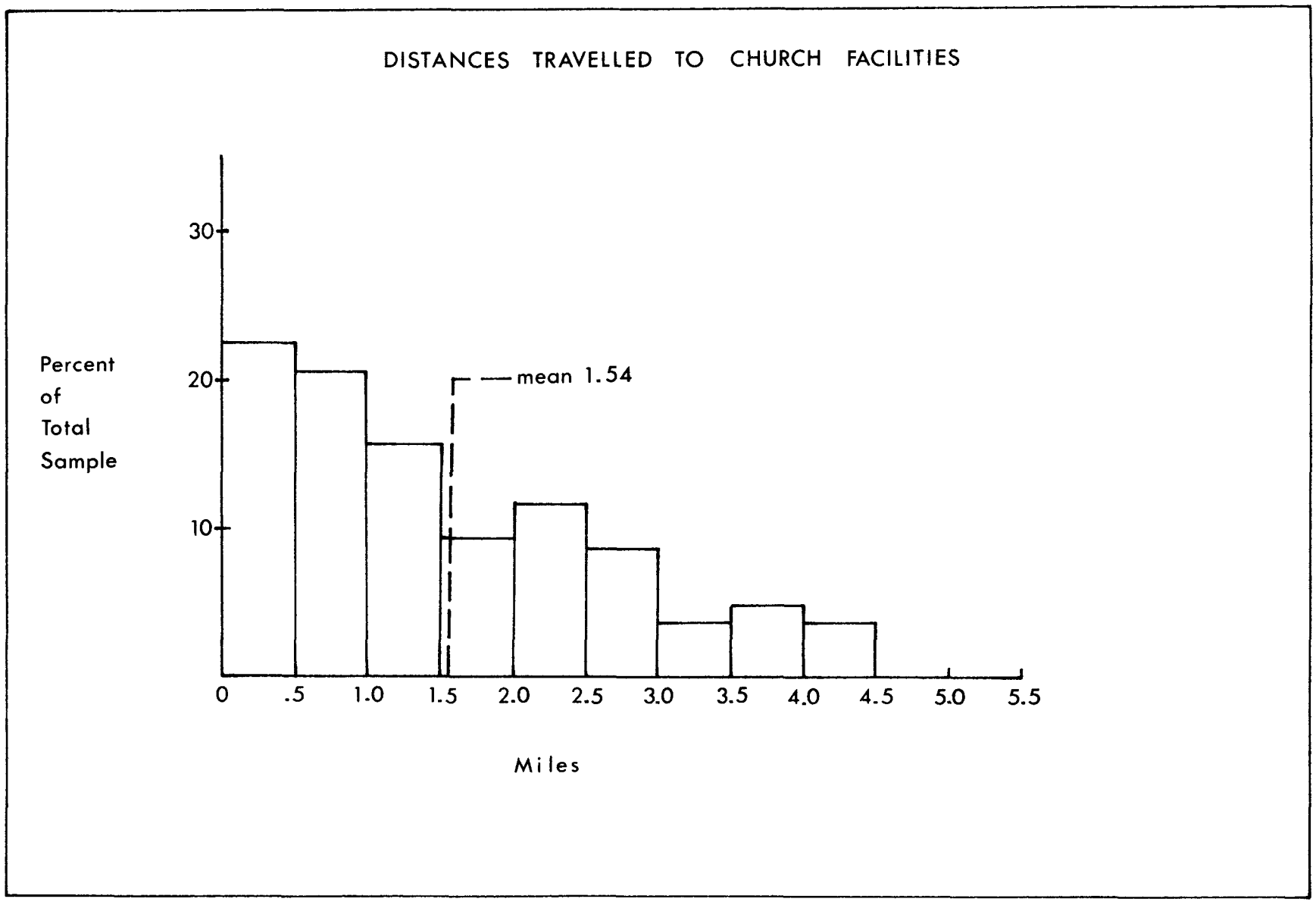

DISTANCES TRAVELLED TO CHURCH FACILITIES
Percent of Total Sample
30
20
10
mean 1.54
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
Miles

Figure 5

The decision to measure distance in spatial units--miles, in this case--raised another problem. Distance from one point to another can be measured along roads or "as the crow flies". For convenience, most studies have used distances measured as straight lines or "as the crow flies". The extra work involved in computing other than straight line distances has proven not to be justified. Nordbeck, for example found the correlations between actual street distance and straight line distance so high that results would be very little influenced by using straight line distances.[6]

This study too, then, will use straight line distances. Distances were calculated between the residence and church using the computer and the Pythagorean theorem.

Another problem faced by the author was that absolute distances were often inadequate measures. In this study; it was often preferable to rank the church attended as the nearest church, the next nearest, and so on, regardless of actual miles involved. For example, two households may both travel to use the closest church facilities to their residence, but, one household travels twice as far as the other. However, if distances are ranked as nearest, next nearest, etc., each household would be considered to have the same response to the friction of distance and thus their travel patterns would be similar.

Another problem of data determination exists: what if, after a church-household connection has been established, another church is erected between the household and the church attended? If travel patterns are considered after the second church was

erected, the household no longer "appears" to be responding to the principle of least effort since it no longer attends the closest church.

In the analysis to follow, this problem is solved by considering travel patterns at the time of entry into the present address. This step was taken because it was not expected that households would change their church affiliation if a church would happen to have been erected between their residence and the church attended at the time of entry. Consideration of travel patterns at the present time only could result in certain households not attending the closest church when in reality the particular church was the closest at the time of entry into the present address.

Information was obtained from the questionnaire regarding the time of entry into the present address of the household.

The analysis also required that information be obtained regarding the date of formation of each church or congregation in its present location. This data was readily available and was utilized to prevent the error of allocating a household to a particular church that was not in existence at the time of entry into the residence.

Figure 6 illustrates the travel patterns of Waterloo households as they travel to use church facilities from their present addresses. The pattern is broken down and illustrated

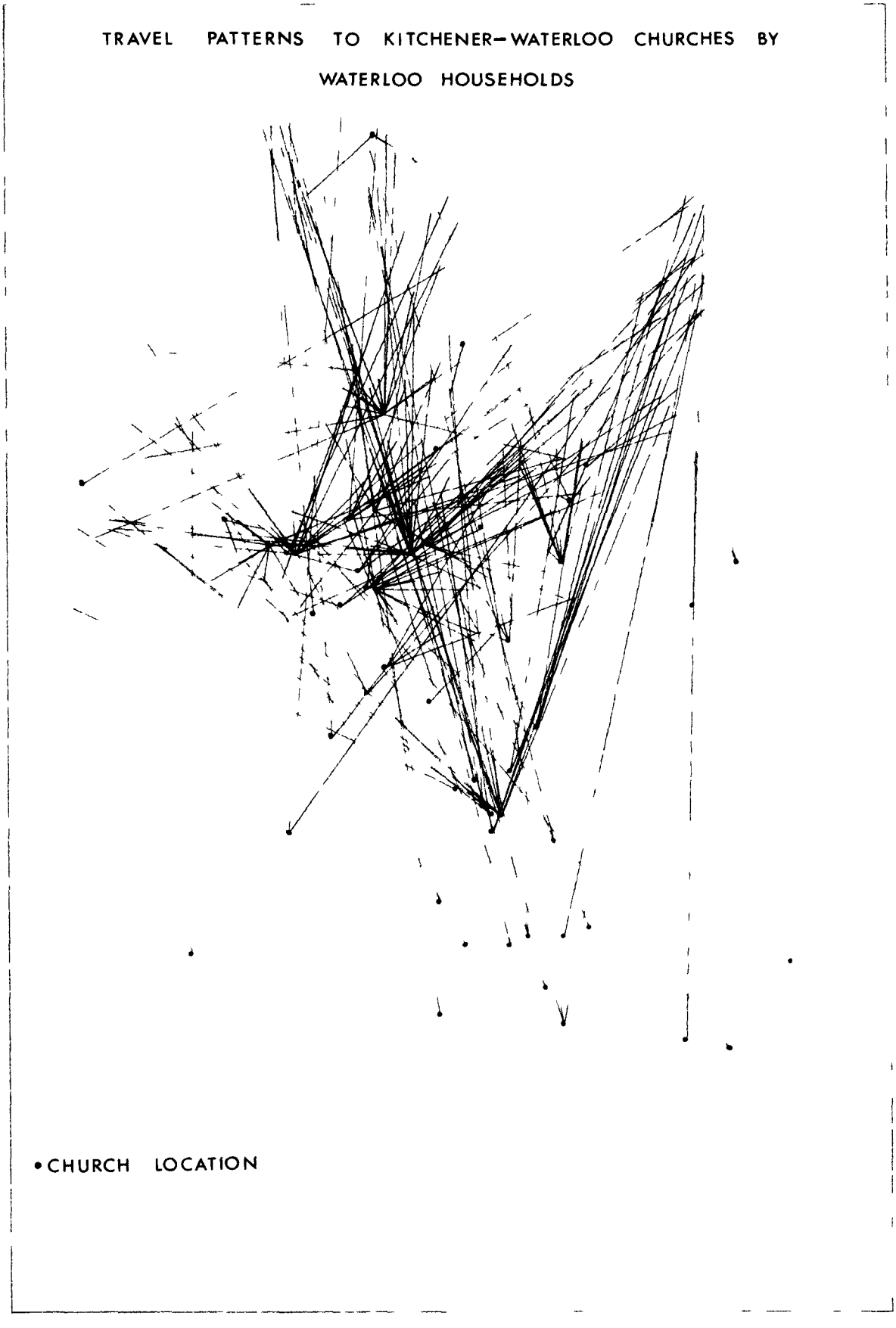

TRAVEL PATTERNS TO KITCHENER–WATERLOO CHURCHES BY WATERLOO HOUSEHOLDS
• CHURCH LOCATION

Figure 6

graphically in Figures 7 and 8.

It is interesting to note that only eleven per cent of the total sample travel to the closest church. In other words, the largest per cent of the sample use church facilities that are further away than the closest church. Although it is interesting that the per cent attending the closest church is larger than the per cent of the sample attending any church that is not the closest to the residence; the author of this study was not satisfied that the results adequately explained how the principle of least effort operates in the journey to worship in Waterloo.

One means of clarifying the effect of the principle of least effort is by considering what Nystuen has called "dimensional tension".[7] Nystuen points out that dimensional tension creates one of the basic geographical problems. For example, distance usually thought of in terms of some units of linear measurement, can be thought of in terms of another dimension such as time or as social distance.

It may be, therefore, that the cultural differences between denominations are a type of dimensional tension that will influence the analysis of the least effort principle in the journey to worship of Waterloo households.

Considering dimensional tension, we can now restate our initial question: "Do Waterloo households attend the closest church of their particular denomination?"

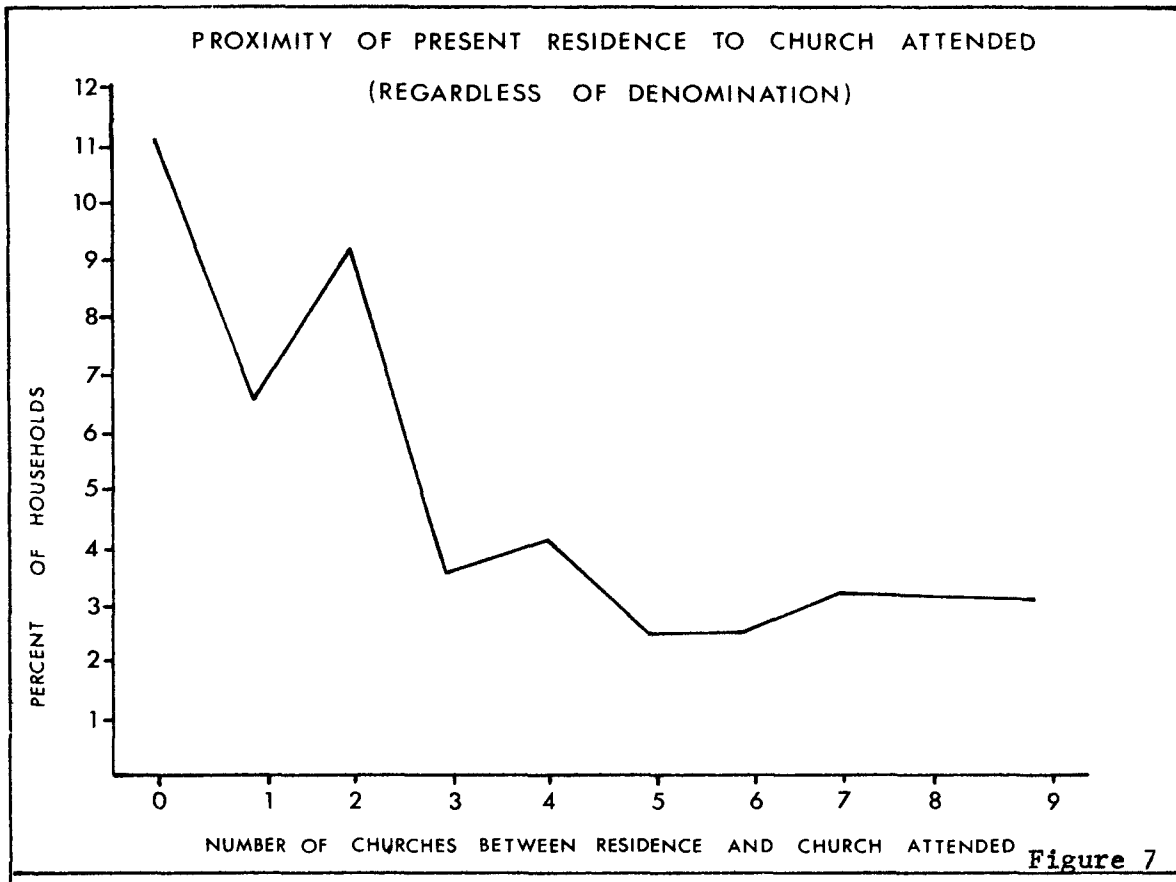


Figure 7

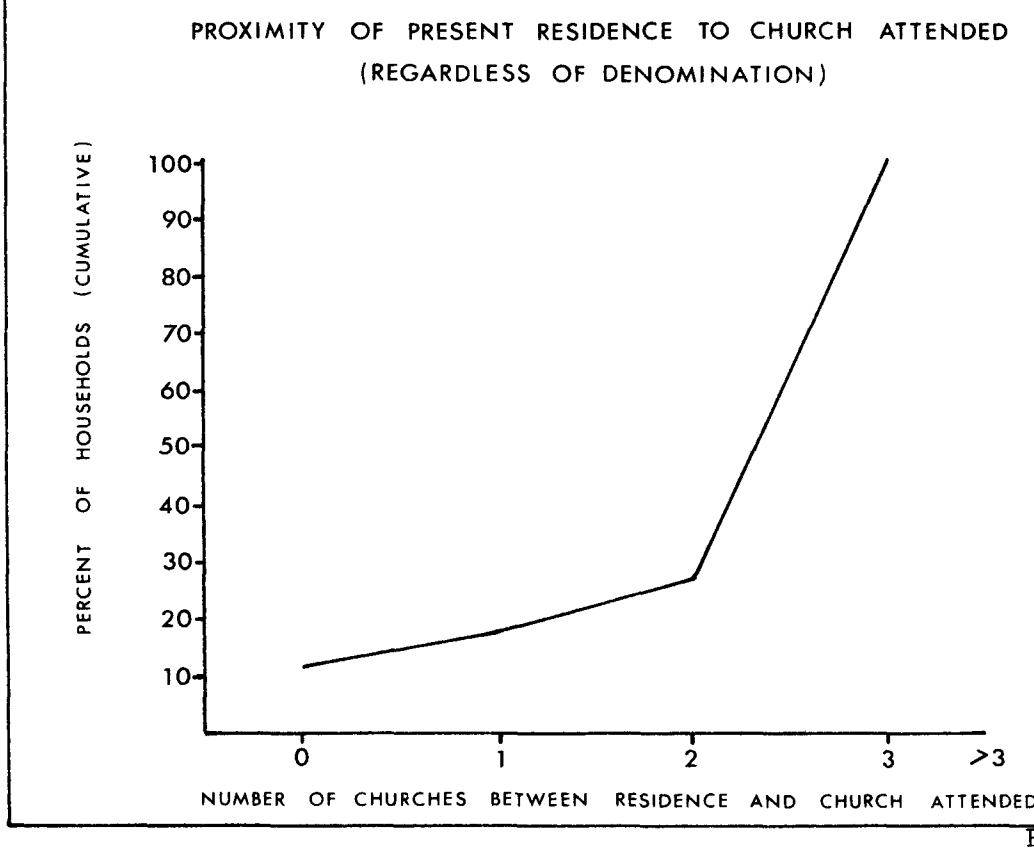


Figure 8

Appendix 2 provides a detailed breakdown of the denominations, their respective churches and the date of the founding of the church in its present location. No non-Christian faiths needed to be considered.

Although there are a great variety of denominations, several of the denominations have a small membership. This researcher was therefore faced with the problem of having very small numbers in several denominations of the sample. Statistical inference in these cases is unreliable. The problem was overcome by combining the twenty-two denominations into ten denominational groups. (Table 3).

TABLE THREE

DENOMINATIONAL GROUPINGS

Denominational Group	Denomination Members
1. Lutheran	1a. Lutheran
	1b. German Lutheran
2. Catholic	2a. Catholic
3. United	3a. United
4. E.U.B.	4a. E.U.B.
5. Presbyterian	5a. Presbyterian
6. Anglican	6a. Anglican
7. Baptist	7a. Fellowship Baptist
	7b. Convention Baptist
8. Mennonite	8a. Mennonite
	8b. United Mennonite
	8c. Stirling Ave. Mennonite
	8d. Mennonite Brethern
9. Protestant Minority	9a. Pentecostal
	9b. Missionary
	9c. New Apostolic
	9d. Christian Reform
	9e. Quaker
	9f. United Brethern
10. Sects.	10a. Christian Science
	10b. Jehovah Witness
	10c. Latter Day Saints

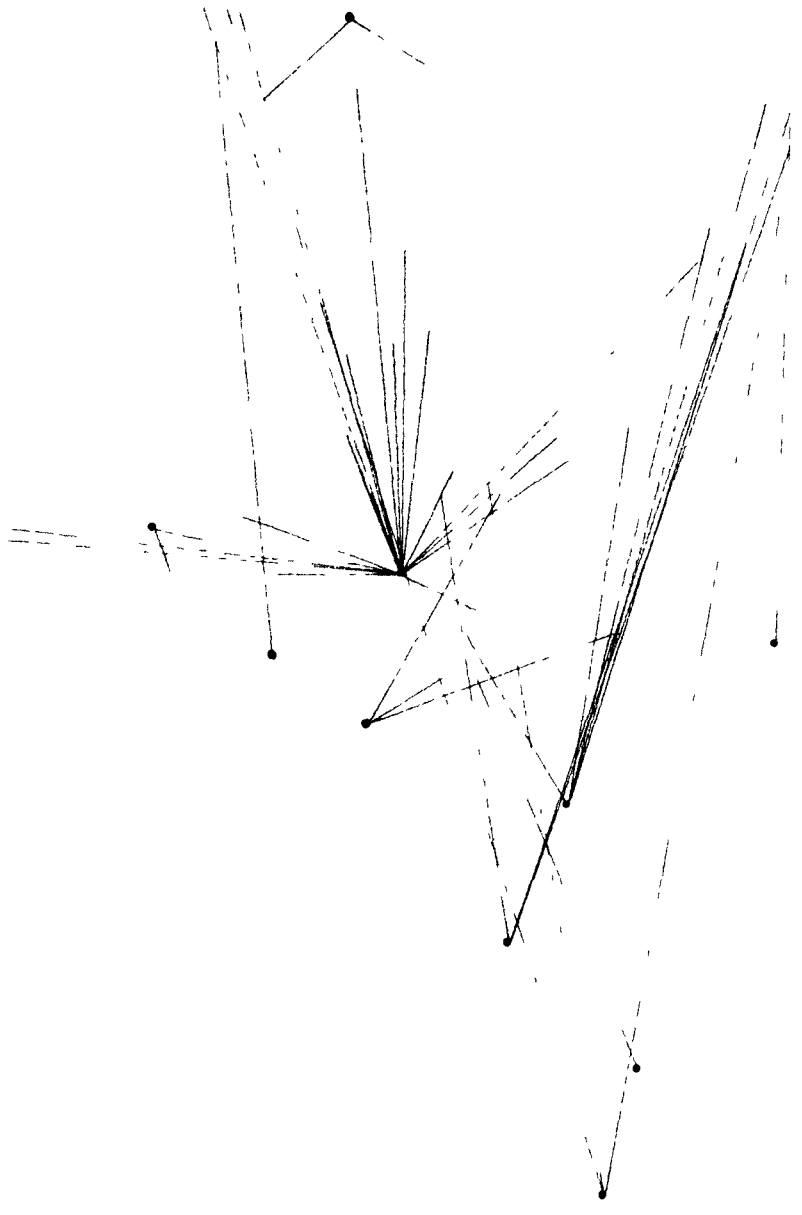
It may be well to mention here the authors reasoning behind several classifications in the foregoing Table 3. The Evangelical United Brethern denomination is presently a part of the United Church but the union only occurred in 1968. It was decided however that for purposes of this study that the denominations and their respective travel patterns be considered separately as the travel patterns established over preceeding decades were not likely to have changed much since the recent union.

The Sects and Protestant Minorities were lumped together primarily because their small numbers of adherents in the sample made statistical analysis of them meaningless.

The travel patterns of the ten denominational groups are illustrated in Figures 9 to 18. Figure 19 provides a graphical interpretation of the travel patterns of the ten denominational groupings. For each group, the number of households attending the closest church of their particular denomination is greater than the number of households attending the closest church regardless of denomination. Particular differences in the travel behavior of the various denominations will be considered in the following chapter.

If the total sample is analyzed considering dimensional tension, the principle of least effort becomes very evident. The results are shown graphically in Figure 20. A majority of the sample or fifty-eight per cent of the households attend or use the closest church facilities of their denomination.

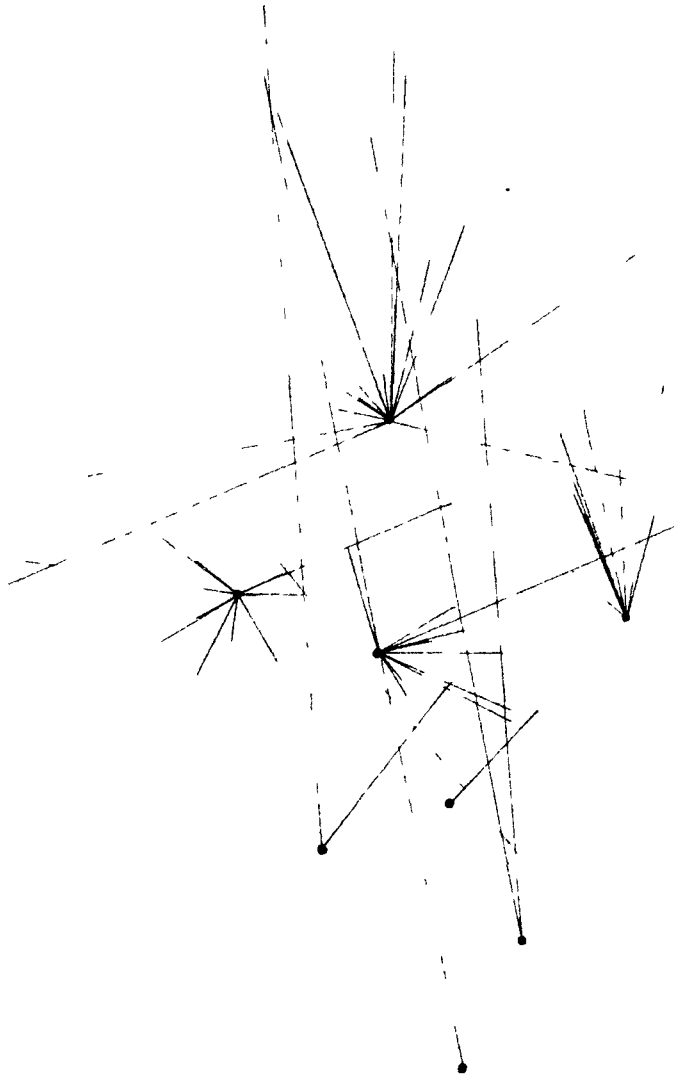
LUTHERAN TRAVEL PATTERN FROM PRESENT ADDRESSES



• CHURCH

Figure

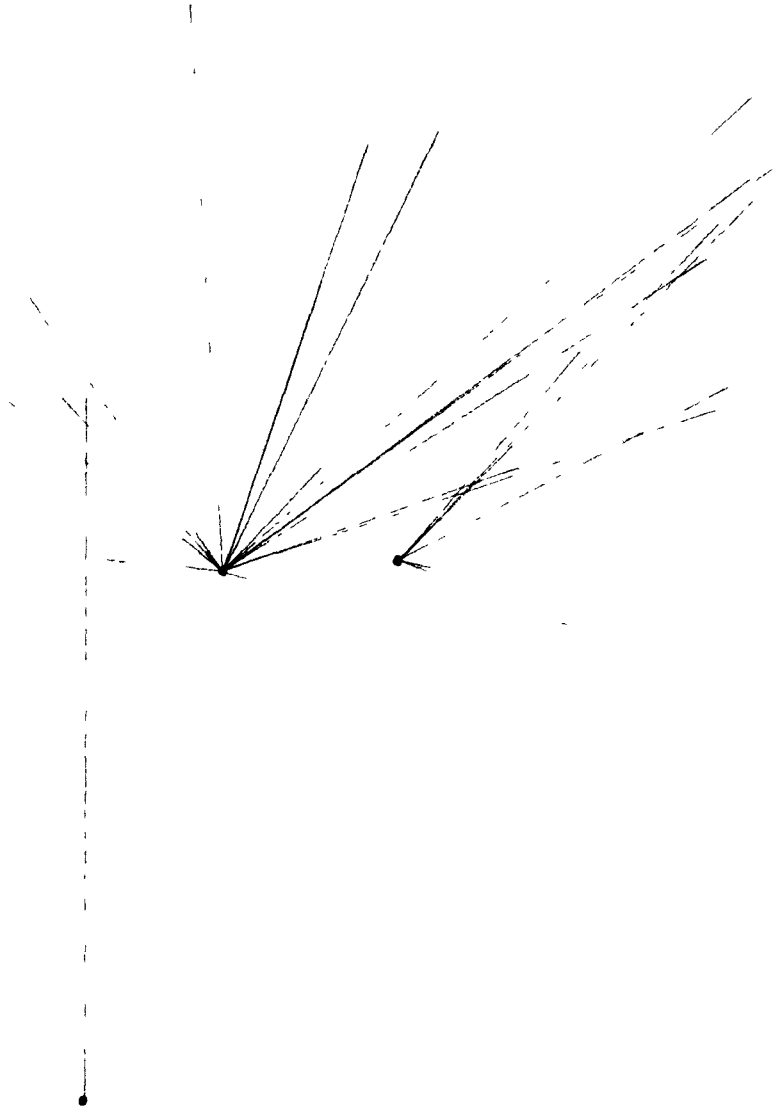
ROMAN CATHOLIC TRAVEL PATTERN FROM PRESENT ADDRESSES



• CHURCH

Figure 10

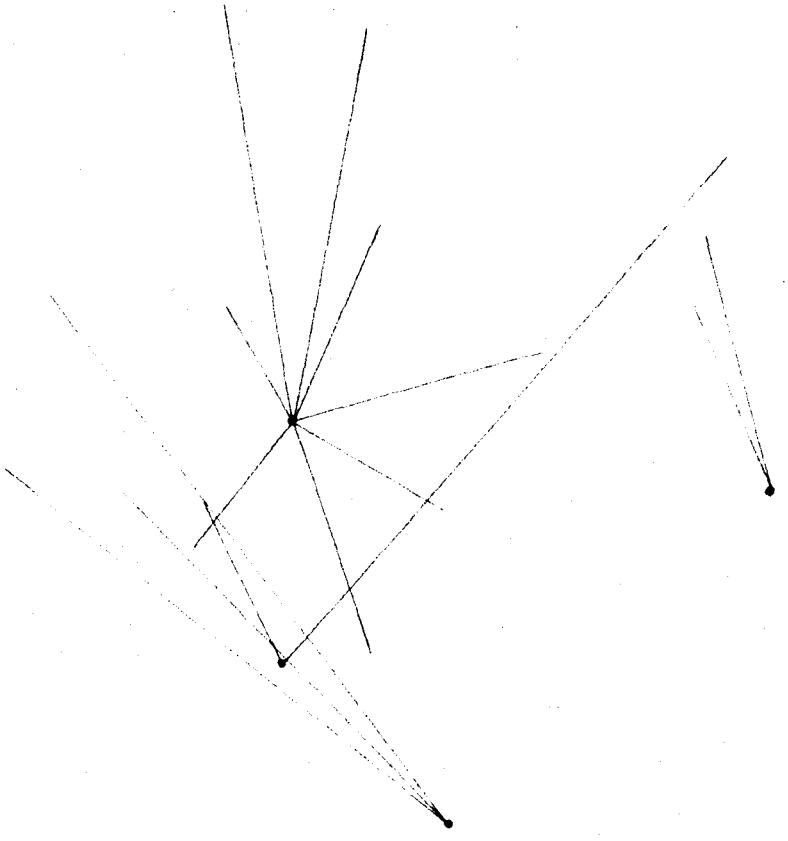
UNITED CHURCH TRAVEL PATTERN FROM PRESENT ADDRESSES



• CHURCH

Figure 11

E-U-B- TRAVEL PATTERN FROM PRESENT ADDRESSES



• CHURCH

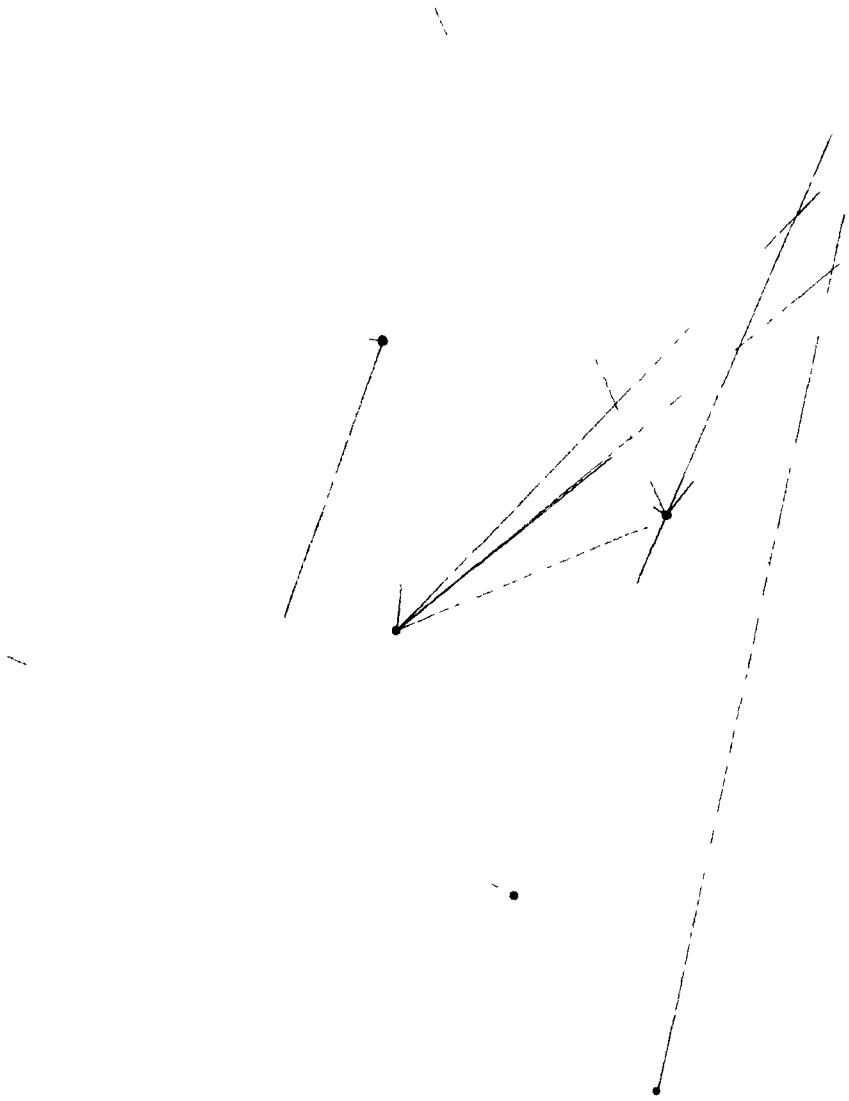
Figure 12

PRESBYTERIAN TRAVEL PATTERN FROM PRESENT ADDRESSES

• CHURCH

Figure 13

ANGLICAN TRAVEL PATTERN FROM PRESENT ADDRESSES



• CHURCH

Figure 14

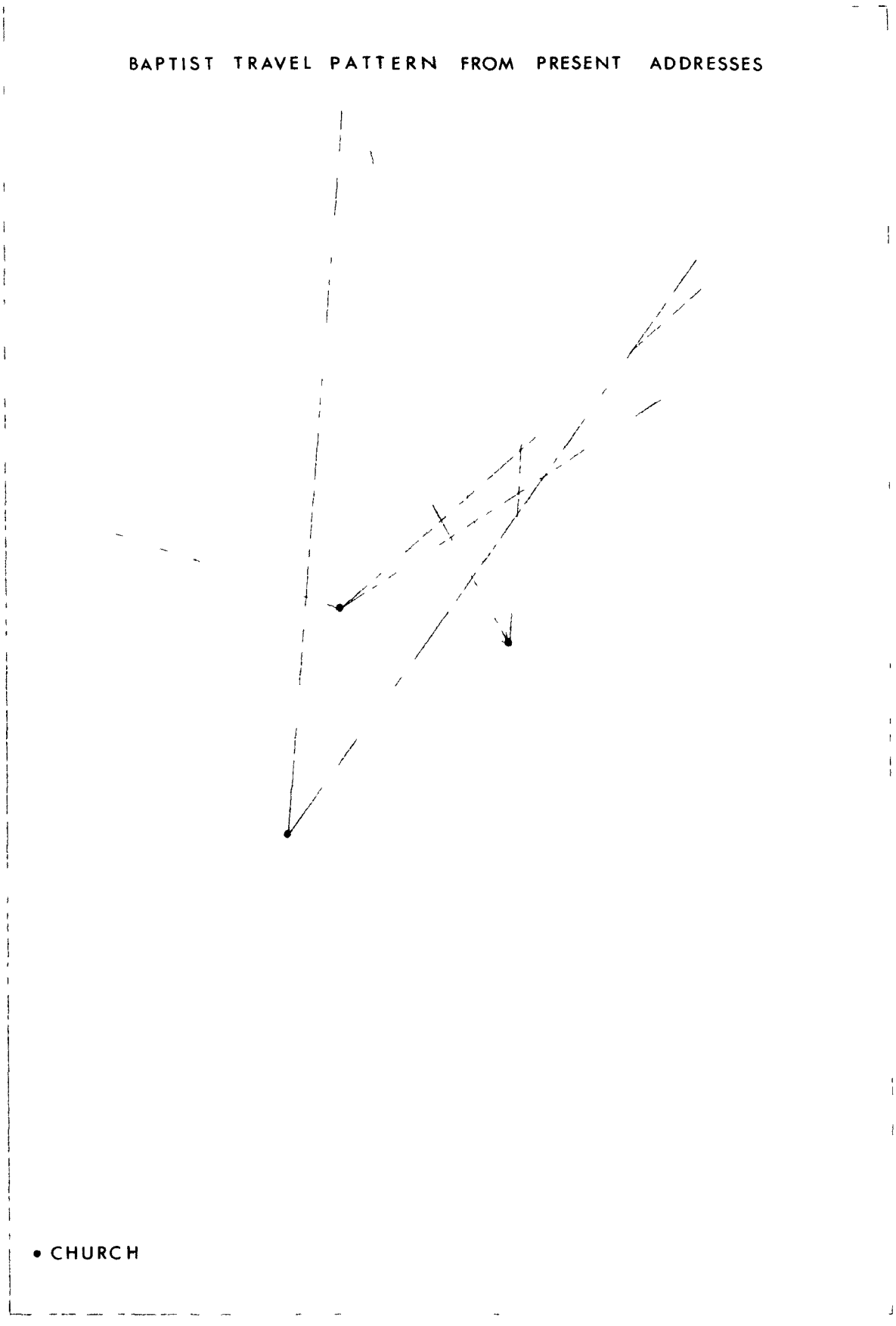
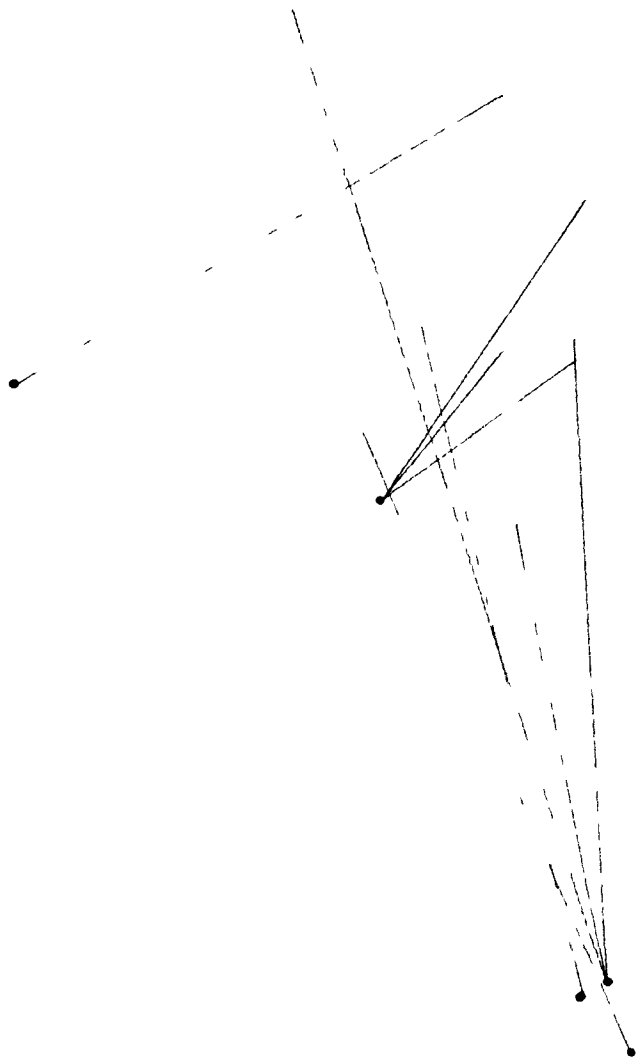


Figure 15

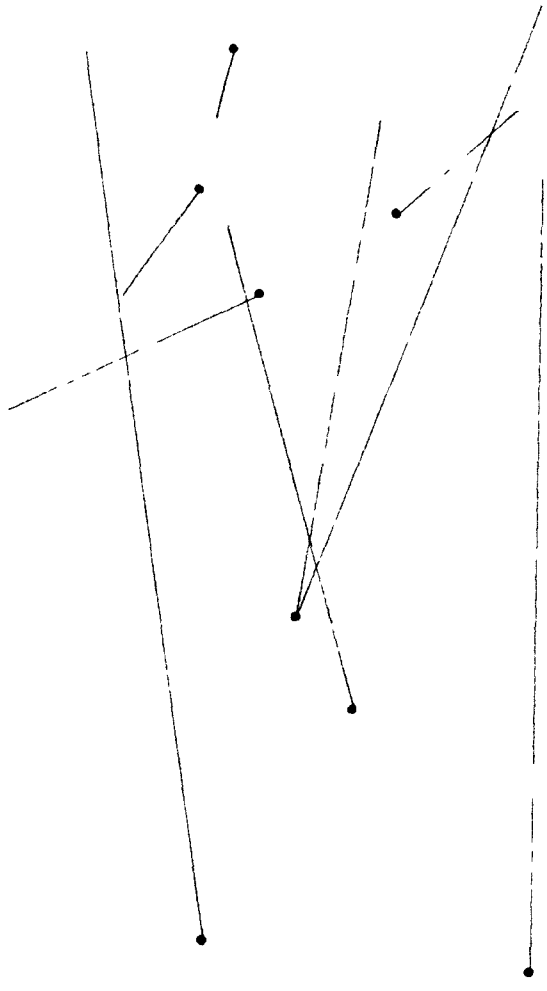
MENNONITE TRAVEL PATTERN FROM PRESENT ADDRESSES



• CHURCH

Figure 16

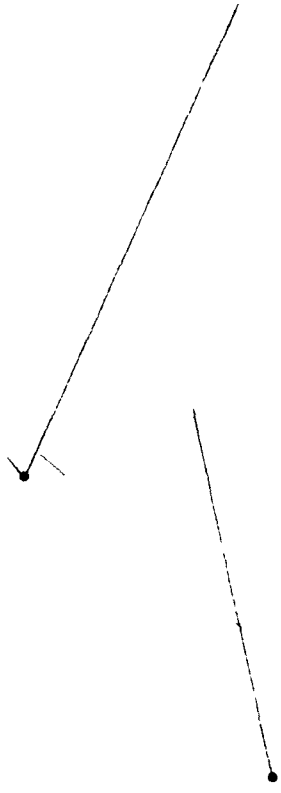
PROTESTANT MINORITY TRAVEL PATTERN FROM PRESENT ADDRESSES



• CHURCH

Figure 17

SECTS TRAVEL PATTERN FROM PRESENT ADDRESSES



• CHURCH

Figure 18

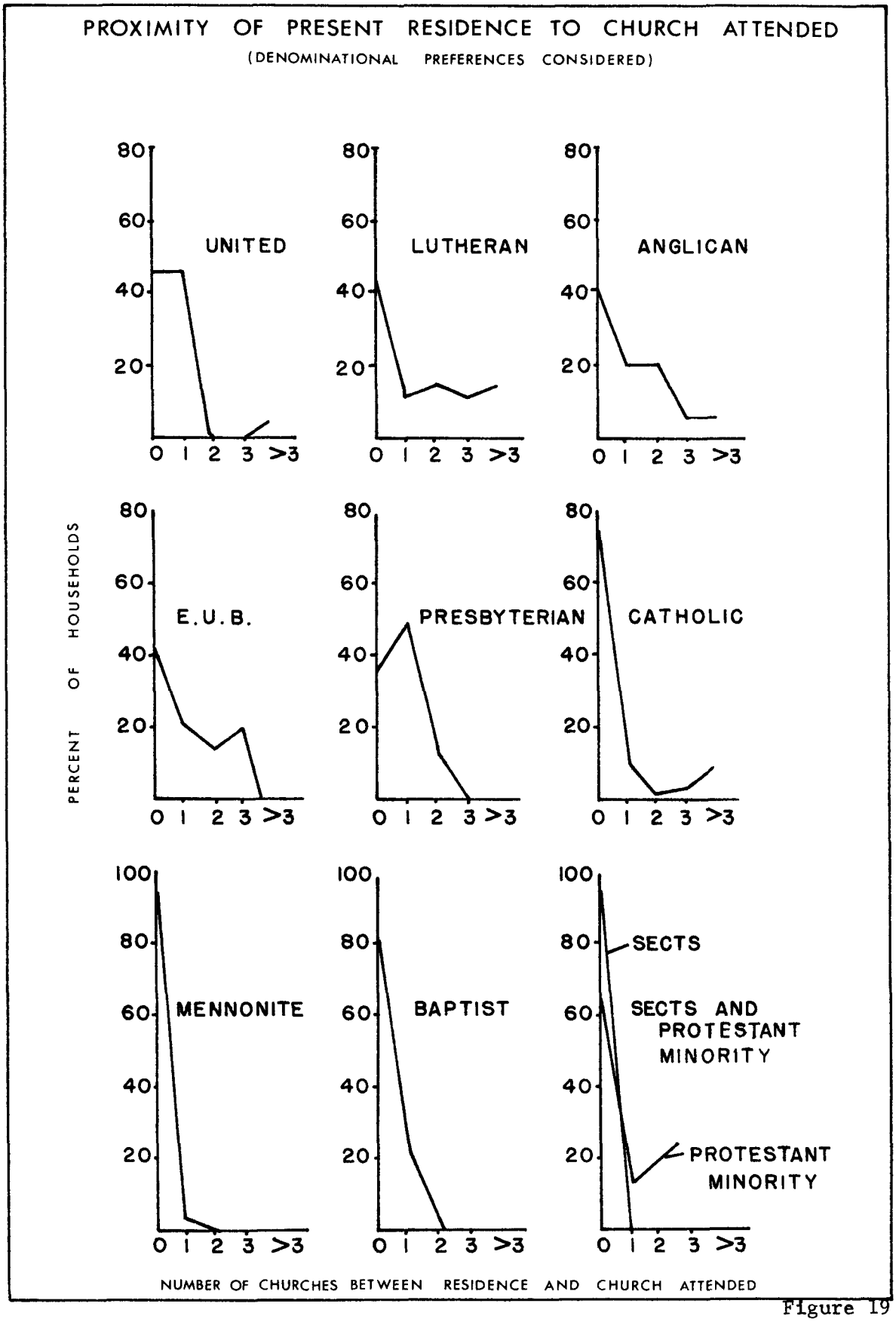

PROXIMITY OF PRESENT RESIDENCE TO CHURCH ATTENDED
(DENOMINATIONAL PREFERENCES CONSIDERED)
PERCENT OF HOUSEHOLDS
UNITED
LUTHERAN
ANGLICAN
E.U.B.
PRESBYTERIAN
CATHOLIC
MENNONITE
BAPTIST
SECTS
SECTS AND PROTESTANT MINORITY
PROTESTANT MINORITY
0 1 2 3 >3
NUMBER OF CHURCHES BETWEEN RESIDENCE AND CHURCH ATTENDED

Figure 19

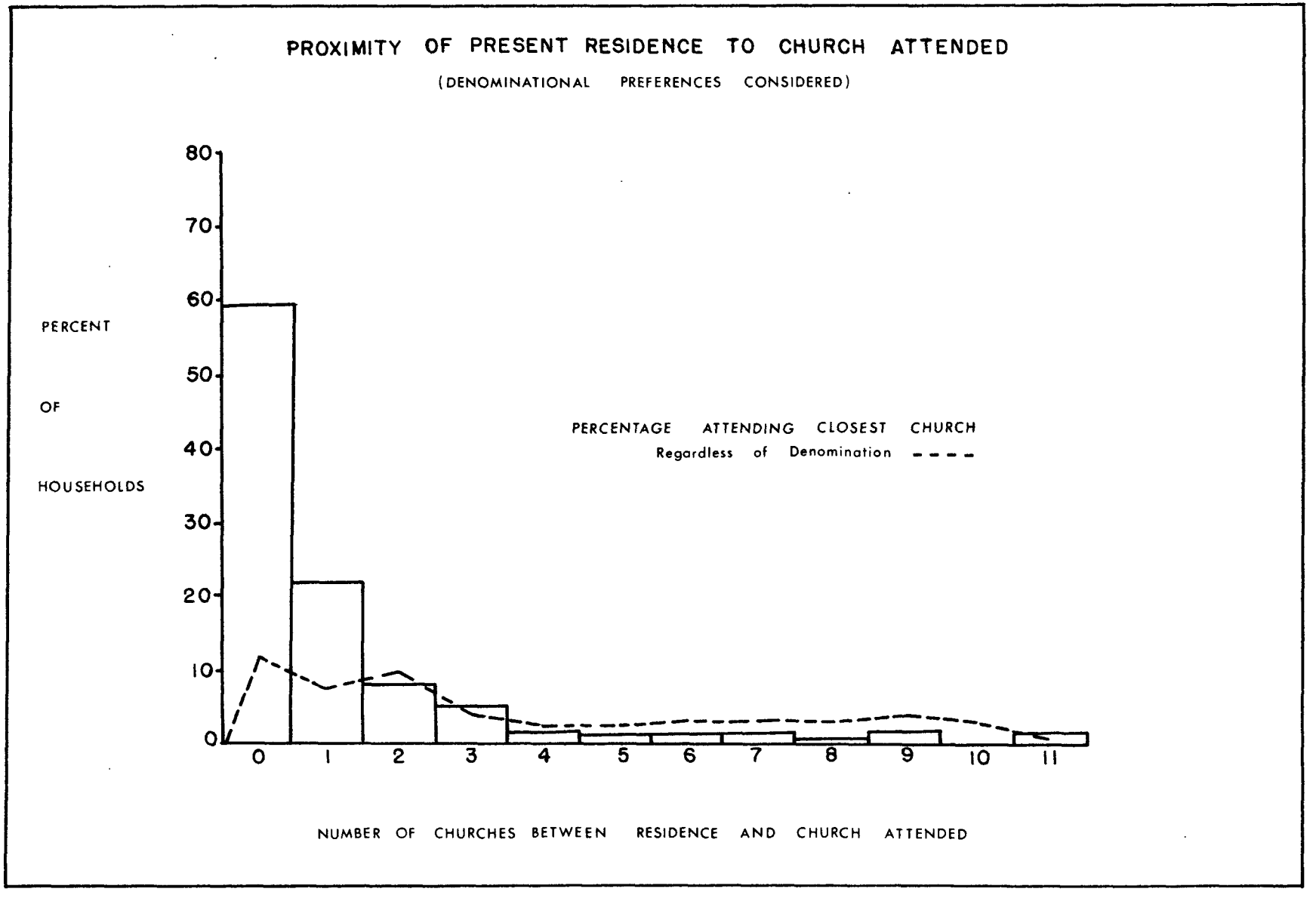

PROXIMITY OF PRESENT RESIDENCE TO CHURCH ATTENDED
(DENOMINATIONAL PREFERENCES CONSIDERED)
PERCENT OF HOUSEHOLDS
80
70
60
50
40
30
20
10
0
PERCENTAGE ATTENDING CLOSEST CHURCH
Regardless of Denomination
0 1 2 3 4 5 6 7 8 9 10 11
NUMBER OF CHURCHES BETWEEN RESIDENCE AND CHURCH ATTENDED

Figure 20

It appears that if dimensional tension is considered, that the principle of least effort is an important factor in explaining the travel patterns of Waterloo households as they journey to worship. The analysis thus far has indicated that if the time of entry into present addresses are known, then one can allocate each household to the church attended on the basis of the least effort principle and the results will be correct for fifty-eight per cent of the cases.

Another means of investigating the actual importance of the least effort principle is by comparing the actual distances travelled and the expected distances travelled. The expected distance travelled by each household is the distance from the residence to the closest church of the particular denomination at the time of entry into the present address. If the principle of least effort was the only factor that actually influences travel patterns, the relationship between actual and expected distance would be perfect and the correlation coefficient would be equal to +1.0. This coefficient does not indicate the per cent attending churches at respective distances from the residences as described above, but rather compares the distance each household actually travels to an expected distance.

The Pearson product-moment correlation coefficient for actual and expected distances travelled from present addresses was calculated at .774 and was significant at the .05 level of significance. Thus the correlation between actual and expected

distances is relatively high and a significant relationship exists. The respective coefficient of determination was calculated to be .60.

The principle of least effort therefore explains sixty per cent of the travel patterns of Waterloo households in their journey to worship.

The above analysis assumes that expected distances travelled are normally distributed and therefore the parametric correlation analysis was utilized. In case the assumption of normalacy was not justified, the non-parametric Spearman Rank correlation coefficient was determined for the total sample and by denomination. (Table 4).

TABLE FOUR

ACTUAL DISTANCE TRAVELLED TO CHURCH CORRELATED WITH EXPECTED DISTANCES TRAVELLED

Denomination	Spearman Correlation Coefficient
United	.82
E.U.B.	.72
Lutheran	.65
Presbyterian	.69
Anglican	.80
Catholic	.50
Mennonite	.83
Baptist	.95
Protestant Minority Sects.	.91
	1.00
TOTAL SAMPLE	.725

In all cases the relationship is relatively strong and is significant at the .05 level of significance.

C. CONCLUSION

In this chapter the least effort principle was found to account for sixty per cent of the choice of churches used by Waterloo households as they travel to use church facilities. But why was the percentage not higher? Could some of the actual strength or inertia of the principle of least effort have become hidden with the passage of time and the moving of some of the households to different addresses? It is to this problem we may turn next.

CHAPTER THREE

THE JOURNEY TO WORSHIP AND HISTORICAL TENSION

When analyzing spatial relationships in geographical research it is often necessary to consider the past and its effect upon the spatial patterns that exist in the present. Nystuen points out that:

> "in many studies this legacy from the past may be the single most important fact. Existing facilities and institutions will always be not quite suitable for the present because society is always creating new activities which, for greatest efficiency, require new arrangements. This tension of present activities with past arrangements is a fundamental geographical problem which arises again and again."[1]

Nystuen has called this effect of the past "historical tension".

To what extent has historical tension affected the journey to worship in Waterloo? Do households travel to use the closest church facilities of their particular denomination in terms of their earliest addresses in the Twin Cities? Answers to these questions will shed light on the effect of residential mobility on the journey to worship as well as on the relation between historical tension and the principle of least effort.

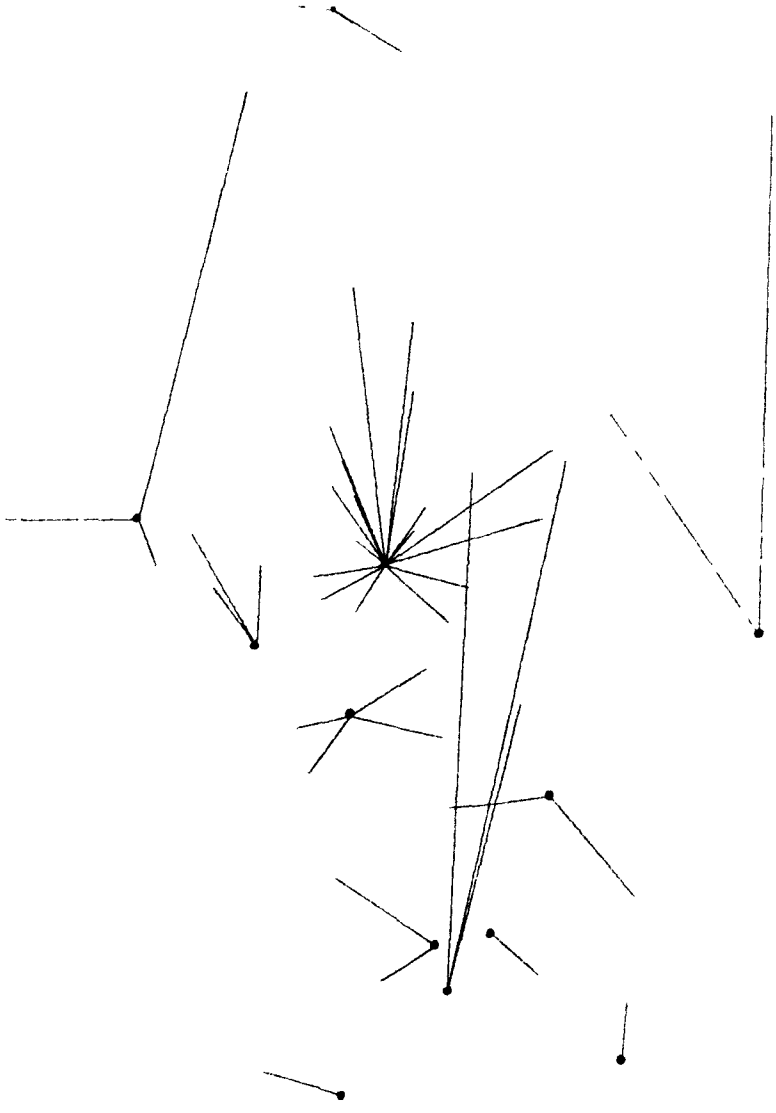
A. HISTORICAL TENSION AND THE PRINCIPLE OF LEAST EFFORT

(i) The Expected Pattern

It may be expected that after moving from one location to another a household would not change to the nearest church because of "ties" already developed at their church. In other words, the "social distance" between the church physically closest to the residence after a move could well be greater than that to the church previously attended. It was expected therefore that the original hypothesis that households would attend the closest church of their particular denomination might be more correct if the earliest address in the Twin Cities was utilized. We should expect a larger percentage of households attending the closest church from the earliest addresses in the Twin Cities than from present addresses.

The expected travel patterns showing journeys to worship from the earliest address in the Twin Cities are shown in Figures 21 to 31. It is interesting to note from these figures that the expected travel patterns are the shortest possible journeys as households are expected to travel to the closest church of their particular denomination.

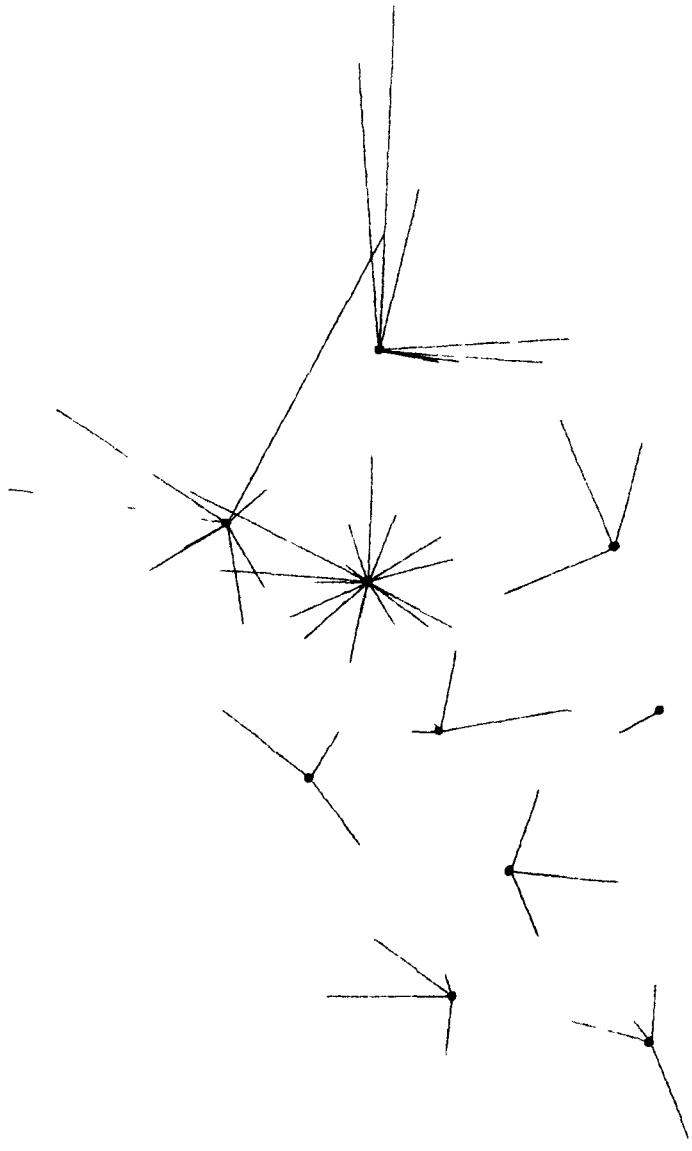
LUTHERAN TRAVEL PATTERN FROM EARLIEST ADDRESSES : EXPECTED



• CHURCH

Figure 21

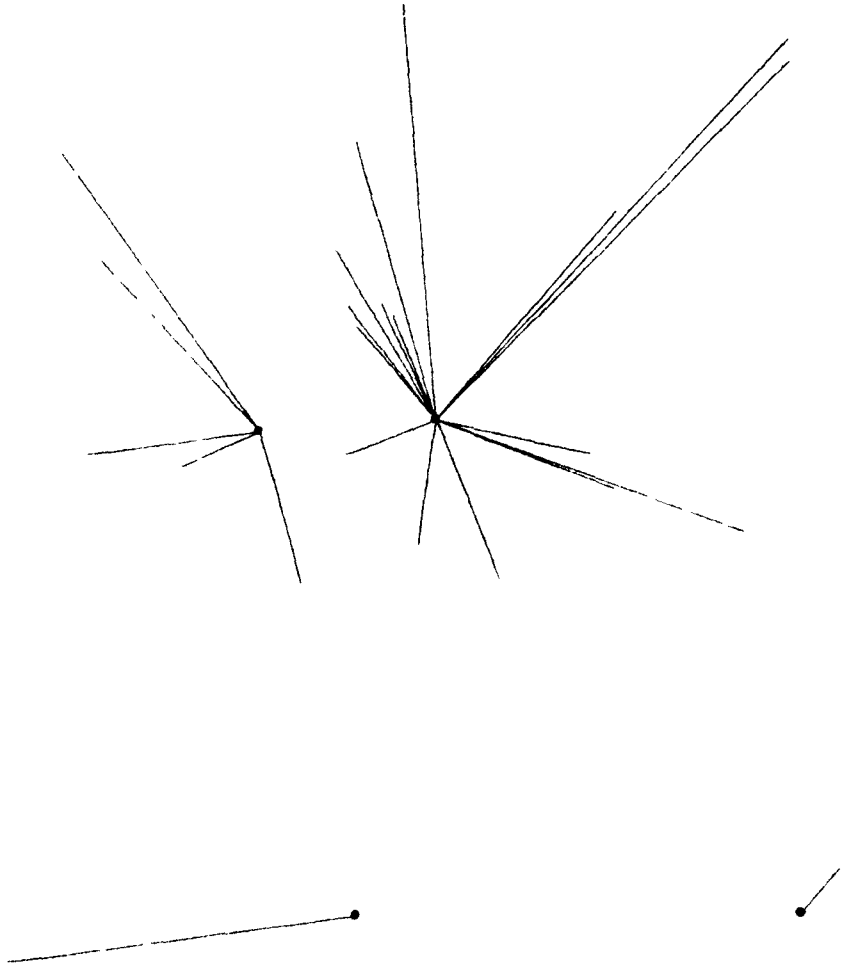
ROMAN CATHOLIC TRAVEL PATTERN FROM EARLIEST ADDRESSES : EXPECTED



• CHURCH

Figure 22

UNITED CHURCH TRAVEL PATTERN FROM EARLIEST ADDRESSES: EXPECTED



• CHURCH

Figure 23

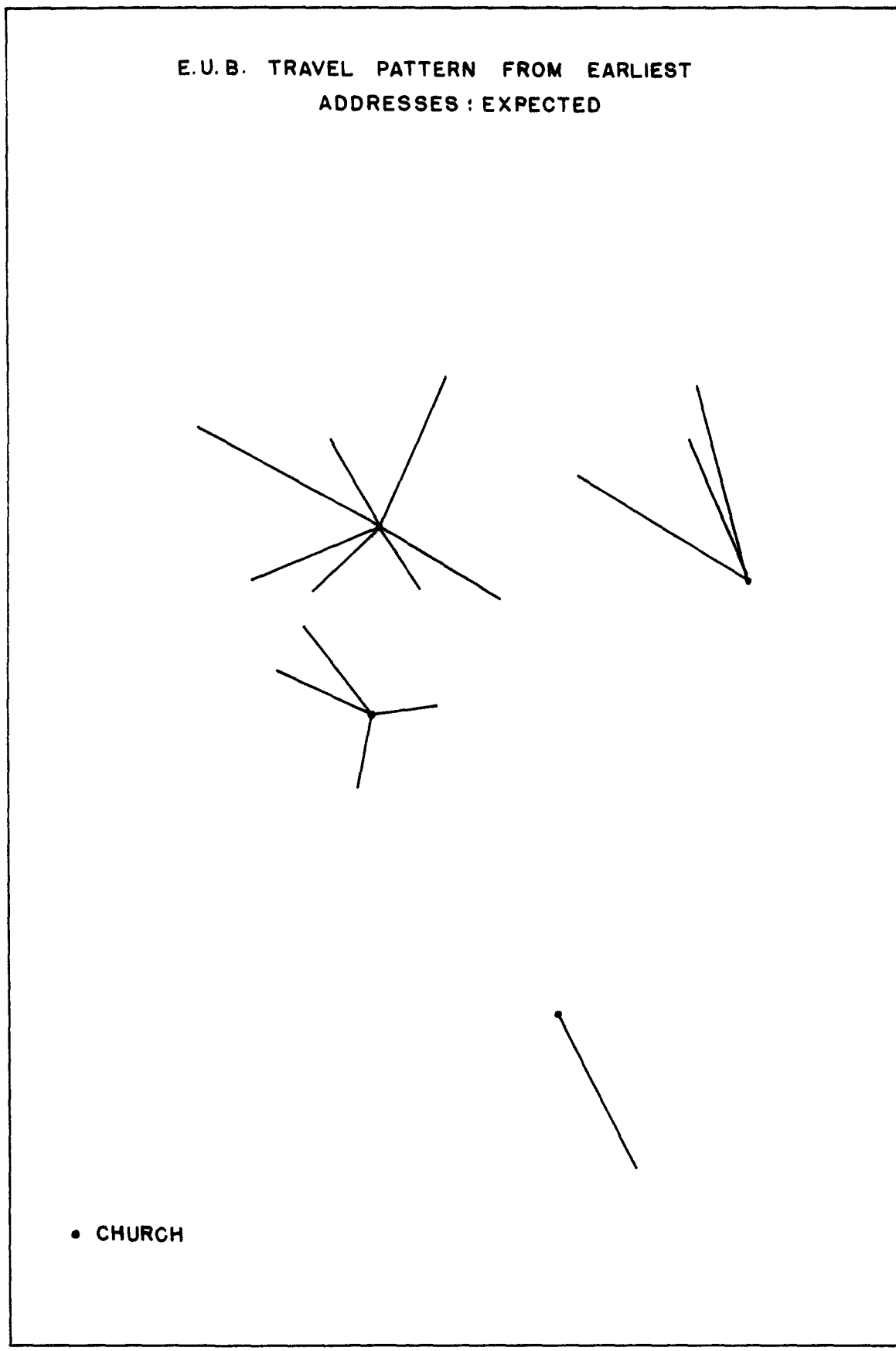
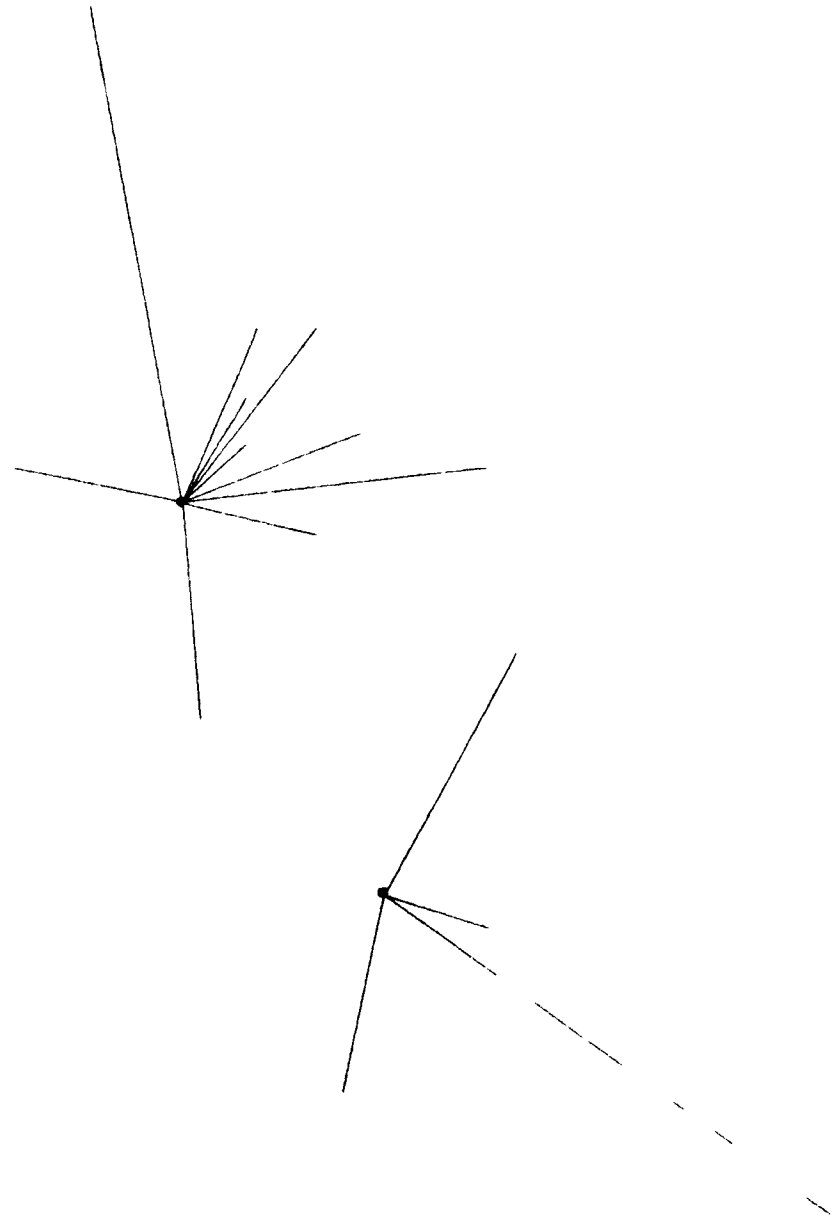

E.U.B. TRAVEL PATTERN FROM EARLIEST
ADDRESSES : EXPECTED
• CHURCH

Figure 24

PRESBYTERIAN TRAVEL PATTERN FROM EARLIEST ADDRESSES: EXPECTED



• CHURCH

Figure 25

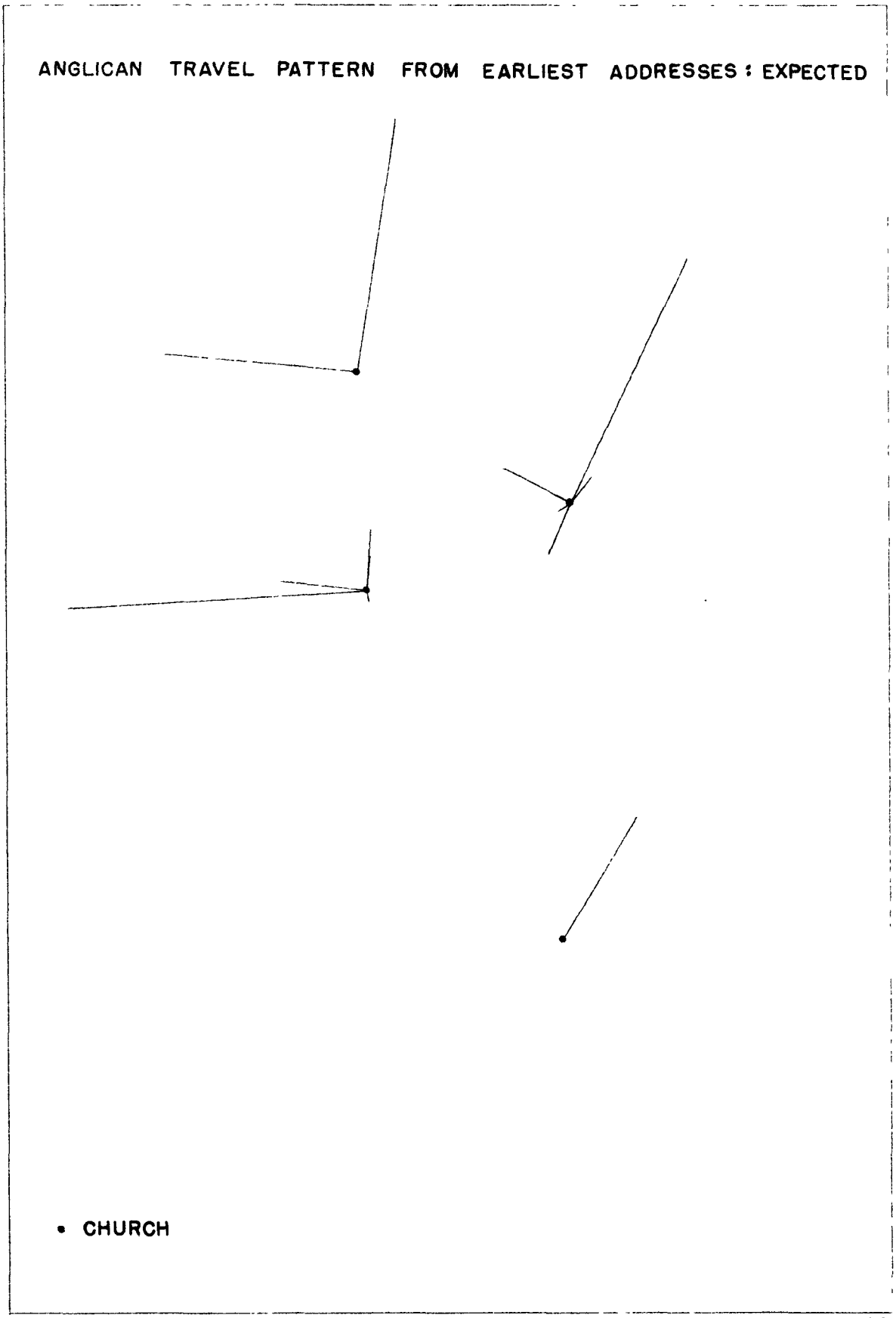
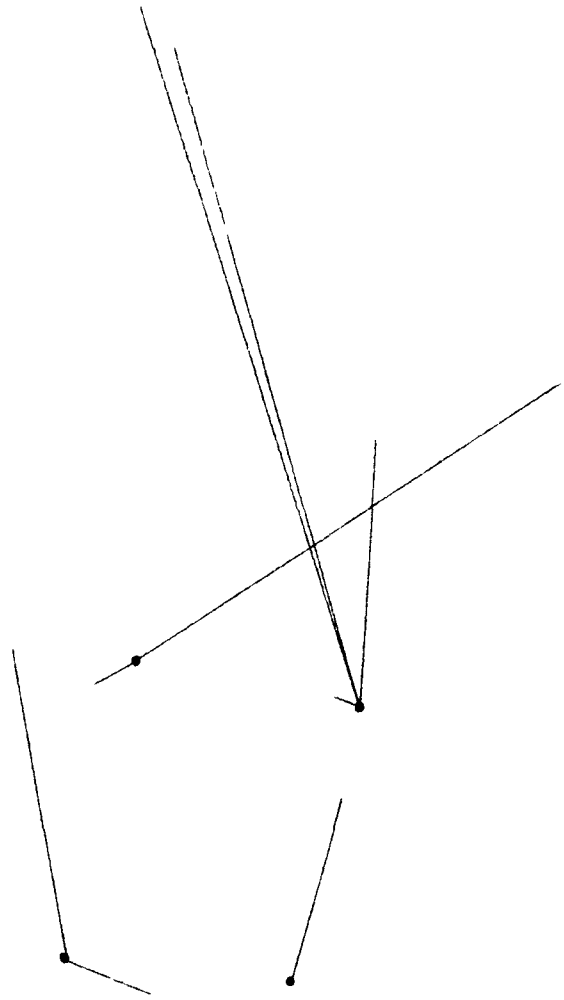

ANGLICAN TRAVEL PATTERN FROM EARLIEST ADDRESSES : EXPECTED
• CHURCH

Figure 26

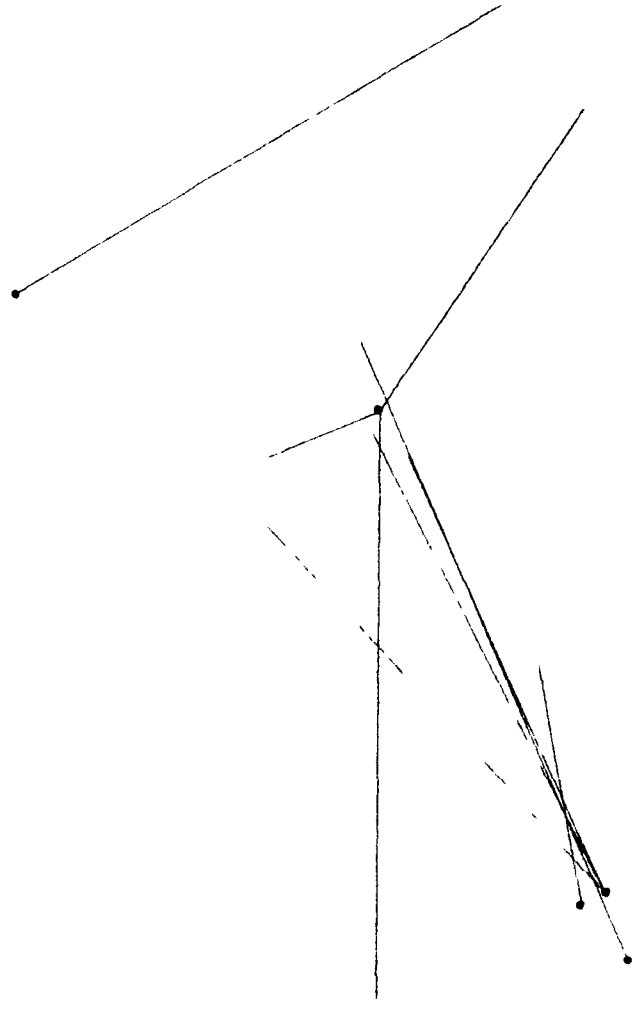
BAPTIST TRAVEL PATTERN FROM EARLIEST ADDRESSES: EXPECTED



• CHURCH

Figure 27

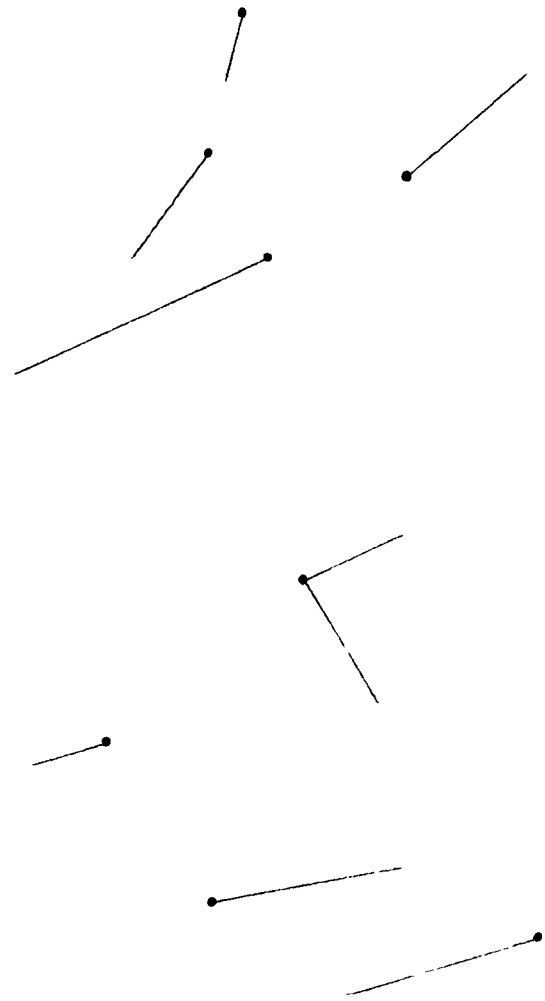
MENNONITE TRAVEL PATTERN FROM EARLIEST ADDRESSES : EXPECTED



• CHURCH

Figure 28

PROTESTANT MINORITY TRAVEL PATTERN FROM EARLIEST ADDRESSES: EXPECTED



• CHURCH

Figure 29

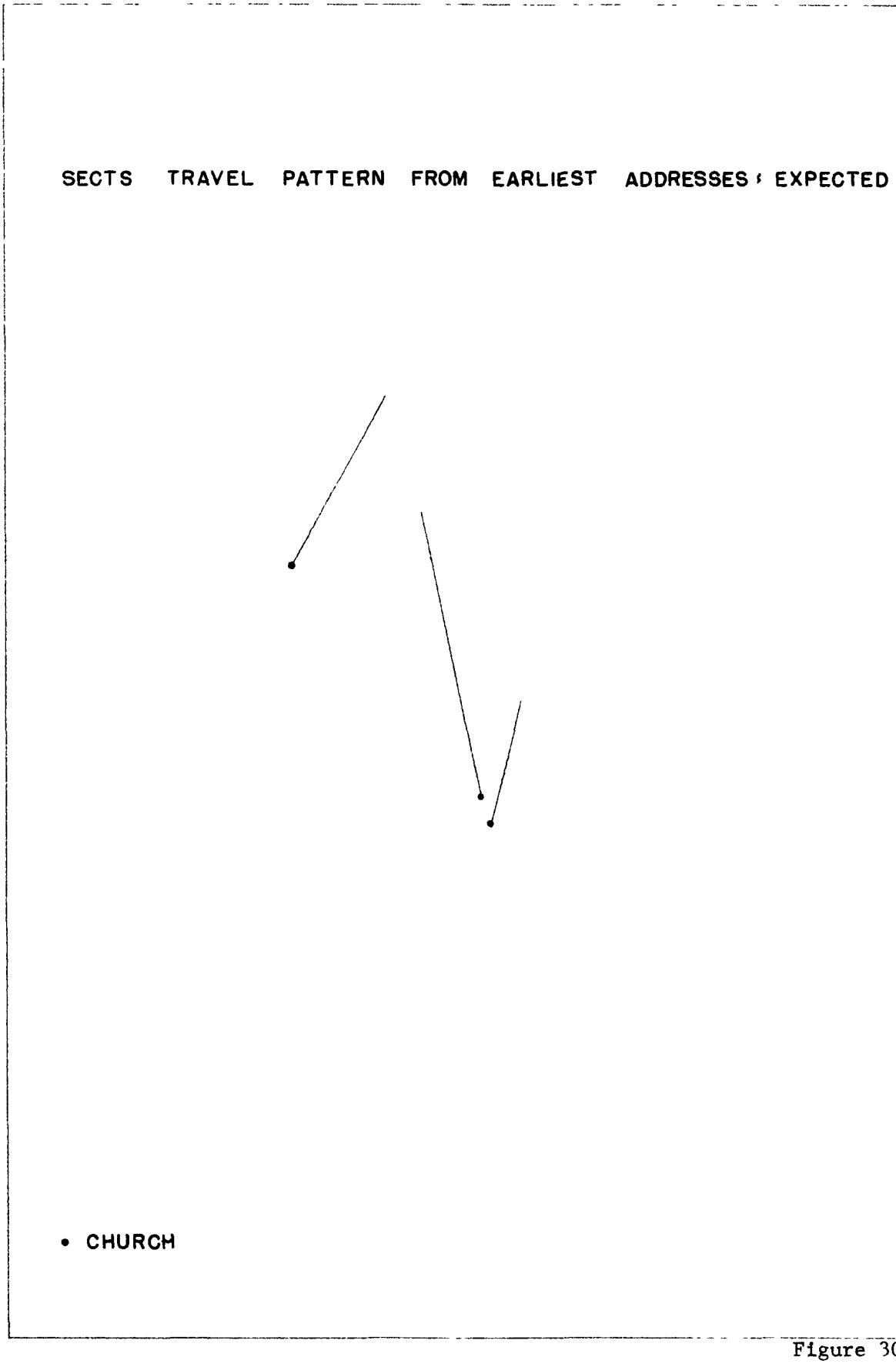
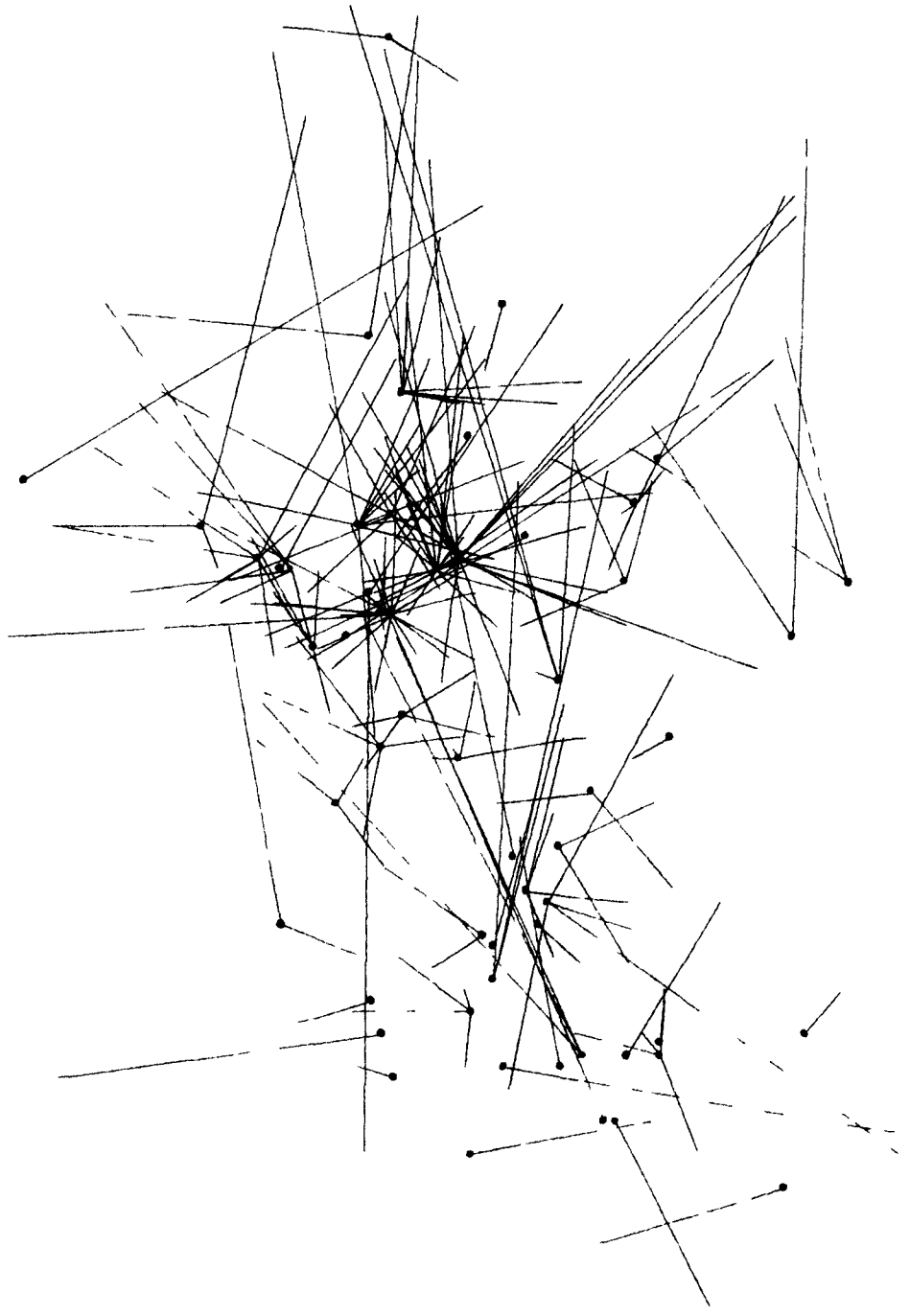

SECTS TRAVEL PATTERN FROM EARLIEST ADDRESSES : EXPECTED
• CHURCH

Figure 30

COMBINED TRAVEL PATTERNS FROM EARLIEST ADDRESSES:
EXPECTED



• CHURCH

Figure 31

If the actual travel patterns are similar to the expected travel patterns, we may conclude that the principle of least effort has a significant influence in the journey to worship from earliest addresses in the Twin Cities to Church. On the other hand, if a greater percentage of households attends the closest church from earliest addresses in the Twin Cities than from present addresses, then historical tension has indeed affected the operation of the principle of least effort.

(ii) The Actual Pattern

How then does the actual pattern in reality compare to the expected pattern indicated above? To answer this question it was first necessary to obtain information regarding the time of entry into the earliest residence for households having moved from one location to another within the Twin Cities. Unfortunately, this information was not asked in the questionnaire, so a conservative estimate was obtained by subtracting one year from the date of entry into the present address. If the results from the most conservative estimate should prove to be significant, then the actual longer periods of earlier residence would be even more so.

Figures 32 to 42 illustrate the actual travel patterns. Comparisons should be made at this point between the actual travel patterns and the expected travel patterns described earlier. It is interesting to note that for almost all denominations there is a remarkable similarity between the actual and expected patterns. Observation may lead one to conclude that the principle of least

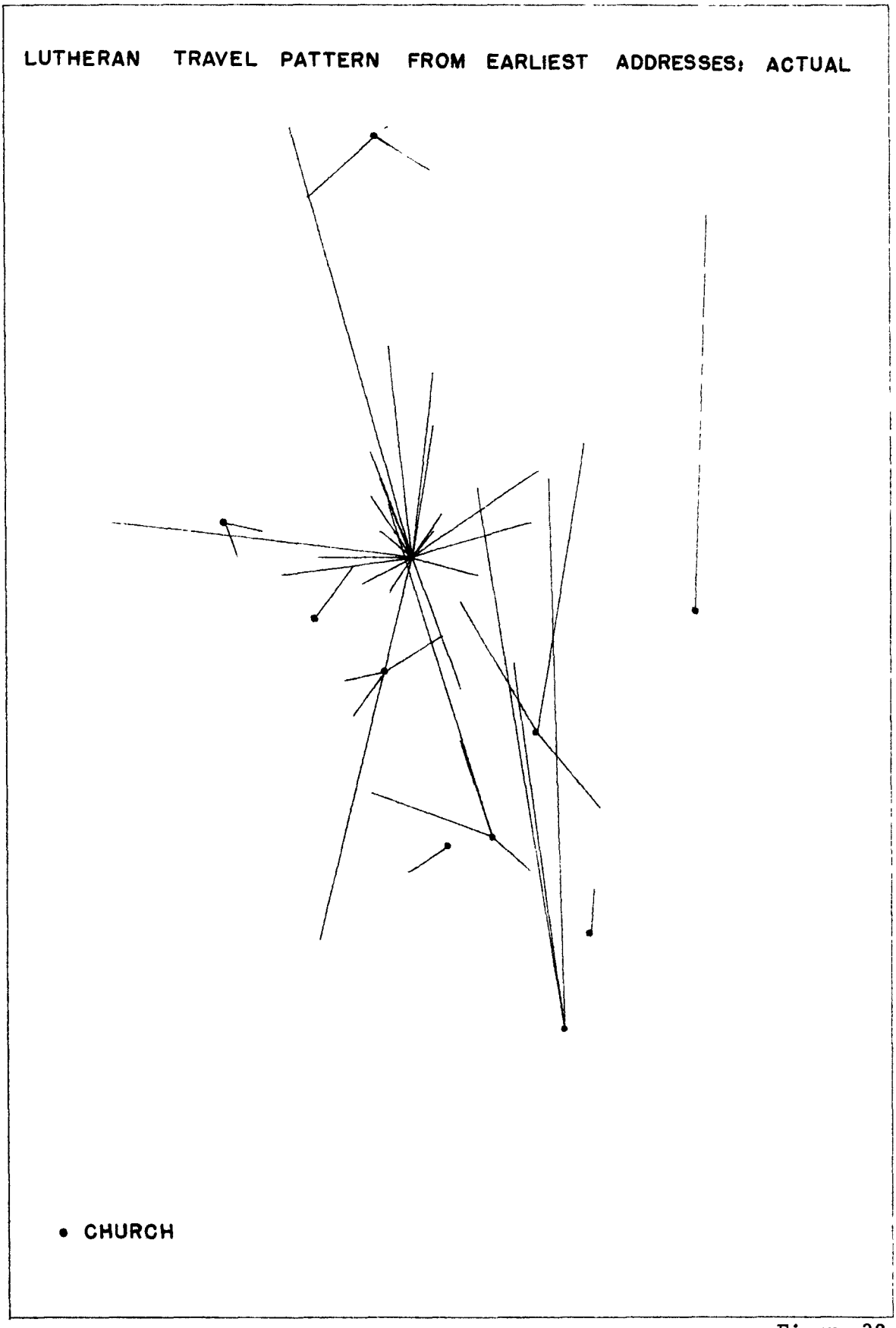
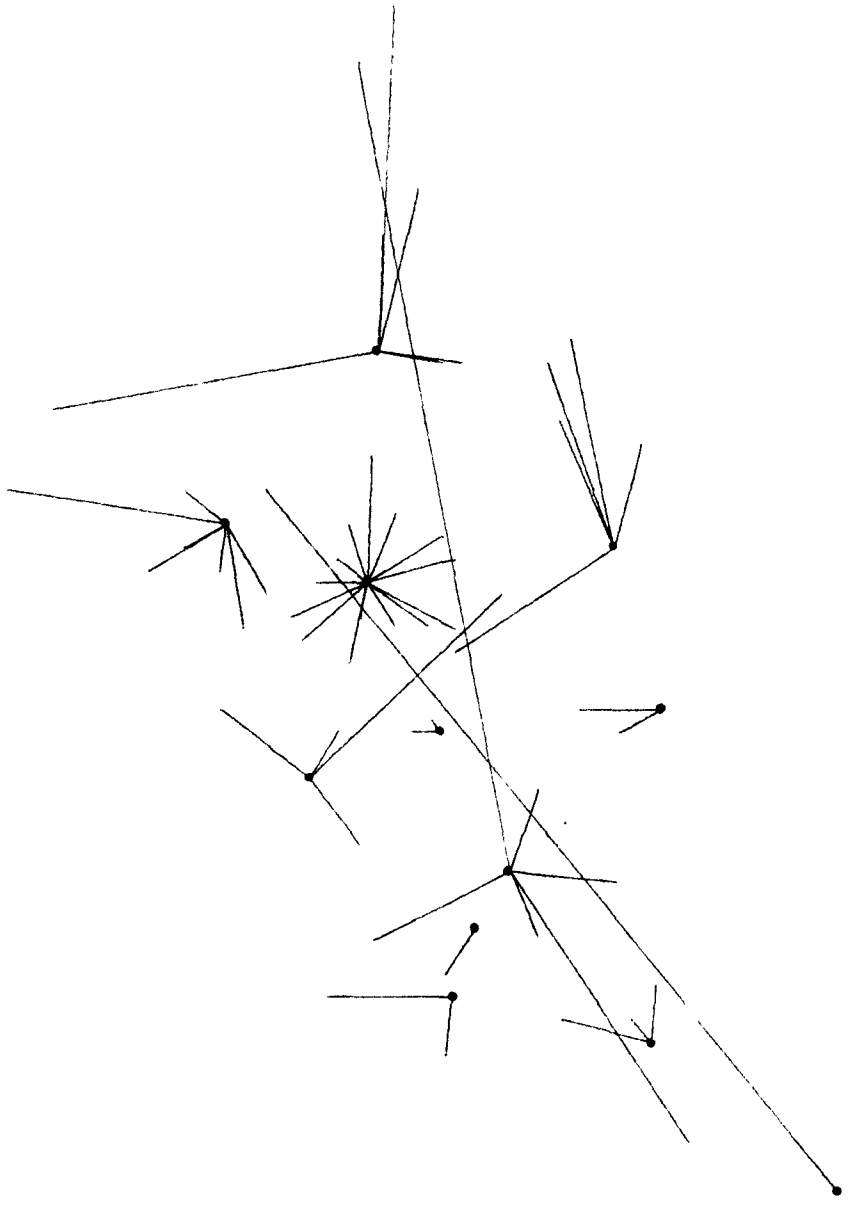

LUTHERAN TRAVEL PATTERN FROM EARLIEST ADDRESSES: ACTUAL
• CHURCH

Figure 32

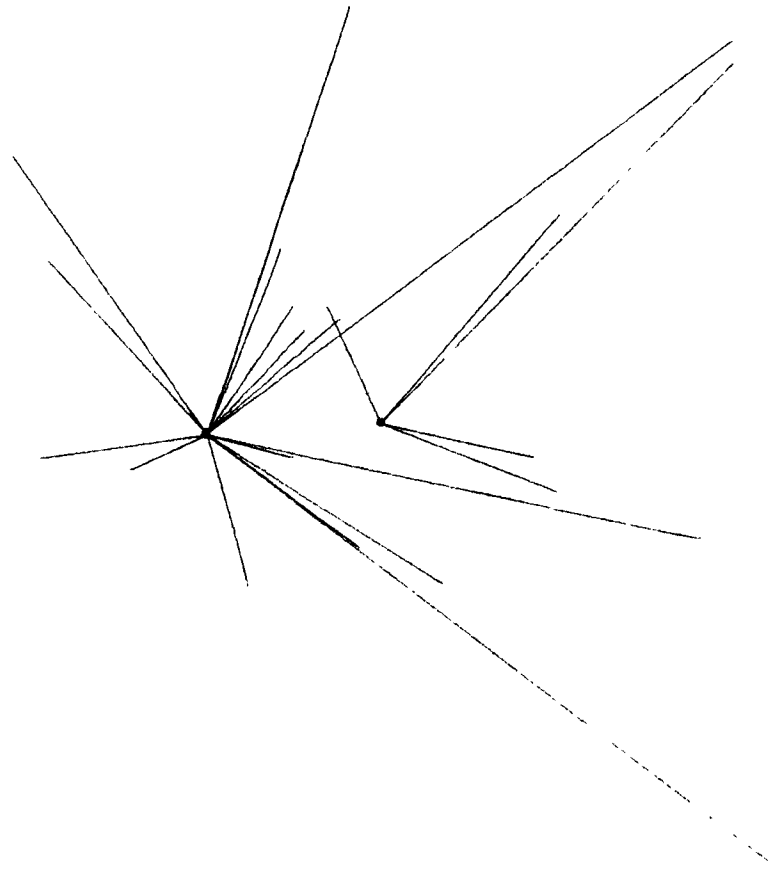
ROMAN CATHOLIC TRAVEL PATTERN FROM EARLIEST ADDRESSES:
ACTUAL



• CHURCH

Figure 33

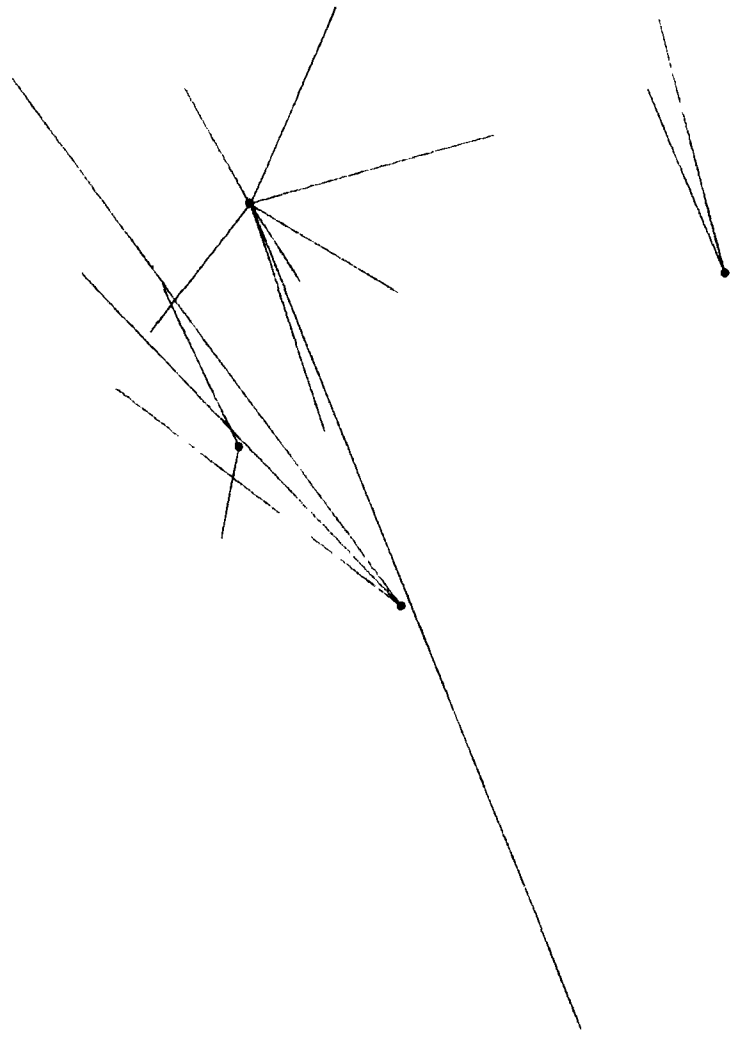
UNITED CHURCH TRAVEL PATTERN FROM EARLIEST ADDRESSES:
ACTUAL



• CHURCH

Figure 34

E.U.B. TRAVEL PATTERN FROM EARLIEST ADDRESSES: ACTUAL



• CHURCH

Figure 35

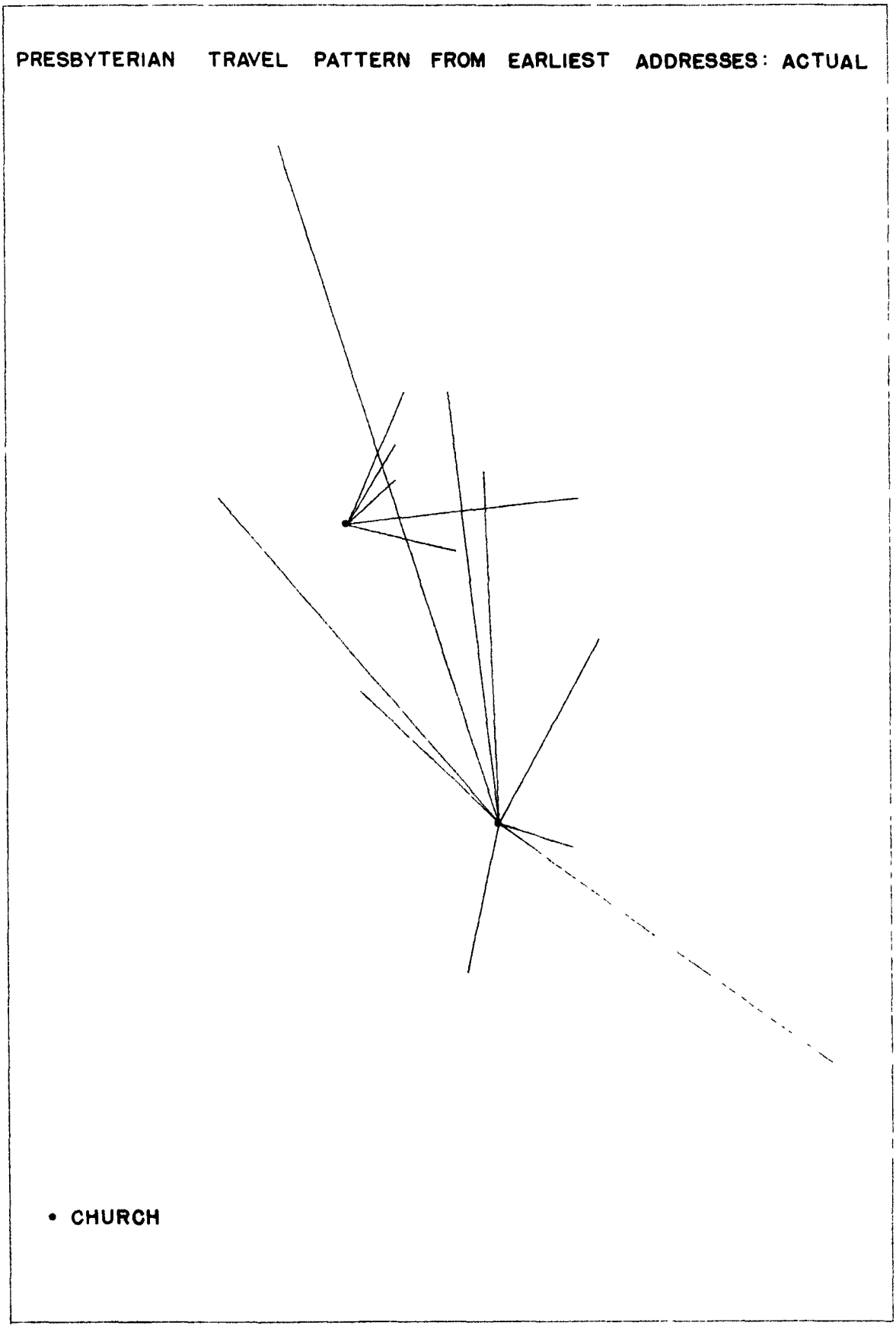

PRESBYTERIAN TRAVEL PATTERN FROM EARLIEST ADDRESSES: ACTUAL
• CHURCH

Figure 36

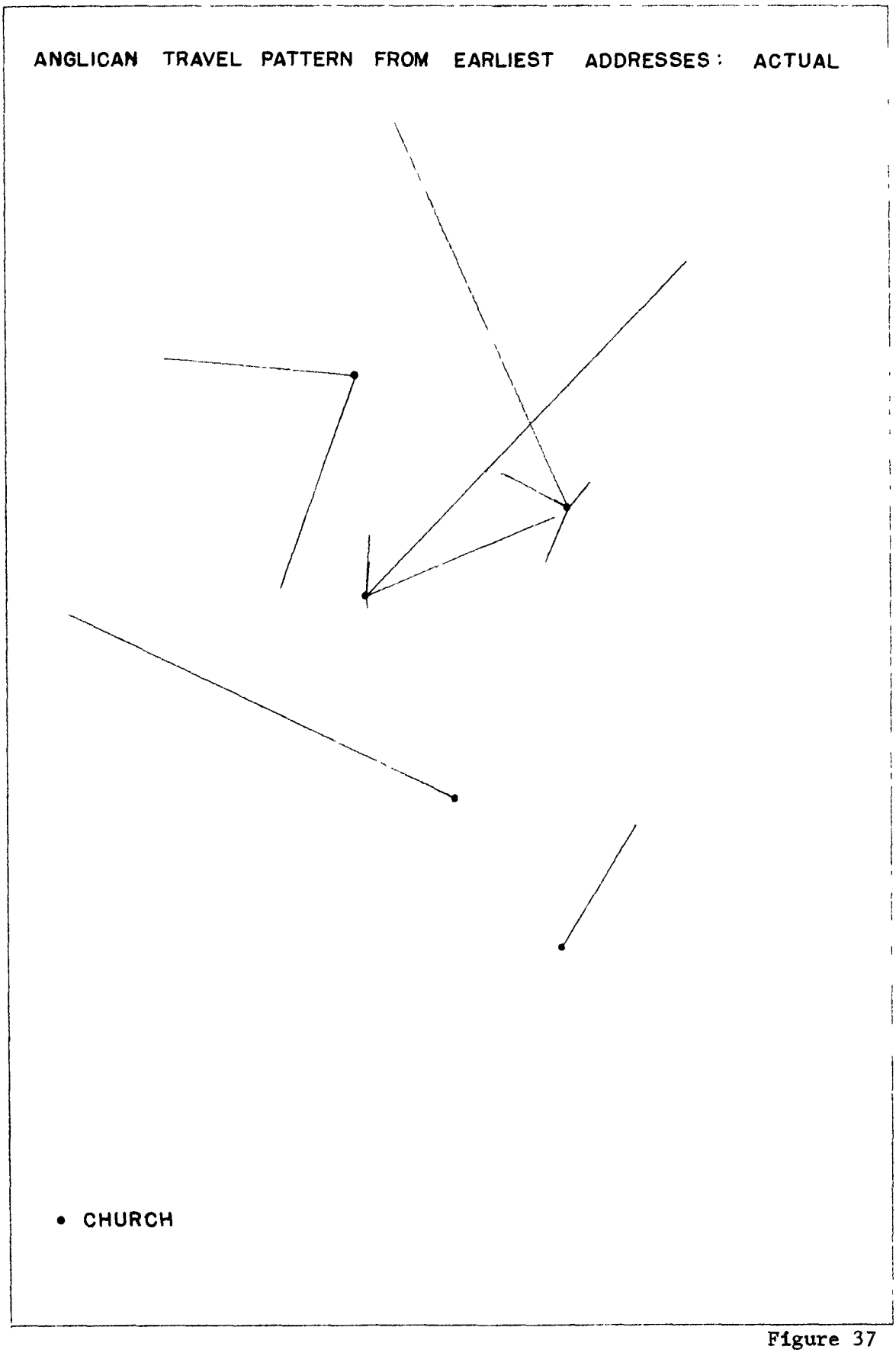
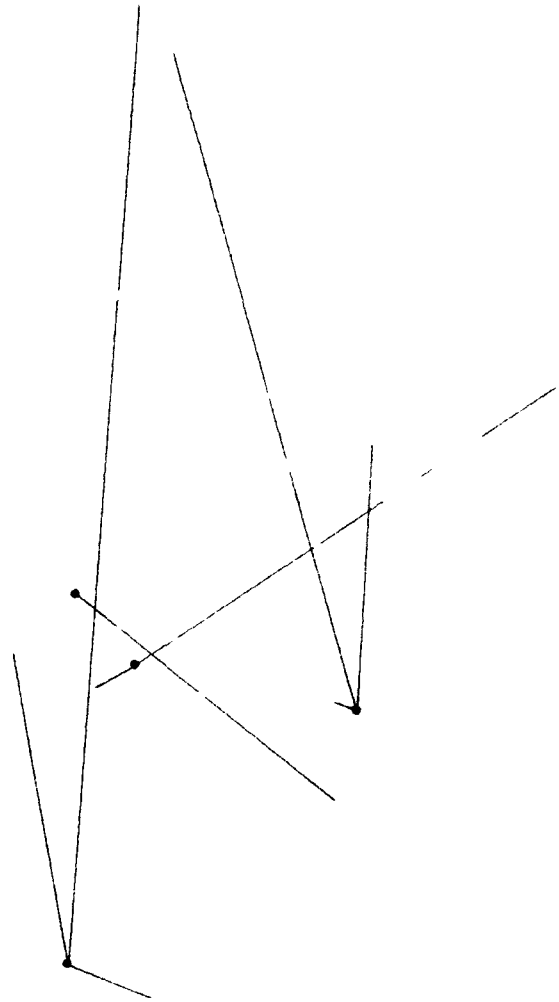

ANGLICAN TRAVEL PATTERN FROM EARLIEST ADDRESSES: ACTUAL
• CHURCH

Figure 37

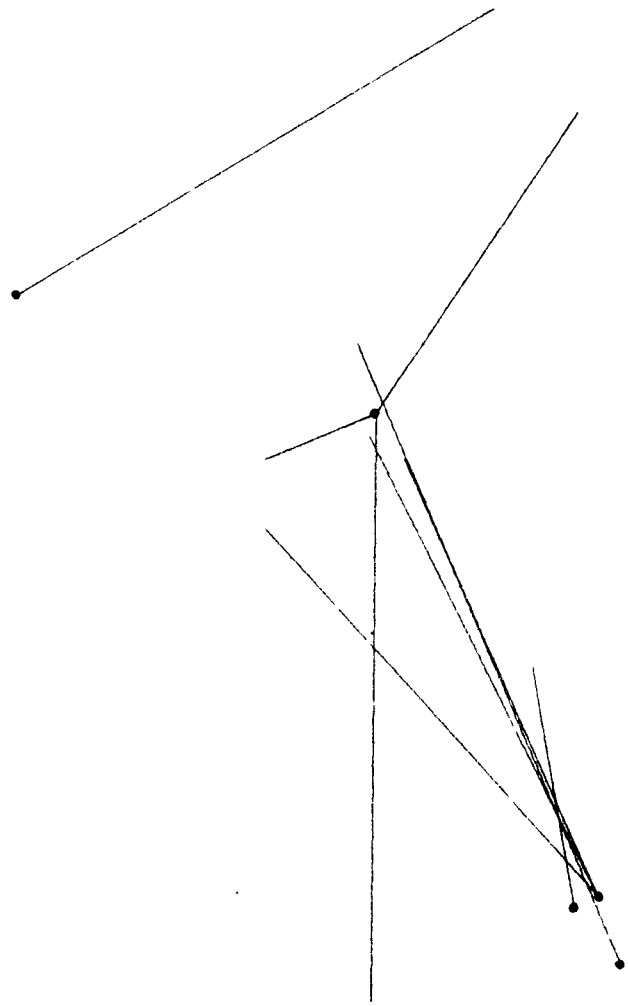
BAPTIST TRAVEL PATTERN FROM EARLIEST ADDRESSES: ACTUAL



• CHURCH

Figure 38

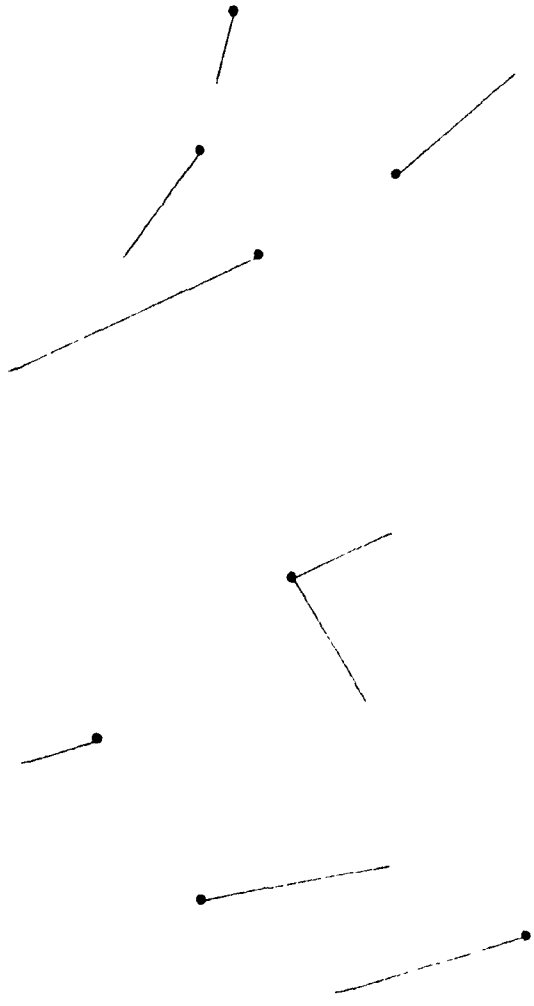
MENNONITE TRAVEL PATTERN FROM EARLIEST ADDRESSES: ACTUAL



• CHURCH

Figure 39

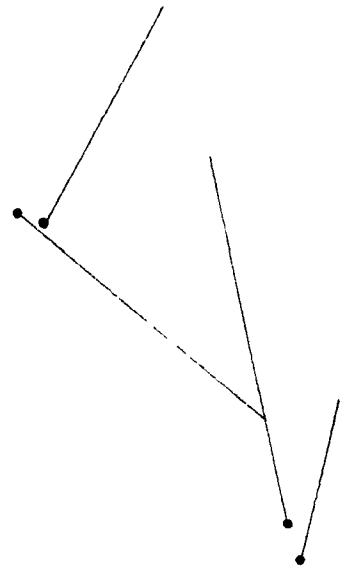
PROTESTANT MINORITY TRAVEL PATTERN FROM EARLIEST ADDRESSES: ACTUAL



• CHURCH

Figure 40

SECT TRAVEL PATTERN FROM EARLIEST ADDRESSES: ACTUAL



• CHURCH

Figure 41

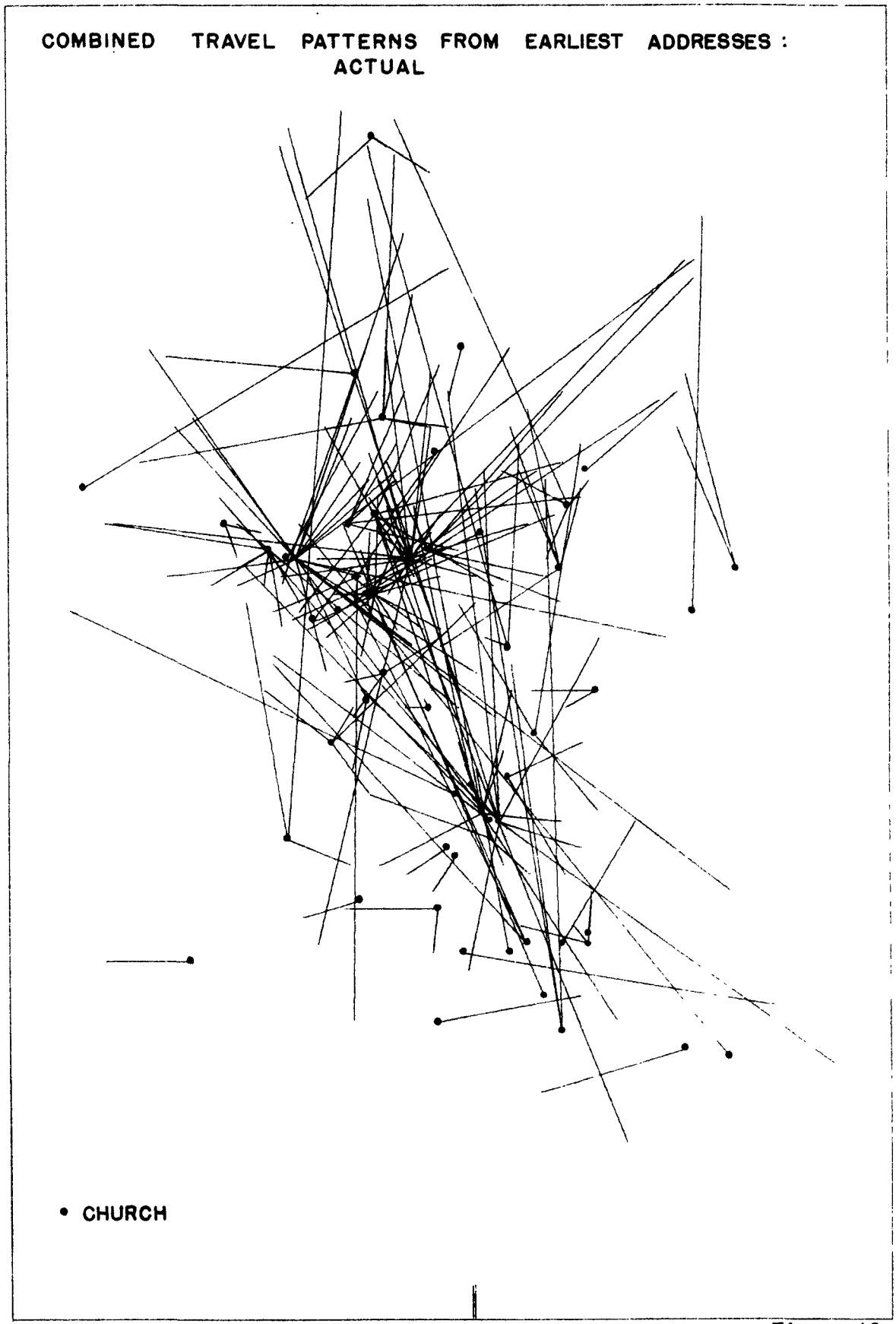

COMBINED TRAVEL PATTERNS FROM EARLIEST ADDRESSES :
ACTUAL
• CHURCH

Figure 42

effort does indeed influence travel patterns from earliest addresses. In actuality about seventy per cent of the households travel to the closest church of their particular denomination from the earliest address in the Twin Cities.

The actual percentages of households attending churches which are at increasingly further distances from the residences is illustrated in Figure 43. Figure 44 compares the percentage of households attending the closest church from both present addresses and earliest addresses in the Twin Cities. Only fifty-eight per cent of households attend the closest church of their denomination from their present address whereas approximately seventy per cent (69.74%) of households attended the closest church of their denomination from their earlier address in the Twin Cities.

The analysis thus far indicates that historical tension does effect the principle of least effort as illustrated in travel patterns in the journey to worship. What is needed, however, at this point is some objective measure to scientifically determine if that conclusion is correct. A Chi Square test was run on the null hypothesis that there was no difference between the number of households attending the closest church compared to all other churches from the present address and the number of households attending the closest church compared to all other churches from the earliest address in the Twin Cities. At the .05 level of significance the null hypothesis was rejected; there is, therefore, a significant difference between the results of earliest and present addresses.

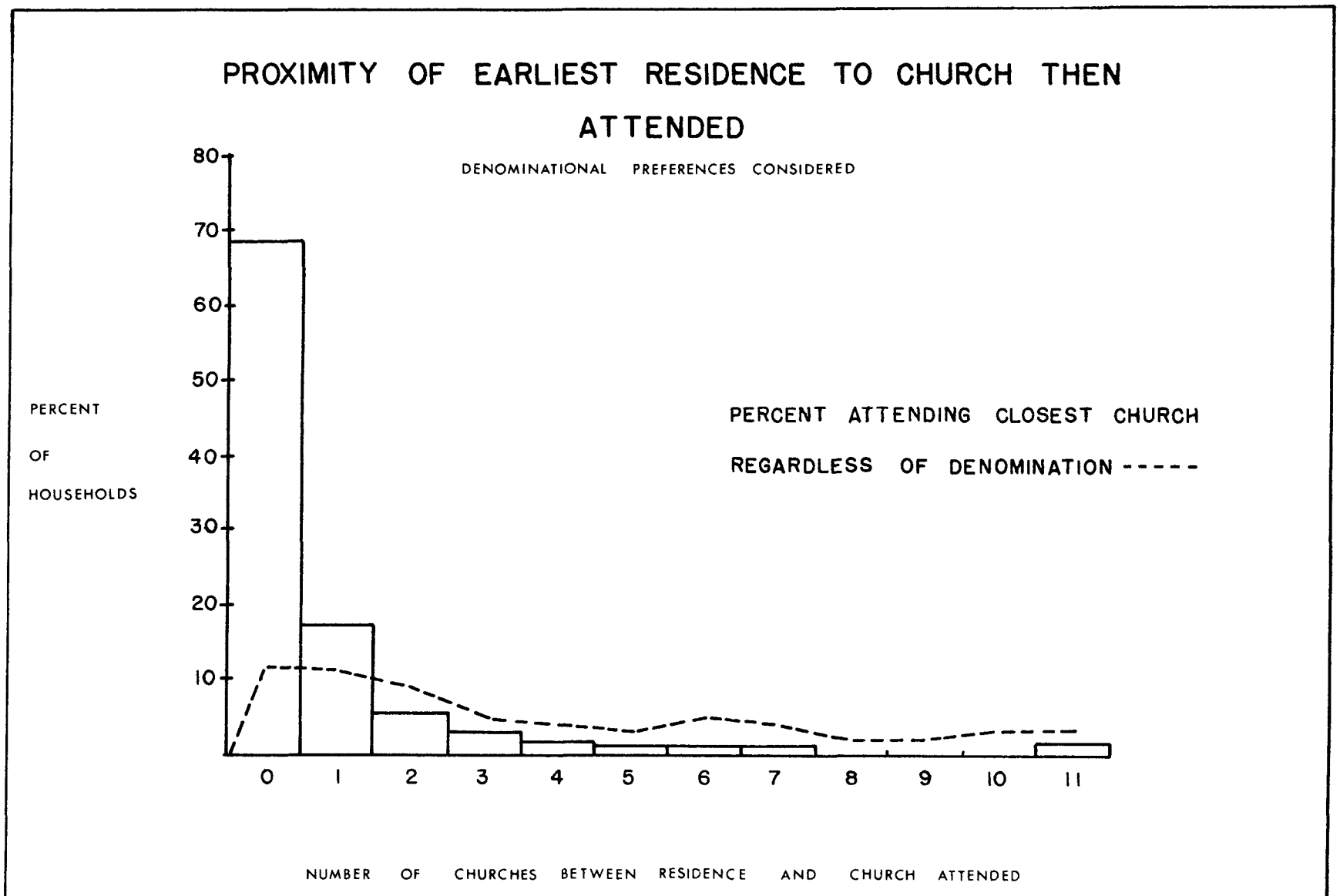

PROXIMITY OF EARLIEST RESIDENCE TO CHURCH THEN ATTENDED
DENOMINATIONAL PREFERENCES CONSIDERED
PERCENT OF HOUSEHOLDS
80
70
60
50
40
30
20
10
PERCENT ATTENDING CLOSEST CHURCH
REGARDLESS OF DENOMINATION -----
0 1 2 3 4 5 6 7 8 9 10 11
NUMBER OF CHURCHES BETWEEN RESIDENCE AND CHURCH ATTENDED

Figure 43

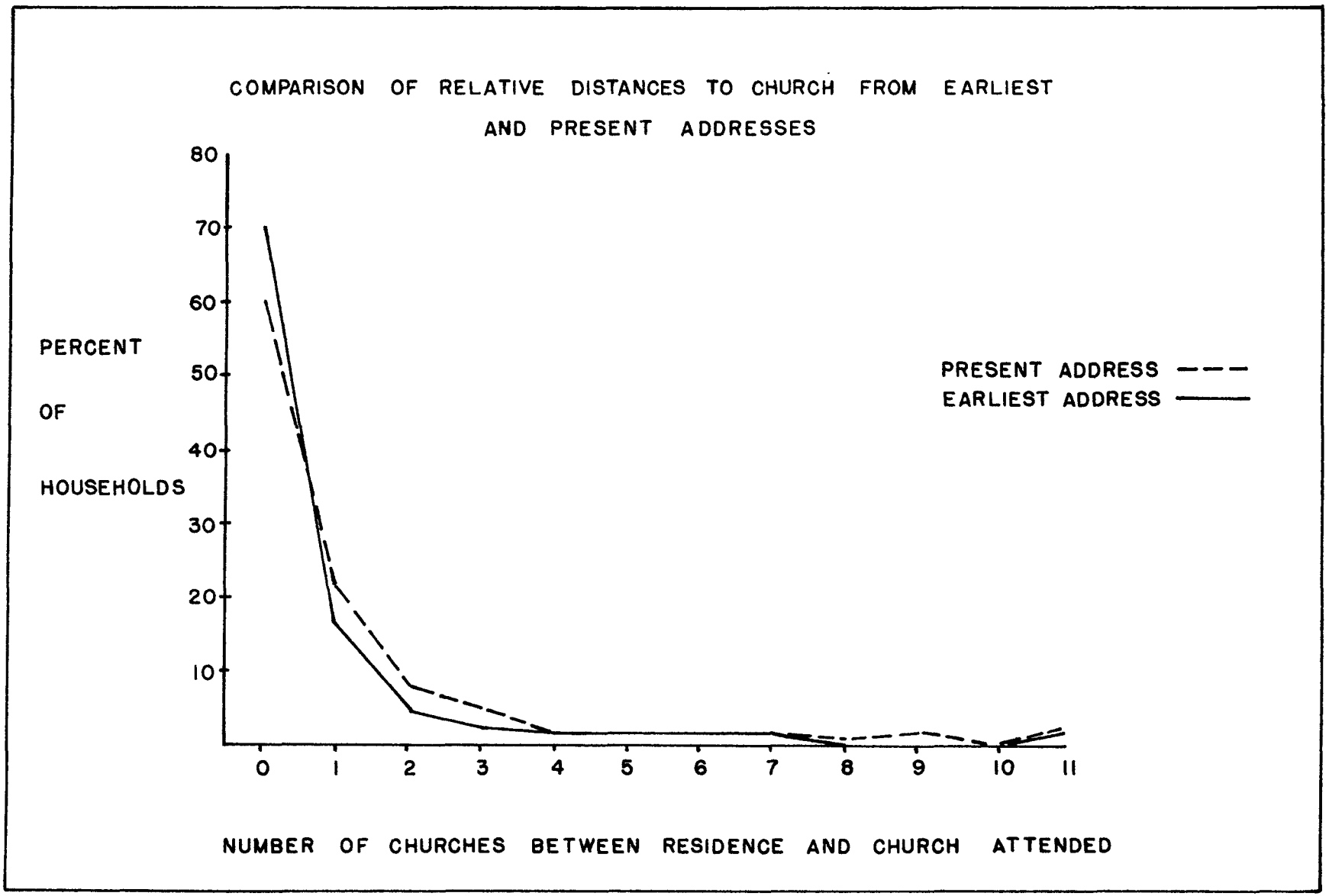

COMPARISON OF RELATIVE DISTANCES TO CHURCH FROM EARLIEST AND PRESENT ADDRESSES
PERCENT OF HOUSEHOLDS
80
70
60
50
40
30
20
10
PRESENT ADDRESS
EARLIEST ADDRESS
0
1
2
3
4
5
6
7
8
9
10
11
NUMBER OF CHURCHES BETWEEN RESIDENCE AND CHURCH ATTENDED

Figure 44

The conclusion can be stated therefore that historical tension does effect the principle of least effort as demonstrated in the journey to worship and that the specific effect of residential mobility is to decrease the original effect of the least effort principle (if effort is measured in terms of distance). It may be, however, as a household moves from one location to another that the least effort principle is still the most important factor in the household travel pattern. For example, it may be that less effort is involved in travelling greater distances to the original church than to change to a new church closer to the new residence. In this paper, however, effort has been considered in terms of distance travelled.

In the preceding chapter, actual and expected distances travelled to church were correlated using the present addresses of households. In this chapter the same approach will be followed but using distances travelled from the earliest addresses in the Twin Cities to church. According to evidence obtained thus far in this chapter, the correlation coefficients for earliest addresses should be greater than the correlation coefficients obtained in Chapter 2. Table 5 shows the actual results.

As expected, the correlation coefficient for the total sample is higher when earliest addresses are utilized thus confirming again the effect of historical tension. For both present and earliest addresses all coefficients are significant at the .05 level of significance. Except for the first two, all denominations

show higher coefficients when earliest addresses are utilized.

TABLE FIVE

CORRELATION OF ACTUAL AND EXPECTED DISTANCES

TO CHURCH FROM PRESENT AND EARLIEST ADDRESSES

	SPEARMAN RANK CORRELATION COEFFICIENT	
Denomination	Present Address	Earliest Address
United	.82	.57
E.U.B.	.72	.64
Lutheran	.65	.75
Anglican	.80	.80
Catholic	.50	.79
Mennonite	.83	1.00
Baptist	.95	.95
Protestant Minority	.91	1.00
Sects.	1.00	1.00
Presbyterian	.69	.77
TOTAL	.725	.793

B. RESIDENTIAL MOBILITY AND THE JOURNEY TO WORSHIP

It may be concluded, then, that historical tension does indeed significantly affect the least effort principle in the travel of households to use church facilities. Because in this study historical tension is a consequence of residential mobility, it is appropriate next to consider in greater detail the effect of residential mobility upon the journey to worship.

Of the sample households interviewed, sixty-four per cent had changed addresses within the Twin Cities. For only thirty-six per cent of the sample was the present address also the first place of residence in the Twin Cities. For the households having moved it was assumed that the previous address was also the earliest address in the Twin Cities.

Sixty per cent of the households that had made a residential move within the Twin Cities did not change churches with a change of residence. If only protestant denominations are considered, then only 25.9 per cent of the protestant households changed churches with a residential move. By contrast seventy per cent of Roman Catholic households changed churches with a residential move.

The Roman Catholic parish system prefers that a member attend the church closest to his residence, and this preference is

well known to each church member.[2] This helps greatly to explain the high percentage of Roman Catholic households that change churches with a residential move.

For households other than Catholic, the predominant tendency not to change churches with a residential move explains why historical tension has a significant effect upon the least effort principle.

Many of the studies of the relationship between mobility and travel patterns have concerned the journey to work. It is informative to compare their findings with the effect of residential mobility on the journey to worship.

Reed found in studying the journey to work in the Twin Cities that the predominent trend for home owners moving into a new residence was to live further from work than previously.[3] It is interesting that a similar trend occurs with residential moves and the journey to worship. Figure 45 shows that only a very few of the households who moved actually moved closer to the original church attended. (Area A). Figure 46 indicates further that even those households changing churches with a residential move fewer ended up with a shorter journey to worship than before. (Area A)

Table 6 illustrates the average length in miles of the journey to worship for each denomination from earliest and present addresses in the Twin Cities.

In all denominations individually and for the sample as a whole the average distance to worship from present addresses is greater than the average distance to church from previous addresses.

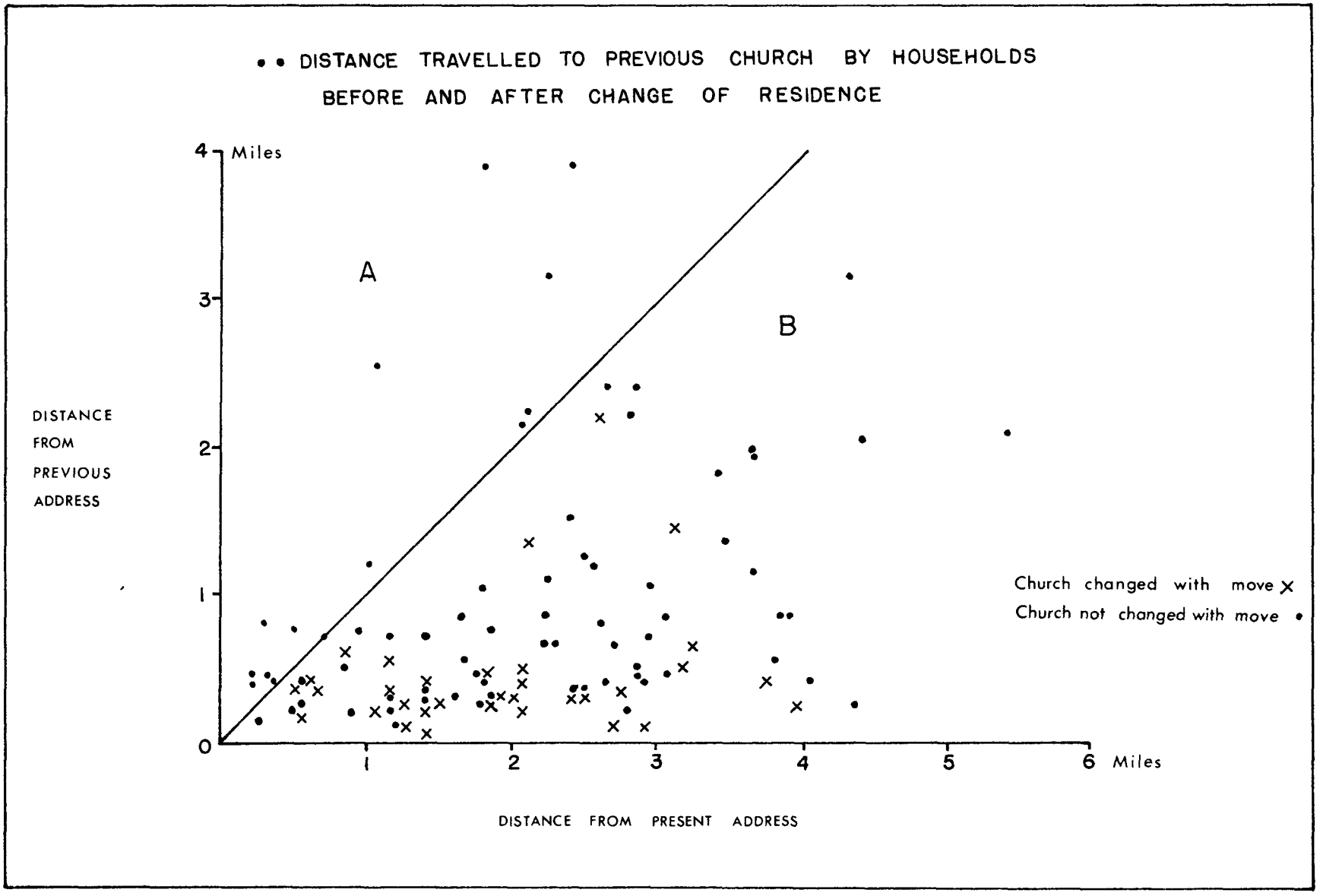

• • DISTANCE TRAVELLED TO PREVIOUS CHURCH BY HOUSEHOLDS
BEFORE AND AFTER CHANGE OF RESIDENCE
4 Miles
3
2
1
0
A
B
DISTANCE FROM PREVIOUS ADDRESS
1
2
3
4
5
6 Miles
DISTANCE FROM PRESENT ADDRESS
Church changed with move ×
Church not changed with move •

Figure 45

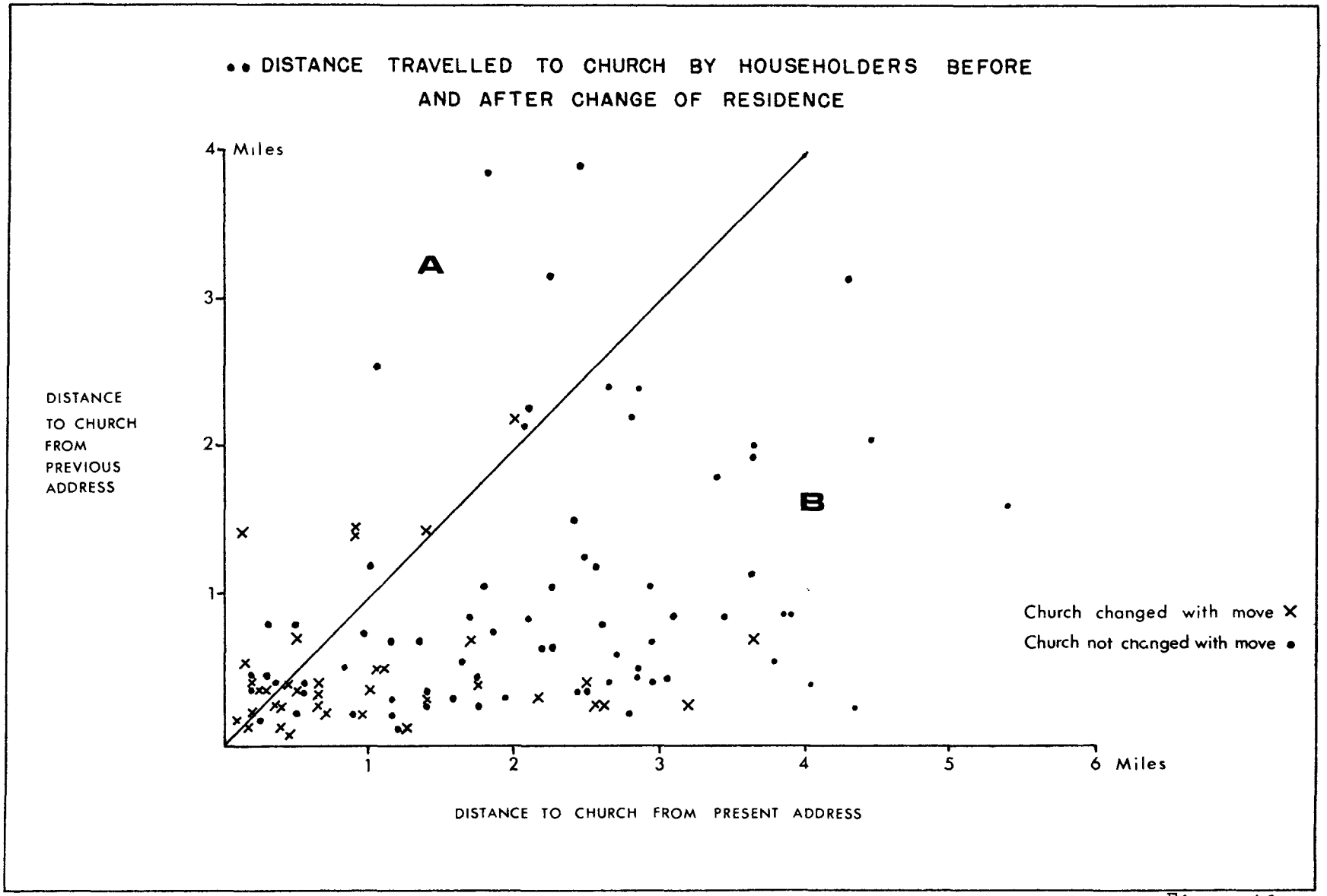

•• DISTANCE TRAVELLED TO CHURCH BY HOUSEHOLDERS BEFORE AND AFTER CHANGE OF RESIDENCE
4 Miles
3
2
1
A
B
DISTANCE TO CHURCH FROM PREVIOUS ADDRESS
1
2
3
4
5
6 Miles
DISTANCE TO CHURCH FROM PRESENT ADDRESS
Church changed with move ×
Church not changed with move •

Figure 46

Households do tend to move further from places of worship with a residential move and thus the total distance travelled to church for the sample increases with increased residential mobility of the sample.

TABLE SIX

AVERAGE LENGTH OF THE JOURNEY TO WORSHIP IN MILES

Denomination	Present Address	Previous Address
United	1.73	1.18
E.U.B.	1.44	1.27
Lutheran	1.62	.90
Mennonite	2.34	1.94
Presbyterian	2.15	1.48
Anglican	1.51	1.07
Baptist	2.19	1.56
Catholic	.93	.73
Protestant Minority	1.92	.65
Sects	1.92	1.23
TOTAL SAMPLE	1.54	1.04

It has already been stated with reference to Figure 46 that even those households changing churches with a residential move travel further distances to church than from the previous address. Perhaps the reason for this is due to the increasing size of the urban area with households moving to the periphery along with the possibility that new church construction has not kept pace with the growth of the suburbs. Carver points out that

> "usually the decision to build a church does not occur until five or ten years after a suburban community has settled in."[4]

It must also be remembered that increasing suburbanization has not brought similar increase in the demand for suburban churches due to the rapidly increasing mobility of the population. That is, with increasing mobility people are more willing to travel to churches at further distances such as established downtown churches.

To determine whether the distances travelled to church before and after a residential move were really different required a more objective measure. The non-parametric Kruskal-Wallis analysis of variance test was used to test the null hypothesis that there was no difference between the distances travelled. The null hypothesis was rejected (at the .05 level of significance); there was indeed a statistically significant difference in the actual average distances travelled before and after a change of residence.

In summary, then, the findings of this section on the effect of residential mobility on the distance travelled to worship can be stated briefly as follows. First, the average distance travelled to church by households increases absolutely as residential mobility increases.

Secondly, all households who changed churches with a residential move travel a shorter distance to church than they would have travelled had they not changed churches. The principle of least effort is apparent.

Thirdly, of the households that changed churches, ninety-one per cent originally travelled less than one mile to church; ninety-seven per cent less than two miles and one hundred per cent less than three miles. After changing churches, of these households sixty-six per cent still travel less than one mile; eighty-three per cent less than two miles; ninety-three per cent less than three miles and one hundred per cent less than four miles. Again the principle of least effort for those households changing churches with a residential move is quite evident.

For those households (sixty per cent of sample) not changing churches with a residential move it appears that historical tension has influenced the importance of least effort in their travel to worship.

C. DENOMINATIONAL DIFFERENCES IN THE JOURNEY TO WORSHIP

Thus far dimensional tension and historical tension and their effect upon the least effort principle as demonstrated in the journey to worship has been discussed mainly in terms of the total sample. Investigation of the travel patterns of individual denominations may shed additional light on the journey to worship, and so will be considered next.

The fact that there may be differences between travel patterns of different cultures has been studied by Murdie[5] and Burton.[6] Both researchers have studied the large Mennonite community in Waterloo County.

Murdie contrasted the travel patterns of Old Order Mennonites with that of modern Canadians. He points out that

> "such a study may not only evaluate the effects of changing technology, but it may also provide a prototype for more elaborate cross-cultural comparisons."[7]

Murdie notes that Isards' concept of "space preference" adopted from psychology, is of particular interest in cross-cultural comparisons.

> "Positive space preference is defined as the nature of an individual, either inherent or acquired, to assume particular levels of spatial interaction. Obviously different individuals and different groups exhibit diverse needs for interaction with other groups, and as a result, display varying levels of space preference."[8]

With reference to the present study, the question can be asked; "Do the different denominational groups (cultures) display different levels of space preference?" or "Is there any significant difference between denominations in the per cent of their households attending the closest church, the second closest, third closest, etc.?"

Figure 47 answers the above questions visually. It is interesting to note that in the case of each denomination, a larger percentage of households attend the closest church than any other church at a greater distance if earliest addresses are considered. Secondly, in all cases except the Baptist, a greater percentage attend the closest church of the particular denomination from the earliest address in the Twin Cities than from the present address. This illustrates again the effect of historical tension on the least effort principle.

Correlation between denominations and attendance at the first, second and third etc. closest church was carried out using the Kendall Coefficient of Concordance (Appendix 3).[9] Results, using earliest addresses in the Twin Cities, indicate a significant correlation coefficient of .83. The strong relationship between denominations is thus illustrated. The similarity is very evident

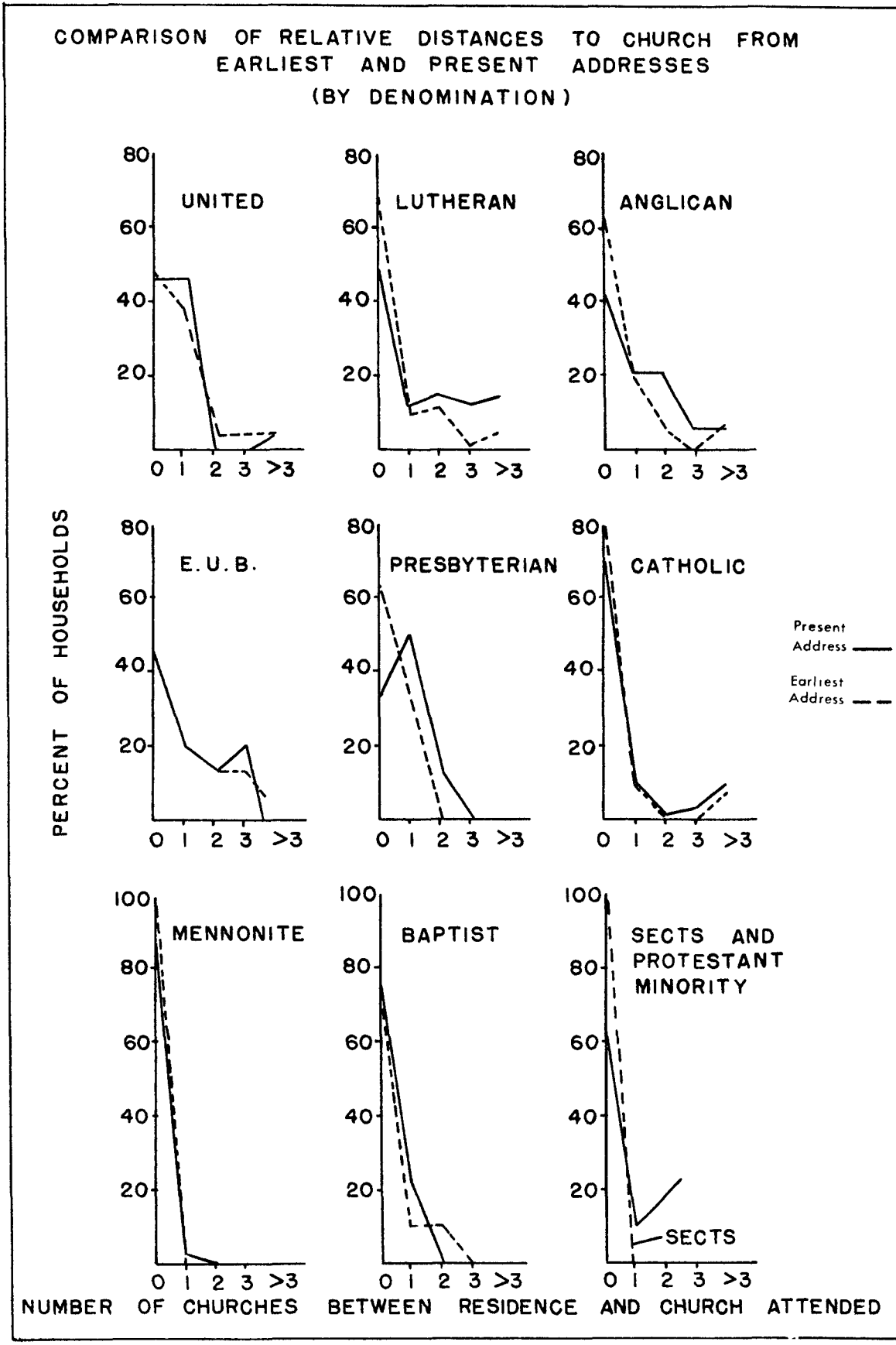

COMPARISON OF RELATIVE DISTANCES TO CHURCH FROM EARLIEST AND PRESENT ADDRESSES (BY DENOMINATION)
UNITED
LUTHERAN
ANGLICAN
E.U.B.
PRESBYTERIAN
CATHOLIC
MENNONITE
BAPTIST
SECTS AND PROTESTANT MINORITY
SECTS
PERCENT OF HOUSEHOLDS
NUMBER OF CHURCHES BETWEEN RESIDENCE AND CHURCH ATTENDED
Present Address
Earliest Address
0 1 2 3 >3
20 40 60 80 100

Figure 47

in Figure 47.

Two interesting patterns ought to be mentioned at this point. First, the Presbyterian church has a larger percentage of households attending the second closest church rather than the closest church from present addresses. This is not the case with earliest Presbyterian addresses in the Twin Cities. The explanation for this anomaly is that for those Presbyterians having moved from one residential location to another within the Twin Cities, ninety per cent did not change church affiliation. This is substantially higher than the average for the entire sample as indicated earlier. As Presbyterian households moved from one location to another, more importance has been placed on attending the original church rather than attending the closest church. The fact that St. Andrews, the largest Presbyterian church in Canada, is located in the Twin Cities and has substantial drawing power, may explain the reluctance of Presbyterian households to change churches with a residential move.

Secondly, where there are only a few churches or only one church in a particular denomination, it is to be expected that a greater percentage of households will attend the closest church because of the limited choice available. This is the case with the Mennonites, Sects and Protestant Minority denominations.

D. CONCLUSION

In this chapter it has been pointed out that the principle of least effort is more evident when travel patterns are considered from earliest addresses to churches attended at that time. It has also been demonstrated that the strength of the principle of least effort is affected adversely by the passage of time and the development of historical tension. Analysis of the denominations revealed them to be similar in demonstrating the least effort principle in their journey to worship, especially when dimensional tension and historical tension are both taken into consideration. Historical tension and dimensional tension may not, however, be the only influencing factors. In the next chapter several other possible influencing factors will be considered.

CHAPTER FOUR

THE JOURNEY TO WORSHIP AND SOCIO-ECONOMIC FACTORS

Each household of the sample has an opportunity to travel to any church of its particular choosing. It has been demonstrated that the choice of churches is influenced by the principle of least effort, dimensional tension and historical tension. Each household therefore has a decision to make that will affect its spatial behavior. Rushton has made a similar point regarding a household's consumer purchases.

> "In making a decision about spatial behavior, every decision-maker faces a unique combination of spatial opportunities and the suggested process in spatial choice is one in which each decision-maker employs a mental search routine whereby alternative opportunities in space are compared with all others, and so, among a restricted and unique class of alternatives, each household, by its decision, reveals its preference between alternative locations for purchases. Any choice which is made implies an ordering of the available spatial opportunities on the part of the household."[1]

In this chapter, those socio-economic variables that may possibly influence the household's mental search routine and eventually influence directly or indirectly the household's choice of church facilities will be investigated.

Specifically do the socio-economic factors of income, age, trip frequency, the number of church programs attended, and family size affect the distance a particular household travels to church?

Or, in somewhat more general terms of the preceeding paragraph, to what extent do socio-economic variables affect the spatial behavior of households as indicated by the journey to worship?

Whenever possible, reference will be made to other studies on the journey to work or on consumer purchasing trips that have similarly investigated the relationship between socio-economic variables and distance.

Socio-economic data was obtained from the questionnaire. Each variable was correlated with the distance travelled from present addresses to church using the non parametric Spearman rank correlation coefficient.[2] The results are given in Figure 48. Reference will be made to these correlations later in this chapter.

It may be argued that a more valid measure of distance travelled to church would be to use closest, second closest church, etc., rather than actual miles travelled. This procedure would insure that all households would be considered in the same relative spatial framework. At the same time, however, information would be lost as to the exact distances travelled.

Whether there was a relationship between each of the socio-economic variables and the attendance at the closest, second closest church, etc., was in fact tested by the Friedman two-way analysis of variance.[3] Because of the large number of calculations, the computer was utilized. The results indicated no significant differences between categories of the socio-economic variables and

CORRELATION (SPEARMAN COEFFICIENTS) BETWEEN SELECTED VARIABLES AND DISTANCE TO CHURCH FROM PRESENT ADDRESS

× SIGNIFICANT AT .05 LEVEL

	EXPECTED DISTANCE	INCOME	TRIP FREQUENCY	NO. PROGRAMS UTILIZED	FAMILY SIZE	AVERAGE FAMILY AGE	AGE OF OLDEST IN FAMILY	NO OF CHILDREN
LUTHERAN	× .69	.14	.21	.10	.28	× −.38	× −.38	.28
CATHOLIC	× .51	−.06	× −.30	−.20	× −.30	−.18	× −.37	−.16
UNITED	× .83	.21	−.14	−.14	.17	−.11	.01	−.02
E.U.B.	× .72	.41	−.30	.15	.30	−.41	−.15	.12
PRESBYTERIAN	× .70	.00	× −.64	−.08	−.06	−.09	−.17	−.10
ANGLICAN	× .81	.23	.16	.26	−.44	.30	.01	−.43
BAPTIST	× .95	.50	−.07	.17	−.13	.33	.29	−.30
MENNONITE	× .83	.24	−.15	−.30	−.44	.23	−.23	−.21
PROTESTANT MINORITY	× .92	.49	−.37	.37	× .79	−.42	.33	× .79
SECTS	× 1.00	.63	−.21	.32	× .95	−.60	−.32	.26
TOTAL SAMPLE AVERAGE	× .73	× .15	.03	× .23	−.06	−.12	× −.16	−.04

Figure 48

attendance at the closest, second closest church, etc. The results are therefore similar to the results indicated in the correlation matrix. Accordingly, the decision was made to utilize the mileages as the distance measurement for further analysis. In the following pages, however, reference will also be made graphically for comparison purposes to the relationship between the socio-economic variables and attendance at the closest, second closest church, etc.

A. INCOME AND THE JOURNEY TO WORSHIP

The theory that distance between residential location and trip destination will increase with higher incomes is a natural outgrowth of the principle of least effort. As the distance increases, the effort increases and the resultant costs require that higher incomes are necessary in order to meet the increased travel costs incurred. Huff has said that theoretically

> "the anticipated costs of transportation, the time and effort involved in preparing for, as well as making the trip, and other opportunities that must be foregone, tend to bring about a contraction of travel distances."[4]

Kain found in Detroit that increasing distances to work from the residence and higher incomes were positively correlated.[5] Duncan's work in Chicago illustrates also that at least for wage and salary workers the socio-economic level of the workers varies directly with the degree of residence--work separation.[6] In West Virginia, Thompson discovered a high correlation between income and the distance travelled by the worker.[7]

The journey to work has been studied in the Twin Cities by Allen[8] and Reed[9]. Allen, however, discovered that higher paid employees travel shorter distances than do employees at a lower economic level. Reed, too, found no positive relationship between income and the length of the journey to work.

The author of this paper was interested in investigating whether or not there was a strong positive relationship between income and distance travelled to church. If such a relationship actually exists it could help to explain the travel patterns of the journey to worship of Waterloo households.

An analysis indicated that, unlike some of the journey to work studies, there was no high positive relationship between distance travelled and income. The relatively low Spearman rank correlation coefficient of +.15 was however statistically significant (at the .05 level).

Figure 49 shows the number of households attending the closest church etc., for each income category. It is also illustrative of the fact that, at least for Waterloo households, there does not appear to be a high correlation between income and distance. Higher income households do not necessarily drive further to church facilities than do households lower on the socio-economic scale.

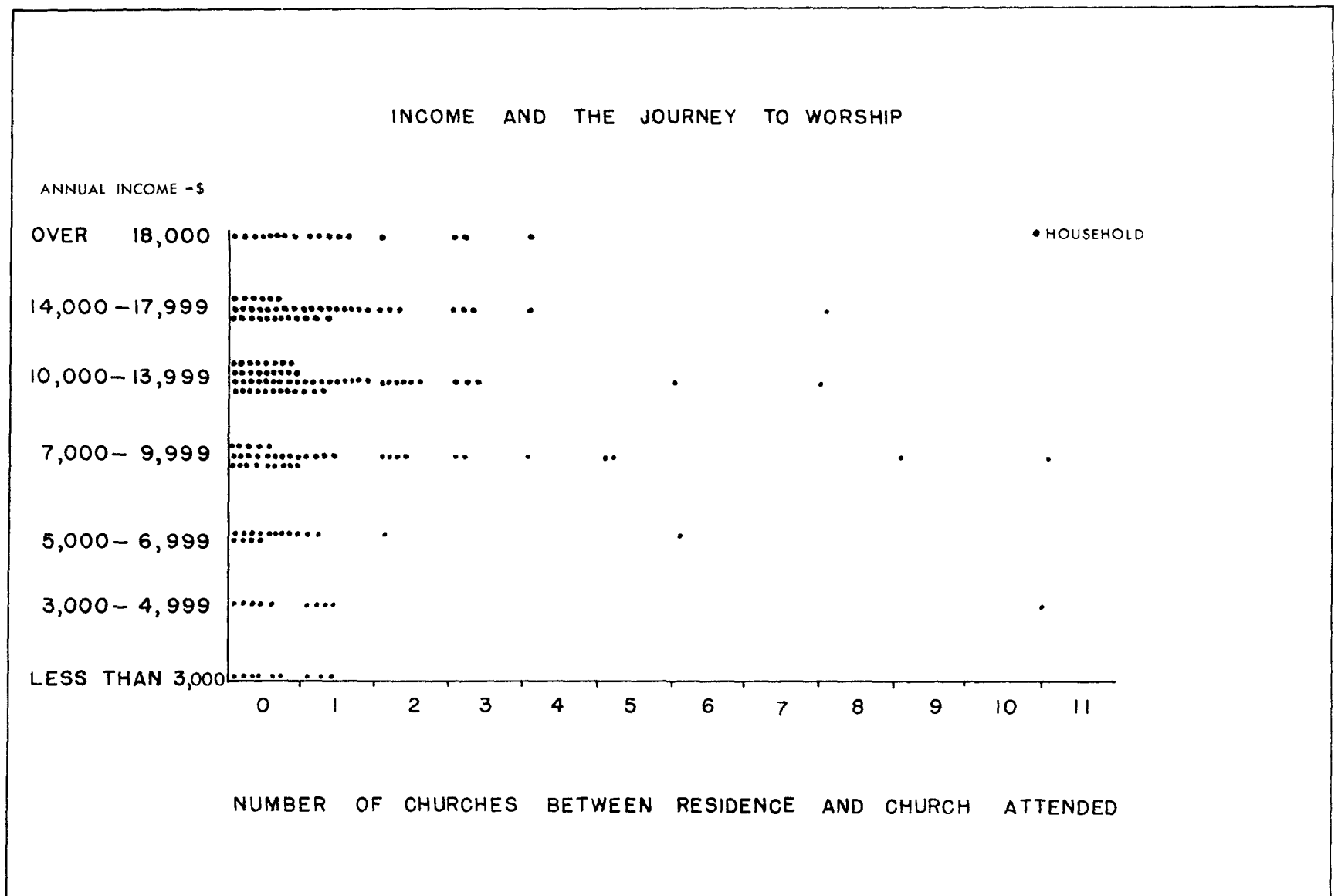

INCOME AND THE JOURNEY TO WORSHIP
ANNUAL INCOME -$
OVER 18,000
14,000 – 17,999
10,000 – 13,999
7,000 – 9,999
5,000 – 6,999
3,000 – 4,999
LESS THAN 3,000
• HOUSEHOLD
0 1 2 3 4 5 6 7 8 9 10 11
NUMBER OF CHURCHES BETWEEN RESIDENCE AND CHURCH ATTENDED

Figure 49

B. TRIP FREQUENCY AND THE JOURNEY TO WORSHIP

Garrison and Marble working respectively in Western Washington and in Cedar Rapids, Iowa, found that trip frequency is not a function of distance.[10] They found that no matter where people live, they make the same number of trips for various goods and services.

Do Waterloo households similarly make the same number of trips to use church facilities regardless of how far they live from church? Can we expect that the further a household is from church, the fewer will be the number of trips to use the facilities?

Contrary to what we might expect, the results are similar to the results achieved by Garrison and Marble. Reference to Figure 48 indicates that there is no significant relationship between trip frequency and distance travelled to church. Certain households are active church-goers regardless of how far away they live. Conversely, other households are relatively inactive church-goers regardless of how close they live.

There are however, two denomenational exceptions to the results for the total sample. Both Presbyterians and Catholics with respective correlation coefficients of -.64 and -.30, travel shorter distances to church as the trip frequency increases.

Households of these denominations feel that if the trips to use church facilities are going to be numerous, they prefer that the church be close. These households have responded positively to the principle of least effort and their decisions have affected their spatial behavior.

C. THE JOURNEY TO WORSHIP AND THE NUMBER OF PROGRAM TYPES UTILIZED

Huff has stated that in the economic sphere

> "consumers will show a willingness to travel further distances for various goods and services as the number of such items available at various locational sources increases."[11]

Could we expect, therefore, that as the number of programs attended at church increases, that there will be a corresponding increase in the distances travelled? If so, the correlation coefficient between number of programs utilized and distance should be relatively high and positive.

The relationship is not as high as we might expect, --at least for the small area studied in this paper. The Spearman correlation coefficient for these variables was only +.23, but was statistically significant (at the .05 level). Perhaps an investigation in a larger urban area would reveal a higher positive relationship.

The relationship between the number of programs utilized and attendance at the closest church etc., is graphically illustrated in Figure 50.

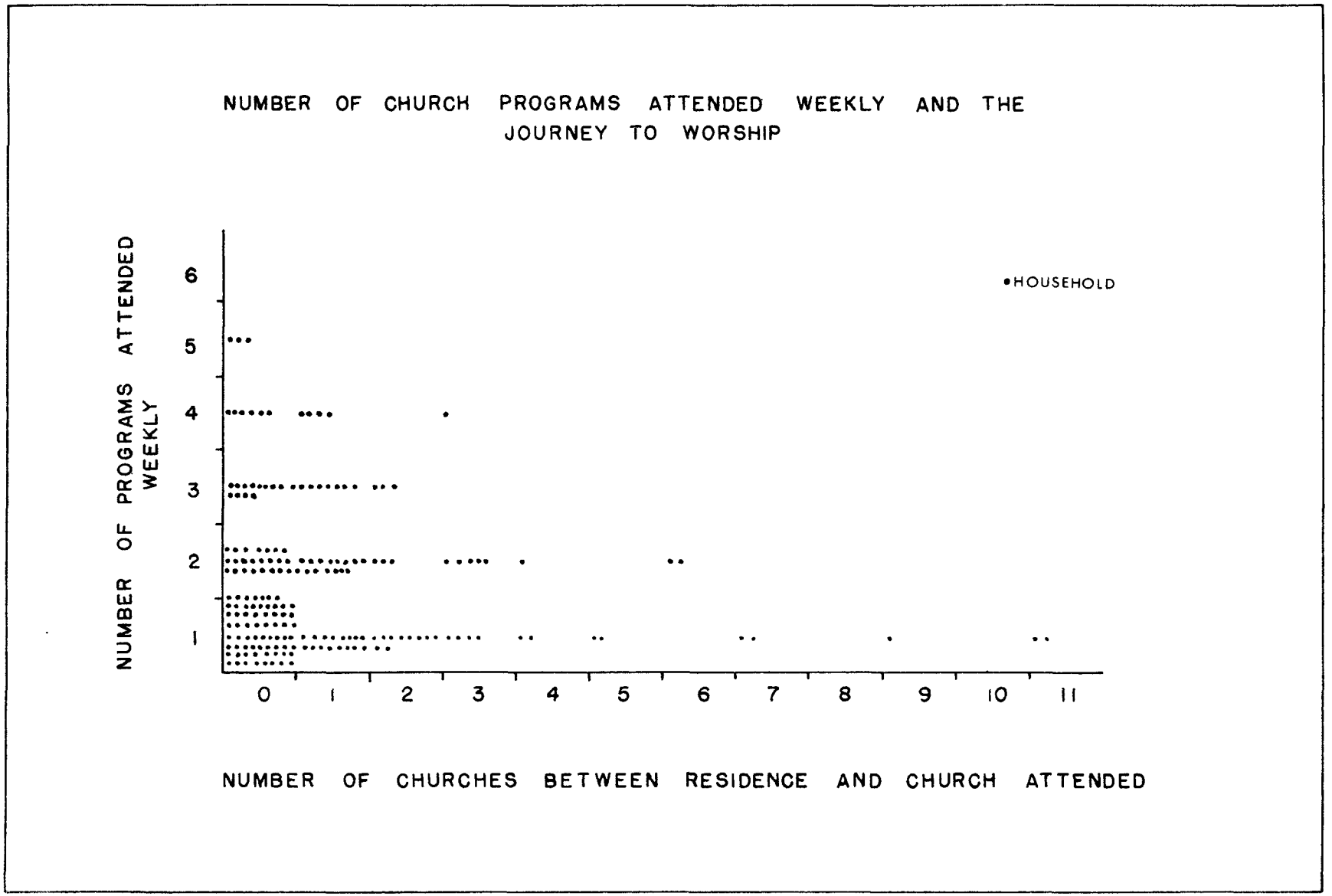

NUMBER OF CHURCH PROGRAMS ATTENDED WEEKLY AND THE JOURNEY TO WORSHIP
NUMBER OF PROGRAMS ATTENDED WEEKLY
1
2
3
4
5
6
•HOUSEHOLD
0
1
2
3
4
5
6
7
8
9
10
11
NUMBER OF CHURCHES BETWEEN RESIDENCE AND CHURCH ATTENDED

Figure 50

D. AGE AND THE JOURNEY TO WORSHIP

Studies on the journey to work have found that the length of the journey to work trip varies inversely with the age of the worker.[12] As the age of the employee increases, the distance the worker is willing to travel to work decreases.

It is to be expected similarly in the journey to worship that as age increases, individuals will be less willing to travel long distances to church.

Two measures of age are useful: the average age of the family and the age of the oldest in the family. When these measures are correlated with distance, the resultant Spearman correlation coefficients are respectively -.12 and -.16. Only the second coefficient is significant (at the .05 level).

There apparently is no relationship between the average age of the family and distance travelled to church. However, as expected, as the age of the oldest in the household increases, the corresponding length of the journey to church decreases.

Figure 51 illustrates that with households where the age of the oldest is greater than seventy years, no household is willing to bypass more than two intervening opportunities to attend the third closest church.

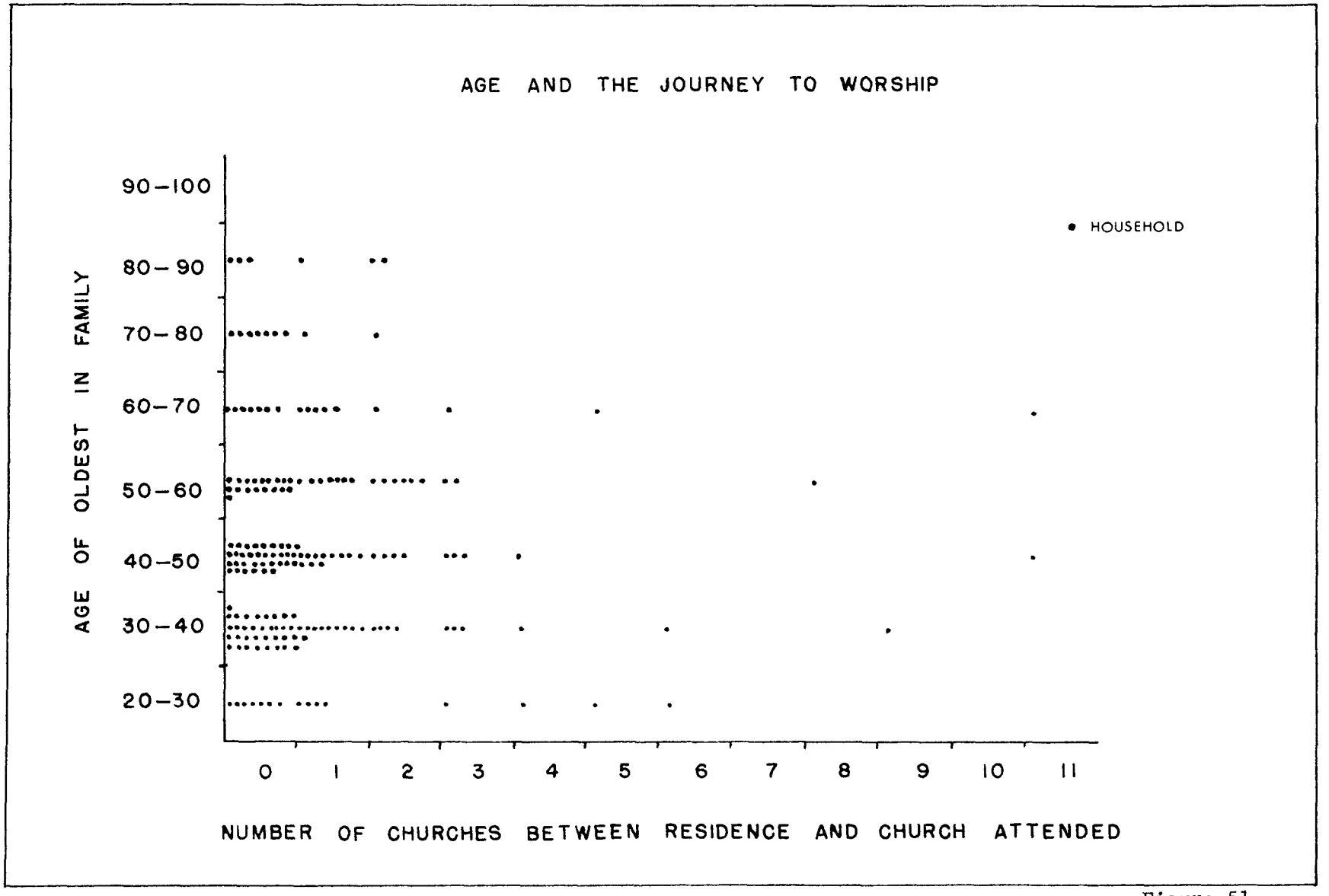

AGE AND THE JOURNEY TO WORSHIP
AGE OF OLDEST IN FAMILY
90–100
80–90
70–80
60–70
50–60
40–50
30–40
20–30
HOUSEHOLD
0 1 2 3 4 5 6 7 8 9 10 11
NUMBER OF CHURCHES BETWEEN RESIDENCE AND CHURCH ATTENDED

Figure 51

E. MODE OF TRANSPORT AND THE JOURNEY TO WORSHIP

The least effort principle dictates that as distance from church increases, the number of households walking to church should decrease whereas the number of households using private automobile or public transit systems should increase.

Carroll studied the mode of transportation in the journey to work in Massachusetts in 1942.[13] His results are illustrated in Figure 52. Comparison with the results obtained in this study (Figure 53), indicates similar tendencies.

Of the households sampled, 14.8 per cent walk to church, 83.1 per cent drive a private automobile and 2.1 per cent use public transportation.

Three basic trends are noticeable in Figure 53. First, the per cent of households using public transportation is very small. Secondly, as distance between residence and church increases, the percentage of households using cars for transportation increases. Thirdly, cars are used exclusively when 2.5 miles or more separate church and home. The exclusive use of private automobile after the 2.5 mile threshold confirms the operation of the principle of least effort in the travel of Waterloo households to church facilities.

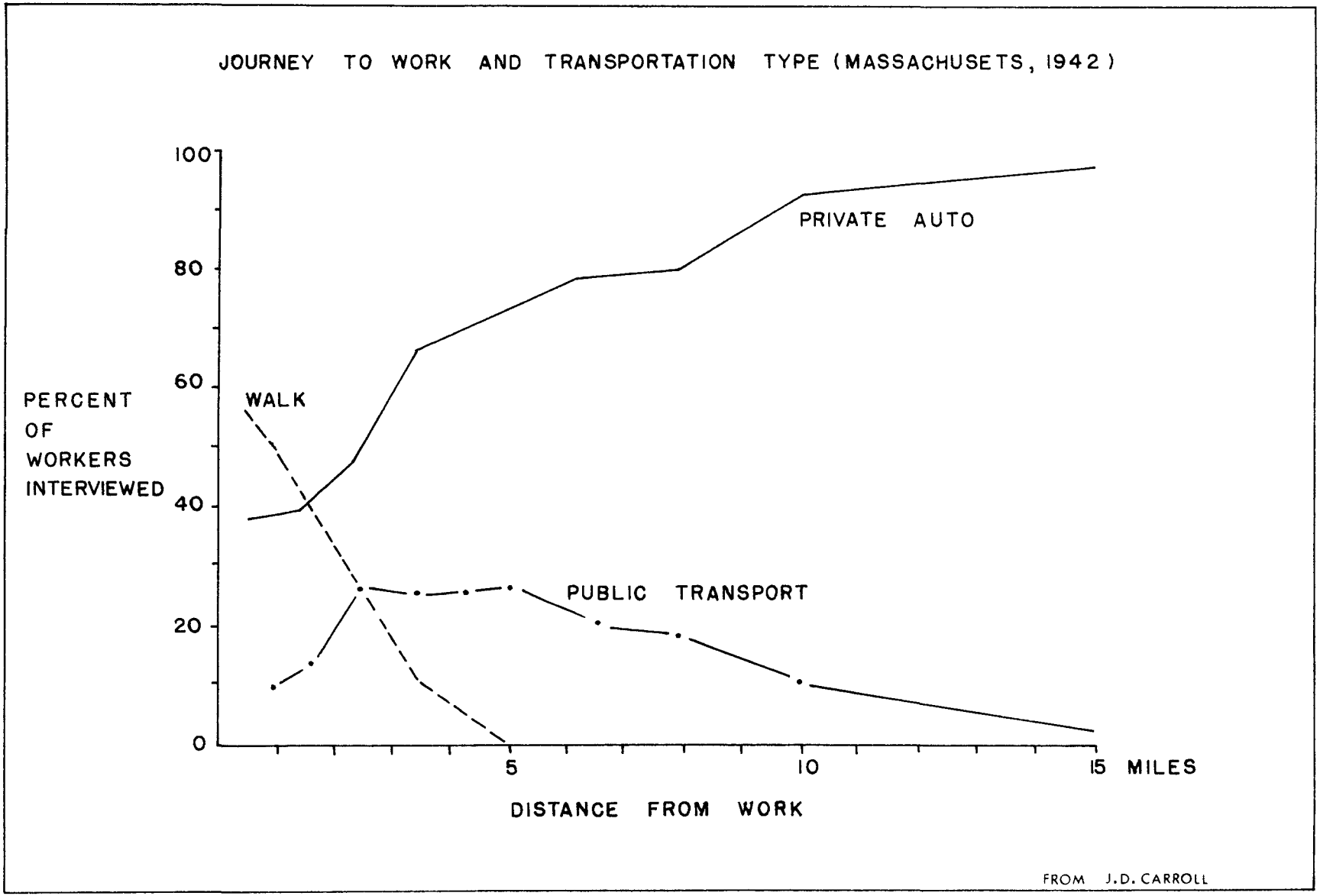

JOURNEY TO WORK AND TRANSPORTATION TYPE (MASSACHUSETS, 1942)
100
80
60
40
20
0
PERCENT OF WORKERS INTERVIEWED
PRIVATE AUTO
WALK
PUBLIC TRANSPORT
5
10
15 MILES
DISTANCE FROM WORK
FROM J.D. CARROLL

Figure 52

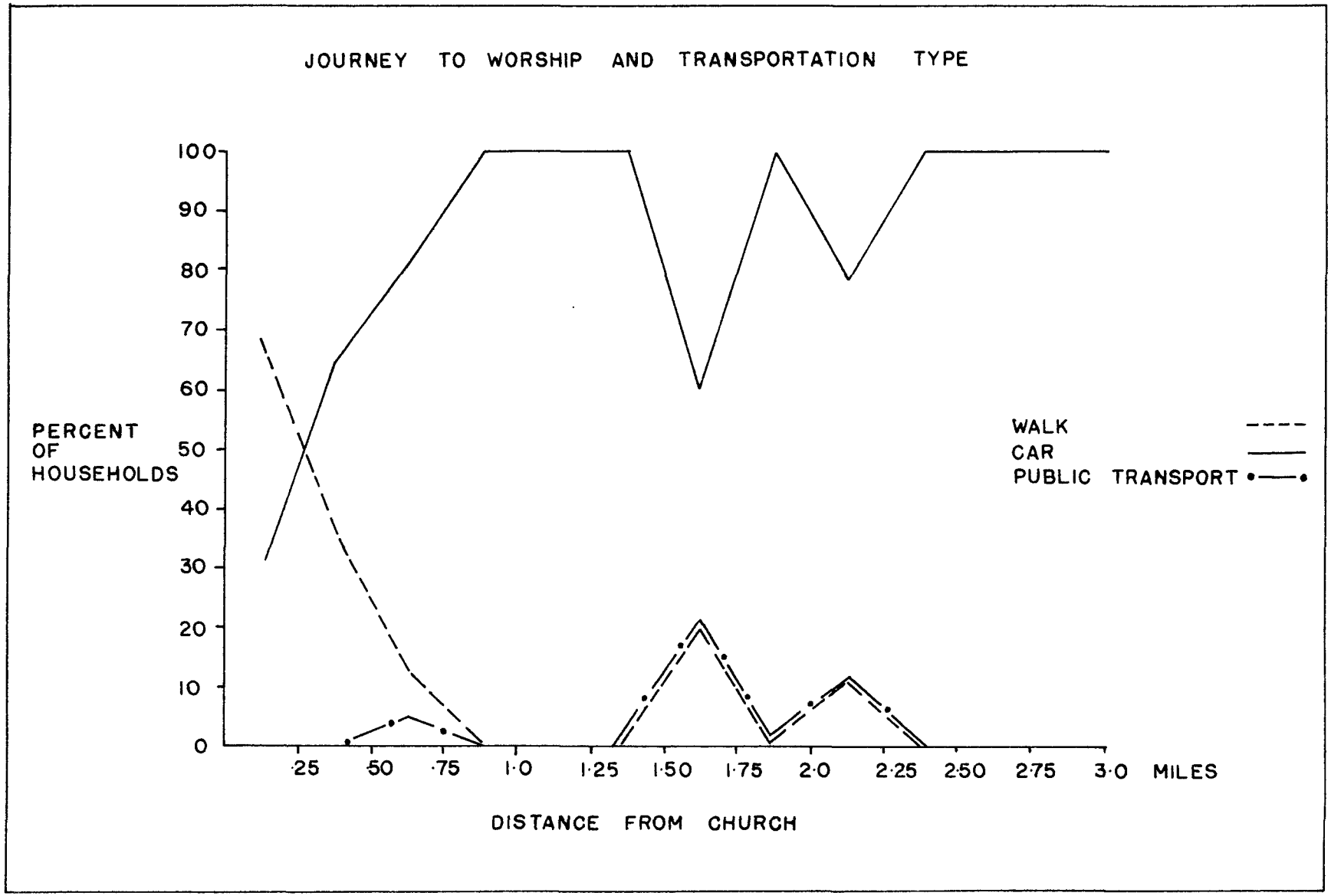

JOURNEY TO WORSHIP AND TRANSPORTATION TYPE
PERCENT OF HOUSEHOLDS
100
90
80
70
60
50
40
30
20
10
0
·25
·50
·75
1·0
1·25
1·50
1·75
2·0
2·25
2·50
2·75
3·0
MILES
DISTANCE FROM CHURCH
WALK
CAR
PUBLIC TRANSPORT

Figure 53

F. CONCLUSION

The aim of this chapter was to investigate the degree of influence of certain socio-economic variables upon the spatial travel patterns of the sampled households. It appears that for this study and the small area within its boundaries, that the socio-economic variables do not influence or determine the spatial patterns to any great degree and in most cases are not helpful in further explaining the spatial patterns generated by Waterloo households as they travel to church.

One final and somewhat different aspect of the journey to worship remains to be investigated, and it is to this we may turn next.

CHAPTER FIVE

THE JOURNEY TO WORSHIP AS PERCEIVED BY HOUSEHOLDS

Previous chapters have investigated the objective relationship of the distance households travel to church. There is, however, an important subjective aspect of the journey to worship: how important do households themselves consider distance to be in their choice of a church to attend? Households may well attend the closest church but the reason for choice of that church is not its proximity.

It is the purpose of this chapter to investigate how important distance is perceived to be compared with other factors that attract households to church.

The least effort principle expresses the tendency of consumers to minimize costs and thus maximize the reward. In the journey to worship, costs are minimized by travel to the closest church. The reward is the quality of the experience obtained. Huff has labeled the non-monetary reward obtained by consumers "psychic income".

> "There are some types of goods which are not evaluated solely by their monetary value but by the amount of "psychic satisfaction" that they afford the consumer. Usually such items have a great deal of social significance to the consumer and therefore are given rather special treatment in his selection process. ...the greater the social significance of such items, i.e., the anticipated "psychic income", the greater is the consumer's willingness to travel further for their procurement."[1]

Some of the attraction factors utilized in this chapter are measures of psychic income. An understanding of these attraction factors and their importance may shed further light on the spatial pattern.

Each household was asked in the questionnaire to indicate, from a list of nine, (Table 7), the three factors most important in their choice of church. The list presented was open ended in order that all possible attraction factors could be considered by each household. The results are shown in Table 8.

TABLE SEVEN

LIST OF ATTRACTION FACTORS

1. Style and attractiveness of the exterior.
2. Accessibility.
3. Closest church in the area at the time.
4. Closest church of your denomination at the time.
5. Personality and ability of the minister.
6. Friends and relatives attended there.
7. Children attend Sunday School and clubs there.
8. Size of the church.
9. Church program.
10. Other, specify _____

A problem arose in utilizing the above information. To use only the factor ranked first was deemed insufficient. To simply add up the figures across as a total measure of each factor's importance would ignore the strengths of preference by weighting

TABLE EIGHT

ATTRACTION FACTORS RANKED BY HOUSEHOLDS

Factor	No. of Households Ranking the Factor First		No. of Households Ranking the Factor Second		No. of Households Ranking the Factor Third	
	No.	%	No.	%	No.	%
1	1	.5	0	0.0	0	0.0
2	2	1.0	17	10.2	15	10.8
3	19	9.9	28	16.9	21	15.1
4	87	44.8	45	27.1	10	7.2
5	22	11.3	26	15.7	15	10.8
6	37	19.1	27	16.3	18	12.9
7	8	4.1	8	4.8	19	13.7
8	0	0.0	3	1.8	7	5.0
9	11	5.7	10	6.0	32	23.0
10	7	3.6	2	1.2	2	1.5
TOTALS	194	100.0	166	100.0	139	100.0

the second and third factors equally with the first. It was decided, therefore, in order for all the information available to be utilized, that the factors be weighted. The weighting procedure was arbitrary in that no information was available as to how much more important the first factor was than the second and third factors. The weights were, therefore, assigned in the most conservative manner: the first factor was multiplied by three, the second by two and the third factor by one. The weights for each factor were then summed to obtain a total measure of each factor's

"attractivity". Figure 54 illustrates the results of the weighting proceedure. The denominational breakdown of the weighted attraction analysis is given in Table 9 and is shown visually in Figure 55. It may be seen that several factors appear to be much more important than others. These will be discussed later.

TABLE NINE

WEIGHTED ATTRACTION FACTORS BY DENOMINATION

	ATTRACTION FACTORS (PER CENT OF TOTAL WEIGHT)										
Denomination	1	2	3	4	5	6	7	8	9	10	TOTAL
United	0.0	7.2	11.2	32.8	12.0	16.0	8.8	2.4	7.2	2.4	100.0
E.U.B.	0.0	9.0	11.2	23.6	15.7	20.2	3.4	0.0	13.5	3.4	100.0
Lutheran	0.0	3.9	15.7	35.2	10.0	15.7	7.8	.8	7.4	3.5	100.0
Presbyterian	0.0	3.8	8.8	22.8	20.3	20.3	7.6	2.5	10.1	3.8	100.0
Anglican	0.0	2.5	13.9	31.6	19.0	21.5	3.8	1.3	5.1	1.3	100.0
Mennonite	0.0	0.0	5.9	31.4	11.7	37.3	5.9	0.0	7.8	0.0	100.0
Baptist	0.0	1.9	15.1	28.3	26.4	5.7	5.7	3.7	11.3	1.9	100.0
Protestant Minority	0.0	4.5	0.0	29.5	22.7	18.2	4.6	4.6	9.0	6.8	100.0
Sects.	0.0	0.0	0.0	11.8	0.0	11.8	0.0	0.0	58.8	17.6	100.0
Catholic	1.1	7.5	16.1	45.0	7.1	15.0	3.6	.3	3.6	.7	100.0
TOTAL	.3	5.2	12.7	34.3	12.6	17.4	5.6	1.2	8.1	2.6	100.0

In order to facilitate analysis the ten attraction factors may also be grouped into four separate general descriptive factors--namely 1) location, 2) program, 3) social and 4) architectural and other. It is therefore possible to isolate and combine all the

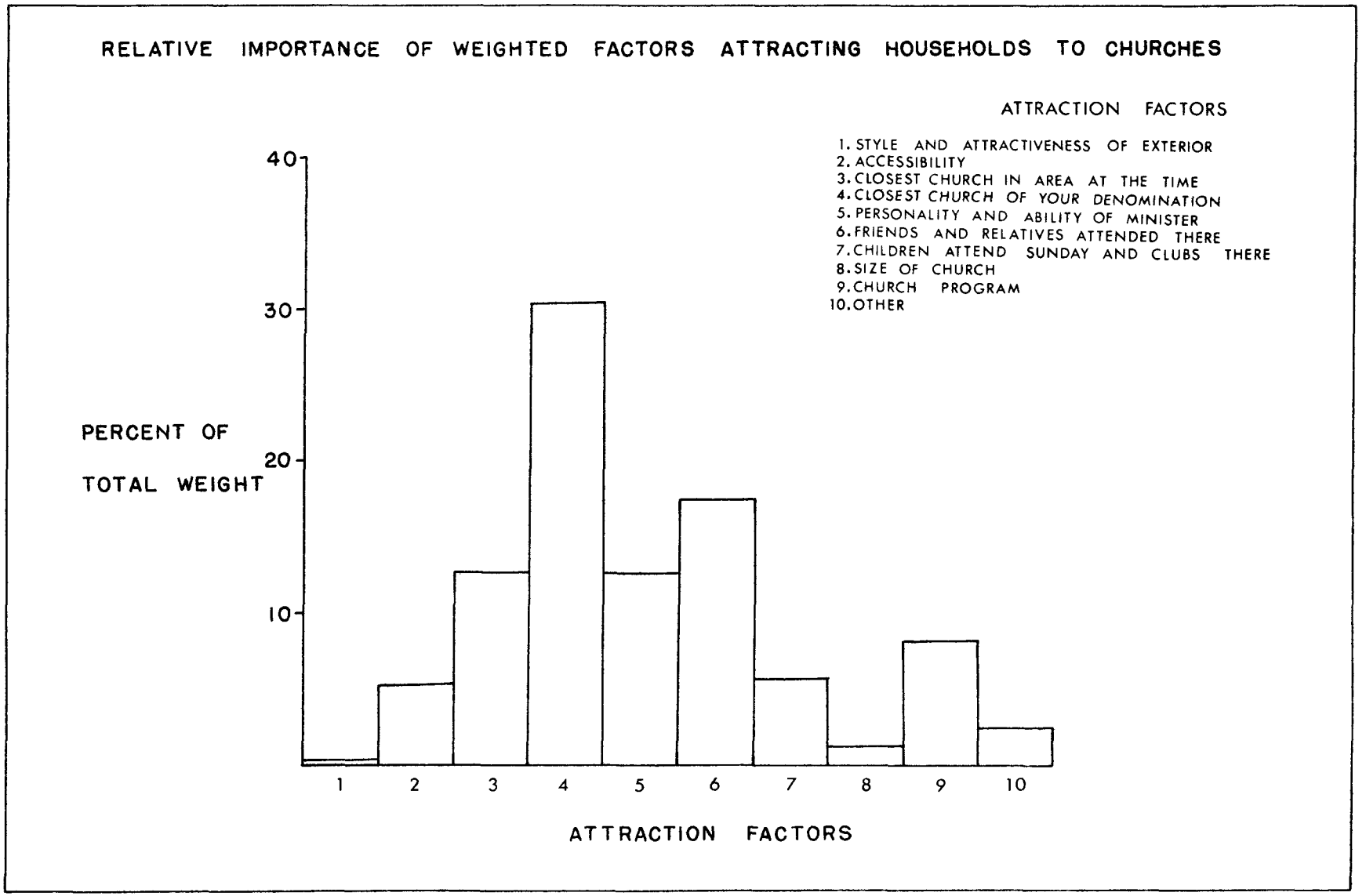

RELATIVE IMPORTANCE OF WEIGHTED FACTORS ATTRACTING HOUSEHOLDS TO CHURCHES
ATTRACTION FACTORS
1. STYLE AND ATTRACTIVENESS OF EXTERIOR
2. ACCESSIBILITY
3. CLOSEST CHURCH IN AREA AT THE TIME
4. CLOSEST CHURCH OF YOUR DENOMINATION
5. PERSONALITY AND ABILITY OF MINISTER
6. FRIENDS AND RELATIVES ATTENDED THERE
7. CHILDREN ATTEND SUNDAY AND CLUBS THERE
8. SIZE OF CHURCH
9. CHURCH PROGRAM
10. OTHER
PERCENT OF
TOTAL WEIGHT
40
30
20
10
1
2
3
4
5
6
7
8
9
10
ATTRACTION FACTORS

Figure 5

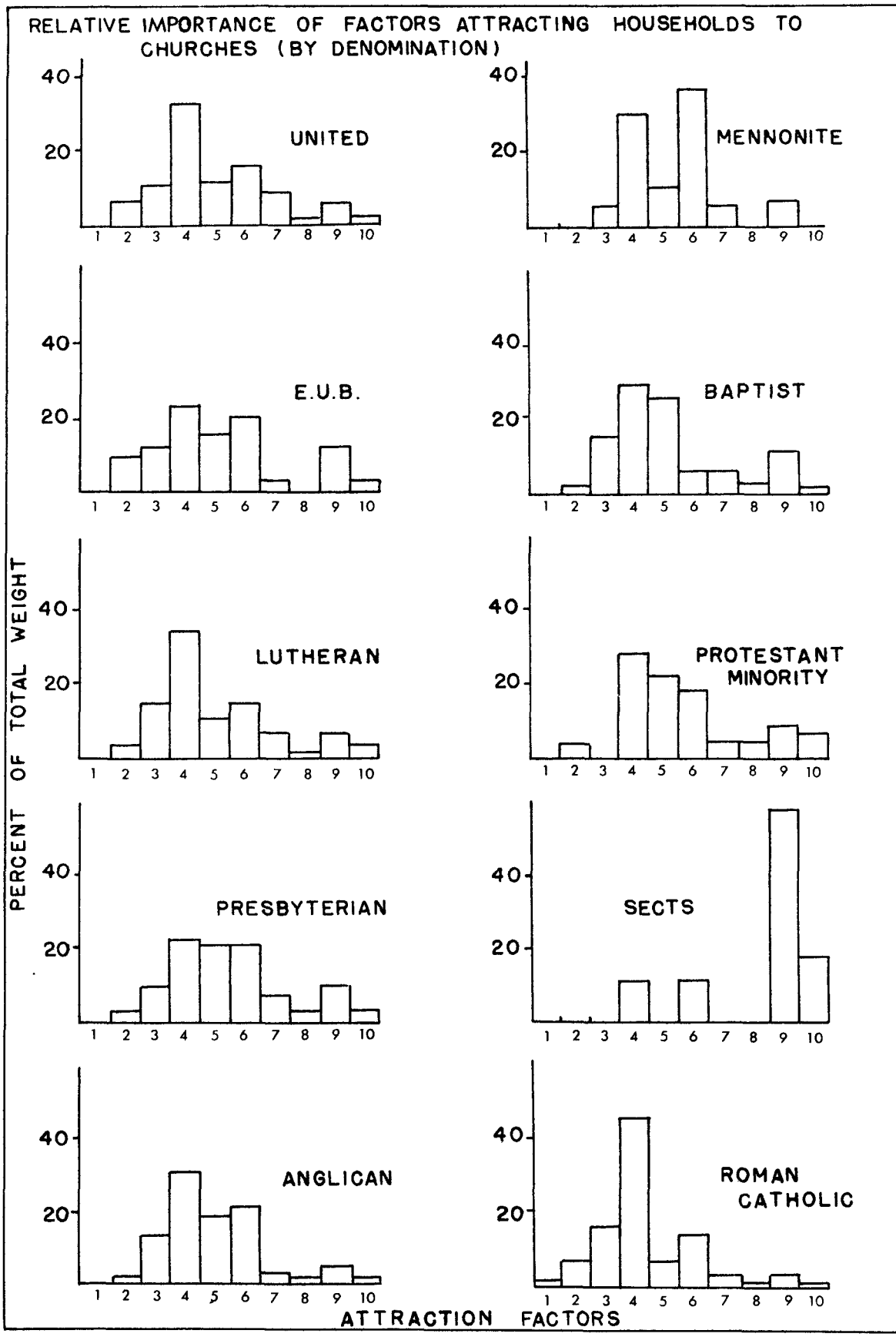

RELATIVE IMPORTANCE OF FACTORS ATTRACTING HOUSEHOLDS TO CHURCHES (BY DENOMINATION)
UNITED
MENNONITE
E.U.B.
BAPTIST
LUTHERAN
PROTESTANT MINORITY
PRESBYTERIAN
SECTS
ANGLICAN
ROMAN CATHOLIC
PERCENT OF TOTAL WEIGHT
ATTRACTION FACTORS
40
20
1 2 3 4 5 6 7 8 9 10

Figure 55

attraction factors that are related to the proximity of the church to the residence under one "location" factor. The actual factors from Table 7, which were combined to form the four new attraction factors are shown in Table 10.

TABLE TEN

GROUPED ATTRACTION FACTORS

New Factor	Combination of Previous Factors (Table 7)
1. Location	2,3,4
2. Program	5,7,9
3. Social	6
4. Architectural and Other	10,8,1

The denominational breakdown of the four attraction factors is shown in Table 11.

TABLE ELEVEN

COMPARISON OF FOUR ATTRACTION FACTORS BY DENOMINATION

Denomination	ATTRACTION FACTORS: Location		Program		Social		Architectural and Other	
	% Total Weight	Rank	% Total Weight	Rank	% Total Weight	Rank	% Total Weight	Rank
United	51.2	1	28.0	2	16.0	3	4.8	4
E.U.B.	43.8	1	32.6	2	20.2	3	3.4	4
Lutheran	54.8	1	25.2	2	15.7	3	4.3	4
Presbyterian	35.4	2	38.0	1	20.3	3	6.3	4
Anglican	48.1	1	27.9	2	21.5	3	2.5	4
Mennonite	37.2	1.5	25.6	3	37.2	1.5	0.0	4
Baptist	45.3	1	43.3	2	5.7	3.5	5.7	3.5
Protestant 'Minority Sects.	34.1	2	36.4	1	18.2	3	11.3	4
	11.8	2.5	58.8	1	11.8	2.5	17.6	4
Catholic	68.6	1	14.3	3	15.0	2	2.1	4
TOTAL	52.2	1	26.3	2	17.4	3	4.1	4

The question can now be raised "Are the denominations similar in the way in which attraction factors are perceived?" An answer to the question can be provided using the Kendall coefficient of concordance. Analysis indicates a high relationship or similarity among denominations with significant coefficients of .87 and .63 for the ten factors and four factors respectively.

The similarity between denominations in the percentages of households ranking the various attraction factors is illustrated graphically in Figures 55 and 56.

The preceeding analysis and the information from Figures 55 and 56 can be summarized in the following way.

1. Denominations are basically similar in the way in which attraction factors are perceived.
2. The single factor which appears to be the most significant in attracting households to church is the fact that the church was the closest church of the particular denomination to the household.
3. When the ten factors were reduced to four, the locational factor was the most important to households of all denominations with the exception of the Sects, the Protestant Minorities and Presbyterians. With the latter groups it appears that the program of the particular church is the most important attraction factor. The importance of the program factor appears to be most pronounced in the Sects.
4. The relative position of each denomination with respect to the perceived importance of the distance factor is illustrated in Table 12.

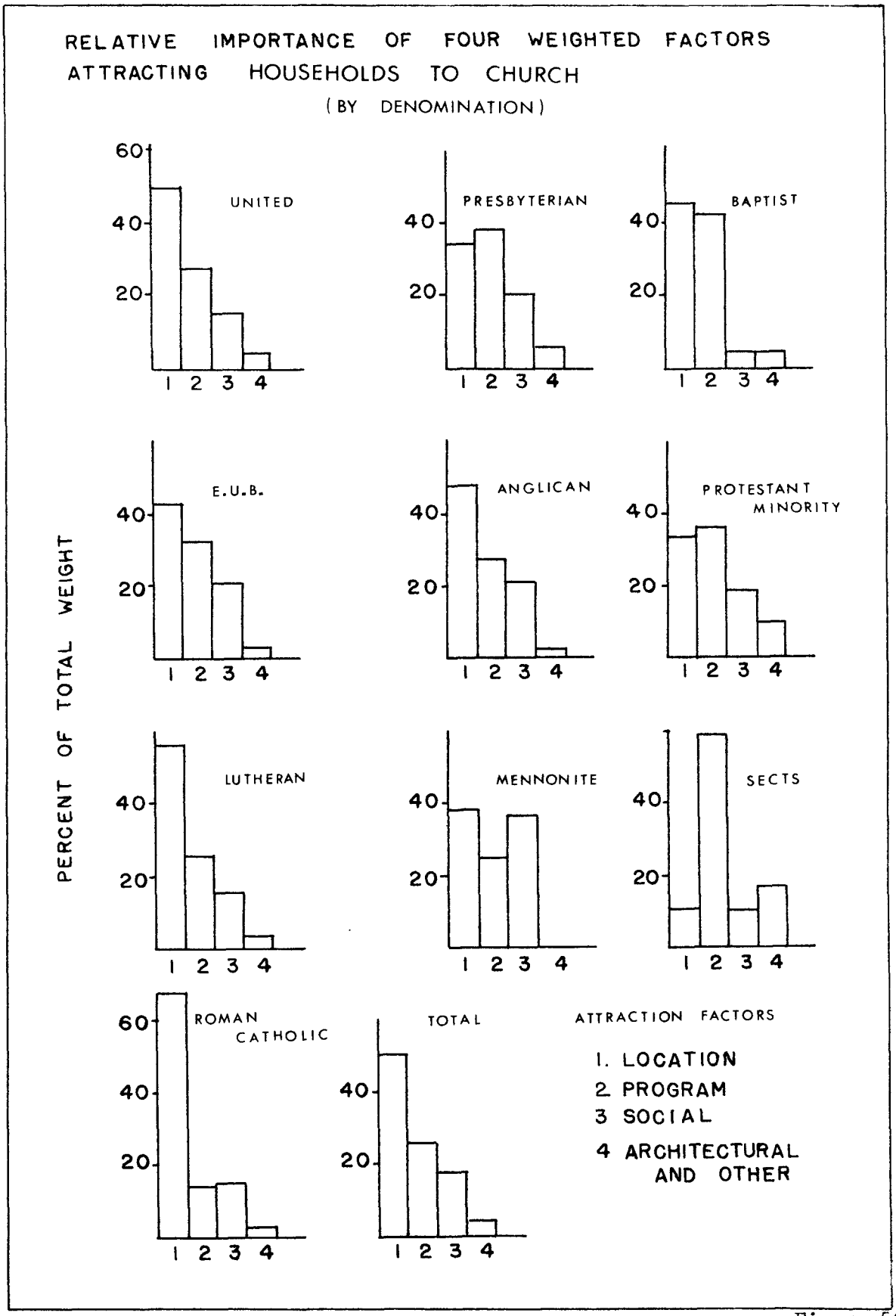

RELATIVE IMPORTANCE OF FOUR WEIGHTED FACTORS ATTRACTING HOUSEHOLDS TO CHURCH
(BY DENOMINATION)
PERCENT OF TOTAL WEIGHT
UNITED
PRESBYTERIAN
BAPTIST
E.U.B.
ANGLICAN
PROTESTANT MINORITY
LUTHERAN
MENNONITE
SECTS
ROMAN CATHOLIC
TOTAL
60
40
20
1 2 3 4
ATTRACTION FACTORS
1. LOCATION
2. PROGRAM
3 SOCIAL
4 ARCHITECTURAL AND OTHER

Figure 56

TABLE TWELVE

RELATIVE PERCEIVED IMPORTANCE OF THE DISTANCE FACTOR

Denomination	Rank
Catholic	1
Lutheran	2
United	3
Anglican	4
Baptist	5
E.U.B.	6
Mennonite	7
Presbyterian	8
Protestant Minority	9
Sects.	10

5. All denominations appear to place little importance upon the social attraction factor with the exception of the Mennonite denomination. This denomination places strong emphasis on family ties.
6. With the exception of the Sects, architecture, style, size and other possible attraction factors appear to have little perceived attraction importance. The Sects placed some importance upon factors other than those specified specifically in Table 7.

In summary, it appears as though the least effort principle analyzed in earlier chapters is not only objectively but also subjectively very important in explaining attraction to church. We have discovered that not only do the majority of households attend the closest church of their particular denomination, but, their perception of the proximity to church as the most important attraction factor reinforces their spatial action.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

A. SUMMARY

It has been the purpose of preceeding chapters to illustrate the journey to worship of Waterloo households and then attempt to explain the spatial pattern utilizing the least effort principle. It was discovered that if historical tension and dimensional tension are considered, one is able to predict the actual pattern of the journey to worship with seventy per cent accuracy. The fact that seventy per cent of the sample attend the closest church of their particular denomination at the time of entry into the earliest address in the Twin Cities appears to indicate that the distance to church is an important attraction factor.

An analysis of the socio-economic factors that could effect the space preference of households indicated that income, age, trip frequency, the number of church programs utilized and family size do not determine to any great extent the travel patterns of households as they travel to worship.

In a final chapter the perception of households was analyzed as to which factors were considered most important in attracting the household to church. It was discovered that a large percentage of the households indicated that proximity to church was the most important attraction factor. This result verifies the previous conclusions on the important effect of the

least effort principle on the journey to worship of Waterloo households.

The question can now be asked, "Is there some way to summarize or generalize the above findings so that they can be in a more useful form for future study and for comparisons in other areas where similar studies may be undertaken?"

The results of the study have generally shown that whenever there is a choice available, the majority of households tend to use the closest church facilities rather than churches at greater distances. In other words spatial interaction falls off with distance.

This distance decay relationship has been commonly described with the use of a distance decay or lapse rate curve. The distance decay curve for this study is illustrated in Figure 57. The decline in spatial interaction with distance is obvious.

Can this relationship be described mathematically? The answer, interestingly, is yes. The curve illustrates what is known as the Pareto function, which has the form

(1) $I = aD^{-b}$ where D = distance
I = interaction,
a and b are constants.

> "Behind the Pareto function...is the gravitational concept, the relation of the attractiveness of destinations at various distances to be overcome."[1]

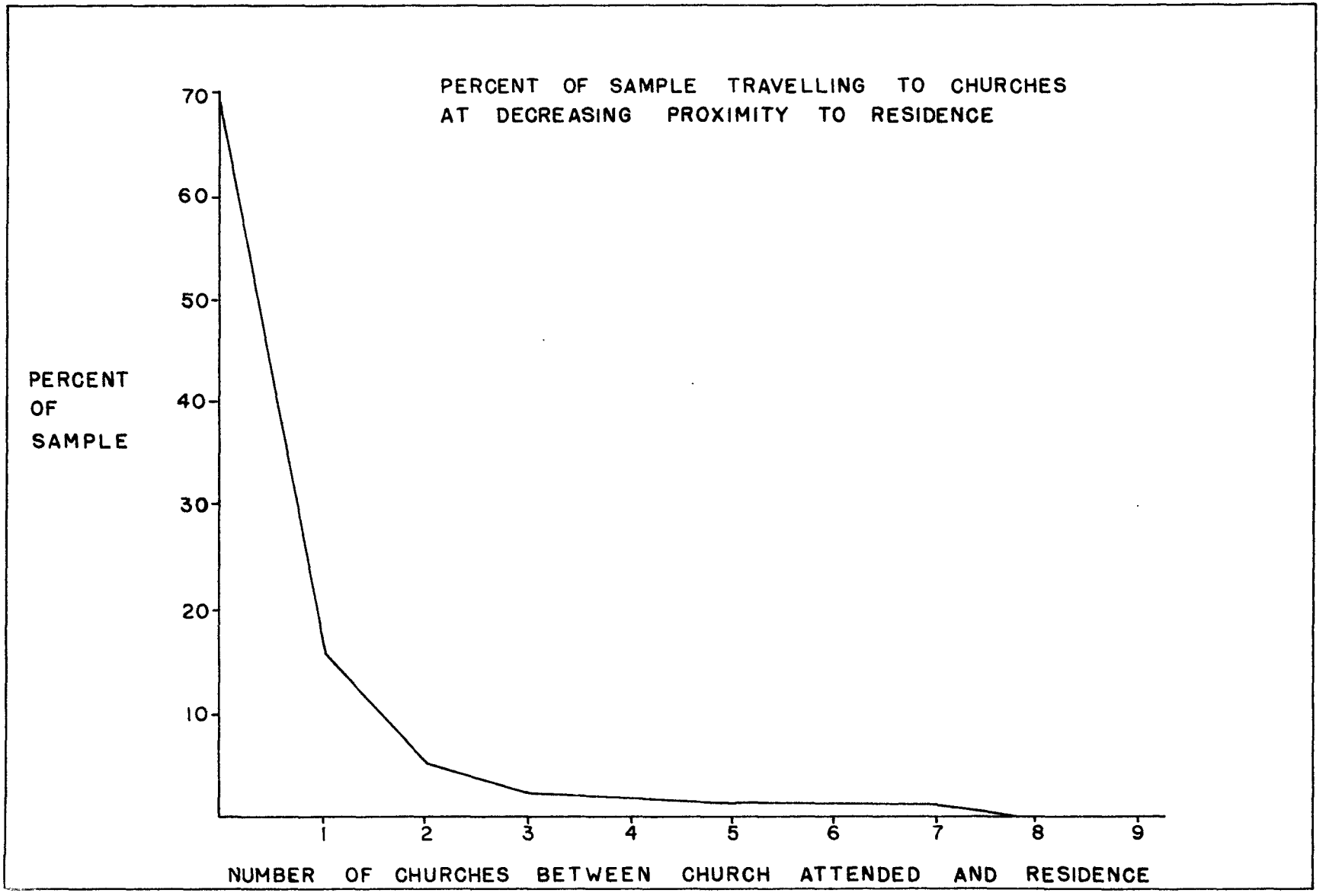

PERCENT OF SAMPLE TRAVELLING TO CHURCHES
AT DECREASING PROXIMITY TO RESIDENCE
PERCENT
OF
SAMPLE
70
60
50
40
30
20
10
1
2
3
4
5
6
7
8
9
NUMBER OF CHURCHES BETWEEN CHURCH ATTENDED AND RESIDENCE

Figure 57

If the function is graphed using arithmetic scales, the resulting curve is a reversed "J" similar to Figure 57 in which flow decreases relatively rapidly over shorter distances and then falls off over the longer distances.

Using the observations of this study, the equation for the Pareto function which best fits the data was discovered to be

$$(2)\quad I = .70D^{-2.5}$$

where D = relative proximity of church to residence i.e. closest church, 2nd closest, etc.

The actual distribution is compared with the above Pareto function in Figure 58. It was discovered that there was no significant difference between the two curves as indicated by a Chi Square test (.05 level of significance).

The value for "b" in equation (1) has generally been of great interest to geographers.

> "Low b values indicate a gentle gradient with a wide field of movement, whereas high b values give sharp distance decay effects".[2]

Stated in other terms more familiar to this study;

> "If distance is considered to be analogous to friction, in that it slows down or decreases interaction as it is applied, then increasing the exponent is analogous to increasing the amount of friction and the effect of distance."[3]

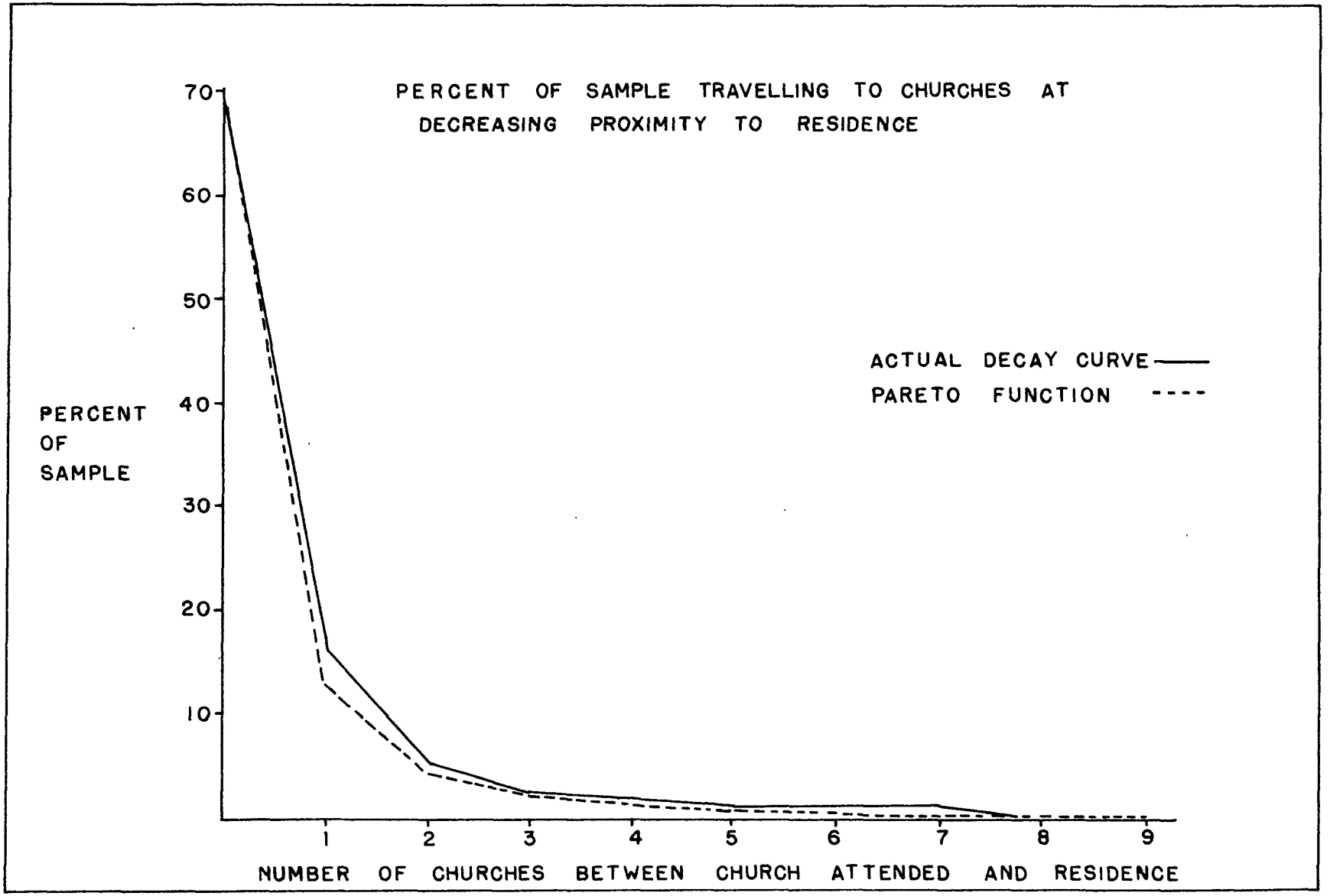

PERCENT OF SAMPLE TRAVELLING TO CHURCHES AT DECREASING PROXIMITY TO RESIDENCE
ACTUAL DECAY CURVE
PARETO FUNCTION
PERCENT OF SAMPLE
70
60
50
40
30
20
10
1
2
3
4
5
6
7
8
9
NUMBER OF CHURCHES BETWEEN CHURCH ATTENDED AND RESIDENCE

Figure 58

Researchers have suggested that the exponent changes not only with the area but also with the phenomena and the cultural background of the individuals involved in the spatial interaction. For example, Marble and Nysteun found an exponent value of -2.74 when investigating direct day to day contacts in Cedar Rapids, Iowa.[4] A study of marriage distances in Seattle had an exponental value of -.589.[5]

It has generally been found in Europe that values for $b = -1$ or using D^2 gives fairly good results, while in America the value of $b = 1$ generally gives better results.[6] Haggett has suggested that the difference in "b" values might be related to the fact that in the United States the effect of friction is decreased due to a higher level of technology.[7]

How then does the exponential value of the present study compare with the values stated above? It appears that for the journey to worship in the Twin Cities a value of $b = -2.5$ best suits the data. This indicates that compared to other studies in Europe and America that there is relatively constrained fields of movement in the travel to worship and that the friction of distance appears to affect substantially the spatial patterns of households as they travel to worship.

B. VALUE OF THE STUDY

This paper hopefully adds to our understanding of the spatial patterns resulting from man's religious convictions. Sopher has said that

> "Geography cannot deal with the personal religious experience, which is to some the core of religion. But religion has been defined as "a system of faith and worship;...a body of institutionalized sacred beliefs, observances, and social practices. Geography can study organized religious systems and culturally molded institutionalized religious behavior".[8]

A segment of the religious behavior of Waterloo households has been analyzed in this paper.

Much work has been done in geography on the investigation of individual space preferences as represented by lines of travel from home to other points. This study, together with studies on the journey to work and consumer travel studies, increases our knowledge of individual space preference and resultant travel patterns.

The conclusions reached in this thesis can also hopefully aid those individuals responsible for planning the location of new churches in urban areas and should be especially helpful to

church planners in the Kitchener-Waterloo area. It has been an observable policy that churches be erected in new suburban areas of the city. This study indicated the validity of such action. Had the principle of least effort not been an important explanatory factor in the travel pattern, then the existence of the small suburban church and the erection of new suburban churches could have been seriously questioned.

Finally the study is an example of a geographic problem in which both functional and genetic approaches were utilized in examining the validity of a law, namely the principle of least effort.

C. AREAS FOR FUTURE RESEARCH

Several exciting areas for future research were recognized during the preparation of this paper. A few research possibilities involve simply expanding the study framework to cover more and larger urban areas. The study could also again be carried out in the Twin Cities, this time utilizing multiple dwelling units rather than the single family dwellings studied in this paper. In this way new values can be determined for the Pareto function and comparison with the Pareto function derived in this paper would increase our understanding of religious spatial interaction within urban environments.

Future research could also concentrate on individual denominations or churches. A larger more meaningful sample would enable the researcher to determine the Pareto function for each denomination. These functions, as measures of the friction of distance would enable further research into the differences between denominations. These micro studies would increase our understanding of the "trade" areas of churches and thus increase our knowledge of the religious spatial system.

A more specific area of future research involves simulation of the journey to worship. Experimental data from this

study on spatial behavior of mobile households as they travel to church permits the construction of an individual information field. An aggregation of the individual information fields into a mean information field for the area studied would be useful in computer simulation of household travel to church.

The mean information field for the present study could be calculated from the Pareto function described earlier. Probabilities of travel patterns to churches could be calculated and addresses assigned to a floating grid. This floating grid would be placed over a household on a map and a random number table would then be utilized to simulate the travel pattern for the household. A more sophisticated computer program could be utilized to simulate travel in a large area.

Another area for future research could involve an investigation of directional bias in the travel to worship. The question could be asked, "Do households travel generally toward the core of an urban area or toward the periphery?" Analysis of the direction from which households come to a particular church and a study of the angles of approach could tell us more about individual church attractiveness and about the travel bias of the consumer of church facilities.

A final suggestion for future research could involve the use of a more sophisticated form of the gravity model than that used in this paper. The use of the gravity model would involve

the calculation of a "mass" variable. In the present study it was assumed that each church would attract with equal drawing power and that each church could make provision for any number of parishioners attracted. One possibility for calculation of the mass variable would be to substitute size of the church. Horton has said that

> "it has been assumed that, in general, increased investment in the form of a rise in capital investment and/or operating costs will lead to greater numbers of consumers being attracted to sites."[9]

The spatial patterns of man's religious space preferences provide a rich field of enquiry for the geographer. Let us hope geographers undertake more investigations; religion is too important to men individually and collectively not to be investigated by contemporary methods.

FOOTNOTES

FOOTNOTES TO CHAPTER ONE

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[3]Elaine M. Bjorklund, "Ideology and Culture in Southwestern Michigan", Cultural Geography: Selected Readings, ed. Fred E. Dohrs, and Lawrence M. Sommers. (New York: Thomas Y. Crowell Company, 1967), p.272.

[4]David. E. Sopher, Geography of Religions (Foundations of Cultural Geography Series; Englewood Cliffs, N.J.: Prentice-Hall Inc., 1967), p.24.

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[7]Zelinsky, pp.139-167.

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[13]Interview with Sam Head, Planning Department, City of Waterloo, May 25, 1972.

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[15]Kitchener-Waterloo Record, Nov. 30, 1968, p.33.

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[17]C.C. Bricker, Annual Report of the Assessment Commissioner for the City of Waterloo for One Year Ending Dec. 31, 1968.

[18]Kitchener-Waterloo Record, Dec. 28, 1968.

[19]Kitchener-Waterloo Record, Nov. 9, 1968.

FOOTNOTES TO CHAPTER TWO

[1]George K. Zipf, Human Behavior and the Principle of Least Effort (New York: Hafner Publishing Company, 1949), p.1.

[2]J.D. Carroll, Jr., "Some Aspects of the Home-Work Relationships of Industrial Workers", Land Economics, XXV (1949), pp.414-422.

[3]L.F. Schnore, "The Separation of Home and Work: A Problem for Human Ecology", Social Forces, XXXII (1953/54), p.336, quoting Harry R. Reed Jr., "The Journey to Work for Manufacturing Workers: A Case Study in Kitchener, Ontario." (Unpublished Masters dissertation, Dept. of Geography and Planning, University of Waterloo, 1969), p.12.

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[5]W.A.V. Clark, "Consumer Travel Patterns and the Concept of Range", Annals of the Association of American Geographers, LVIII, No. 2 (1968), p.386.

[6]Gunnar Olsson, Distance and Human Interaction (Bibliography Series Number Two; Philadelphia, Pa.: Regional Science Research Institute, 1965,) p.58.

[7]John D. Nystuen, "Identification of Some Fundamental Spatial Concepts", Spatial Analysis, ed. Brian J.L. Berry and Duane F. Marble (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1968), p.40.

FOOTNOTES TO CHAPTER THREE

[1]John D. Nystuen, "Identification of Some Fundamental Spatial Concepts," Spatial Analysis, ed. Brian J.L. Berry and Duane F. Marble (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1968), p.40.

[2]Interview with Father Gehl, St. Mary's Roman Catholic Church, Kitchener, August 3, 1972.

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[5]Robert A. Murdie, "Cultural Differences in Consumer Travel," Economic Geography, XLI, No. 2 (1965), pp.211-233.

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FOOTNOTES TO CHAPTER FOUR

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[2]Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences, (McGraw-Hill Series in Psychology; York, Pa.: McGraw-Hill Book Company, Inc., 1956), pp.202-213.

[3]Ibid., pp.166-172.

[4]David L. Huff, "Ecological Characteristics of Consumer Behavior, " Papers and Proceedings of the Regional Science Association, VII, No. 1 (1961), p.21.

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[10]W. Bunge, Theoretical Geography, (Lund Studies in Geography; Lund, Sweeden: Gleerup, 1962), p.147.

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[12]Allen, p.60.

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FOOTNOTES TO CHAPTER FIVE

[1]David L. Huff, "Ecological Characteristics of Consumer Behavior", Papers and Proceedings of the Regional Science Association, VII, No. 1 (1961), p.25.

FOOTNOTES TO CHAPTER SIX

[1]Richard L. Morrill, and Forrest R. Pitts, "Marriage, Migration, and the Mean Information Field: A Study in Uniqueness and Generality", Annals of the Association of American Geographers, LVII (June, 1966), p.412.

[2]P. Haggett, Locational Analysis in Human Geography, (London: Edward Arnold, 1965), p.329.

[3]Herbert G. Kariel and Patricia E. Kariel, Explorations in Social Geography, (Reading, Mass: Addison-Wesley Publishing Company, 1972), p.327.

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[7]Ibid.

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APPENDICES

APPENDIX I

THE CHURCH QUESTIONNAIRE

CHURCH QUESTIONNAIRE

1. Do you use church facilities? Yes _____ No _____

   a) if 'yes' how often?

   _____ one service a week
   _____ two services a week
   _____ more than two
   _____ once a month
   _____ other

   b) if 'no' would you if a church of your choice was closer to your home? Yes _____ No _____

2. Are you a church member? Yes _____ No _____

3. What is your denomination? _____

4. Which church do you attend? _____

5. What type of church programme does your family attend?

   _____ children's programmes
   _____ worship
   _____ sunday school
   _____ prayer service
   _____ social club
   _____ other, specify _____

6. How do you get to church?

   _____ walk
   _____ car
   _____ public transit

7. How long have you lived in this home? _____

8. Did you live in the twin cities previously? Yes _____ No _____

   a) if 'yes' did you attend this church before you moved here? Yes _____ No _____

   b) if 'no' (to Part a) what church did you attent?

   _____

   c) What was your previous address? _____

9. Approximately how far do you drive to church? _____ miles.

10. Approximately how long does it take you to get to church? _____ minutes.

11. What first attracted you to your church? Rank 3 in order of importance with 1 as most important.

____ Style and attractiveness of the exterior

____ Accessibility

____ Closest church in the area at the time

____ Closest church of your denomination at the time

____ Personality and ability of the minister

____ Friends and relatives attended there

____ Children attended sunday school and clubs there

____ Size of the church

____ Church Programme

____ Other, specify _____

12. Which churches do you know of between your present home and your church?

_____ _____ _____

13. If you were to move to a new city which of the following would you prefer to attend?

____ small church in your community

____ large downtown church

14. What is the age structure of your family?

Age in Years	Mother	Father	Single	Children or Other Household Occupants
0 - 9				
10 - 19				
20 - 29				
30 - 39				
40 - 49				
50 - 59				
60 - 69				
70 - 79				
80 and over				

15. What is the occupation of the head of the household?

____ professional
____ clerical
____ retired
____ skilled labourer
____ unskilled labourer
____ student
____ housewife
____ salesman
____ manager, owner
____ civil servant
____ other, specify _____

16. What is your approximate annual gross family income? This includes all money earned by members of your household.

____ under $3,000
____ $3,000 - $4,999
____ $5,000 - $6,999
____ $7,000 - $9,999
____ $10,000- $13,999
____ $14,000- $17,999
____ $18,000 and over

17. How does the head of the household get to work?

____ walk
____ car
____ public transit

18. Approximately how far is it from your home to the place of employment? _____ miles.

19. Approximately how long does it take to get from your home to the place of employment? _____ minutes .

APPENDIX II

CHURCHES OF KITCHENER AND WATERLOO

AND DATE OF FOUNDING IN PRESENT LOCATION

CHURCHES IN KITCHENER AND WATERLOO

AND DATE OF FOUNDING IN PRESENT LOCATION

CHURCH	DATE OF FOUNDING
United	
First United	1890
Parkminster	1960
Trinity	1831
Highland Road	1948
Forest Hill	1963
St. James	1956
Christ the King	1961
Evangelical United Brethren	
Emmanuel (1) Waterloo	1849
Calvary	1920
Zion	1839
Olivet	1931
Emmanuel (2) Bridgeport	1879
St. Timothy	1950
Lutheran	
Pilgrim	1966
Messiah	1969
St. Johns	1837
Redeemer	1935
Grace	1944
St. Pauls (1)	1835
St. Pauls (2)	1889
St. Marks	1939
St. Peters	1877
St. Matthews	1904
Holy Cross	1948
Reformation	1956
St. Stephens	1952

Lutheran Cont'd

St. Lukes	1940
St. Philips	1958
Mt. Zion	1956
Faith	1958
Hope	1964
Christ Lutheran	1967

German Lutheran

Martin Luther	1953
Bethel	1949

Mennonite

United	1927
Stirling Avenue	1925
Zion Mennonite Brethren (German)	1961
Mennonite Brethren (Ottawa Street)	1936
Mennonite Brethren (Brighton Public School)	1960
First Mennonite	1813
Erb Street Mennonite	1852
Rockway	1960

Presbyterian

St. Andrews	1854
Knox	1927
Calvin	1960

Anglican

St. Columba	1961
St. John Evangelist	1861
Christ Church	1947
Holy Trinity	1954
All Saints	1959
Holy Savior	1897
St. Andrews	1948
St. Georges Forest Hill	1963

Fellowship Baptist

First	1934
Benton	1851
Bethel	1946
Grandview	1969

Convention Baptist	
Highland Road	1959
Glen Acres	1956
Stanley Park	1968
Baptist (German)	
Central Baptist	1955
Salem Baptist	1962
Roman Catholic	
St. Michaels	1961
St. Agnes	1967
Our Lady of Lourdes	1953
St. Louis	1890
St. Johns	1938
St. Marys	1857
Sacred Heart	1918
St. Theresa	1956
St. Annes	1951
St. Daniels	1969
St. Josephs	1930
St. Francis	1960
St. Jeromes	1953
St. Aloysius	1953
Pentecostal	
Waterloo	1949
Kitchener Gospel Temple	1968
German Pentecostal	1959
Missionary Church	
Lincoln Heights	1967
Evangel	1949
Faith	1960
Bethany	1908
Latter Day Saints	1964
Jehovah Witness	
Waterloo	1964
Kitchener	1959

New Apostolic	
Lancaster	1950
Victoria Street	1946
Sixth Avenue	1950
Lodge Street	1925
Christian Science	1900
Christian Reform	1965
Quaker	1969
United Brethren	
Stanley Park	1968
Alliance	1971
Apostalic Christian	1954
Brethren	
Bethel Chapel	1947
Gospel Hall	1939
Church of God (German)	1956
Church of God	1963
Deutsche Evang. Gemeinde	1963
Greek Orthodox	1926
International Gospel Centre	1970
Missionary Tabernacle	1935
Nazarene	1960
Salvation Army	1966
Swedenborgian	1936
Ukranian Orthodox	1970
Unitarian Hall	1963
Reorganized Church of Latter Day Saints	1966

APPENDIX III

CORRELATION OF DENOMINATIONAL TRAVEL PATTERNS USING THE KENDALL COEFFICIENT OF CONCORDANCE

CORRELATION OF DENOMINATION TRAVEL PATTERNS

Null Hypothesis: There is no agreement among denominational travel patterns.

RANK TABLE

Denomination	Ranking of Numbers of Households Attending		
	Closest Church	Second Closest Church	Other Churches
United	1	2	3
E.U.B.	1	3	2
Lutheran	1	3	2
Presbyterian	1	2	3
Anglican	1	2	3
Mennonite	1	2.5	2.5
Baptist	1	2.5	2.5
Roman Catholic	1	3	2
Protestant Minority	1	2.5	2.5
Sects.	1	2.5	2.5
	10	25	25

Using the formula $$W = \frac{S}{\frac{1}{12} k^2(N^3-N) - k\sum_T T}$$

where s = sum of squares of the observed deviations from the mean of R_j i.e. $s = \sum(R_j - \frac{\sum R_j}{N})^2$

k = number of sets of rankings

N = number of entities ranked

T = correction for ties = $\frac{\Sigma(t^3-t)}{12}$

t = number of observations in a group tied for a given rank.

Now $$W = \frac{150}{\frac{1}{12}(10)^2(3^3-3) - 10(2)} = .83$$

Test of Significance

From the table for critical values of s, for N=3 and k=10, the value equals 60 (at the .05 level). Now 150 > 60 therefore we reject the null hypothesis.

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