Goal Achievement in Two English New Towns: An Analysis of Occupational Class Mixing in Crawley and Hemel Hempstead New Towns

Phillip J. Zimmerman
GOAL ACHIEVEMENT IN TWO ENGLISH NEW TOWNS: AN ANALYSIS OF OCCUPATIONAL CLASS MIXING IN CRAWLEY AND HEMEL HEMPSTEAD NEW TOWNS

by

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CHAPTER I

INTRODUCTION

The decision of the British Government to publicly finance New Town building was a landmark event. The decision was, however, a result of many years of prior experimentation. These experiments ranged from trial-and-error to plans well thought out, that contained within them many philosophical goals.

The first widely accepted formulation of a New Town was that of Ebenezer Howard. The theoretical plan contained several goals that were to be developed, used, and modified by later British planners. Although Howard borrowed many goals from other "planners," he was one of the first to incorporate many identifiable goals into a single master plan. The goals include a healthy environment, separation of industrial and residential land-use, a self-sufficient city (as near as possible), the mixing of different occupational groups in "neighborhoods," and other sociological and engineering goals.

The above-mentioned goals set by Howard and other planners were adopted without scientific basis, but rather by the philosophy of the controlling interests at that time. Several papers have been written evaluating the success or failure of these goals. Rarely did the papers written on
goal achievement use census material (local or national) to evaluate these goals. As a result most papers on the subject, even today, tend to be essays of evaluation. The statistical evaluations of these goals have been hampered also by the lack of small area census data; however, with information compiled in the British census of 1971, data have now become available.

The status of social class groups in Britain is traditionally based on occupations. Occupational class mixing is the most widely discussed goal in the articles of evaluation of the success and failure of New Towns. The sample census material gives easily available data by which to measure the achievement of this goal. Included in this sample census material are two post-World War II New Towns. The New Towns are Crawley and Hemel Hempstead, located peripheral to the city of London, both of which have been cited as specific examples for the success of social class mixing.

The achievement of the goal of class mixing in the New Towns will be evaluated by two methods. The first method will use the Z-score on small statistical areas within each city to assess possible concentrations of occupational groups. A second method of evaluation will compare the occupational composition of small statistical areas or sub-units of the neighborhood to the occupational composition of the city as a whole. The results derived from the two analyses should make it possible to understand the amount of class mixing
the New Town has achieved.

Yet proximity of different occupational groups does not indicate the extent of social mixing (social class interaction) between the different occupational groups. The information found in the census, however, can give some insight into the success of the achievement of locational mixing which can lead to interaction that is one of the planning goals.
CHAPTER II

A BRIEF HISTORY OF THE DEVELOPMENT OF PLANNING
POLICIES USED IN BRITISH NEW TOWNS

Many of the goals incorporated into English New Towns are based on events which, out of context, may lead to an incomplete understanding of the problems faced by British planners. Therefore, a brief background is needed on the development of the policies of British planning. The role played by each policy in the New Town movement is best understood by tracing the historical development and motivations behind the policy.

The pioneering effort of New Town planning in England finds its roots in a history America does not share. This British history basically revolves around the Industrial Revolution and the laissez faire attitudes of the English middle and upper classes and the industrial capitalists. The development of England as an industrial power is mentioned only to bring into context the rather stark conditions and selected events that influenced English planning theory from the late 1800's to the 1950's.

English Planning Policies and Events from 1800 to 1920

England found power, economic and political, in the exploitation of resources both physical and human. Of the
domestic resources, coal and people were exploited most readily. With the rapid expansion of the industrial base, the need for a high-density, factory-clustered working population (short journey to work) was essential to serve the local needs. William Petersen, writing in the *Journal of the American Institute of Planning*, has gone into more detail on this topic. Petersen's article discusses the growth of the factory towns, the process of class separation occurred dividing cities into exclusive class neighborhoods. Entrepreneurs, middle income, and upper income groups were allowed by both their income and by their economic class status to move from the inner city homes to low density areas at the periphery of the industrial cities. With this separation of classes not only by location, but by Victorian protocol as well, a rather rigid social system was promoted.

This does not mean that as measured against some ideal norm the industrial cities were attractive. This mass migration and the consequent rapid growth of cities was undoubtedly one reason for the great discrepancy between the reality of urban life and the British intellectuals' general perception of it. A change of scale seems to engender a new reality. The same situation acquired a new urgency when the poor and miserable collected in highly visible clusters and, though their proportion may have remained constant or even declined, grew in absolute numbers with the general increase in population.¹

An alternative explanation of the effect of industrialization is that the pre-existing class system was most likely

reinforced by the industrial wealth brought to England. These existing conditions were examined by several prominent Victorian writers including Charles Dickens, Lewis Carroll, and William Wordsworth.

In spite of this exposure, little was done by civic or governmental authorities in the way of reform. The row housing of the "Black Country" and other industrial areas was a recurrent pattern, providing the basic shelter for many of the poor, working classes in Victorian times.

Ebenezer Howard laid down the first English theoretical basis for planning with the publication in 1898 of To-morrow: A Peaceful Path to Real Reform, and republished in 1902 under the more familiar title of Garden Cities of Tomorrow. The Garden City was to be the model of this planning theory. The Garden City was to integrate the "best" of the rural and urban communities. The surrounding agricultural land, an integral part of Howard's model, was to provide the self-sufficiency in food, the need of open and green space, and to promote class interaction. The urban portion was designed to provide shorter journeys to work, better health conditions, and the amenities of city life.

Basically, the urban portion was to have a population of 30,000, with the inhabitants divided into "neighborhoods" (or wards) of 5,000. These smaller "neighborhoods" were to be somewhat self-sufficient and were to depend upon the central city for other higher activities such as theater,
museum, civic functions, and non-everyday shopping. Not only were the wards of the city to be partly self-sufficient economically and socially, but the city as a whole was also to be self-sufficient from the areas beyond its boundaries. This ideal was extended to the proposal of the city to be self-sufficient even with agricultural products.

The model town has a radial pattern and the allocation of land use was to combine the world of the country and the urban amenities. This circular design of the city afforded maximum land-use with residential areas nearing a density of seventeen households per acre (Figure 1). At the center and surrounded by the central park were the main cultural and civic buildings of the Garden City, such as the concert hall, the library, town hall, the theater, the hospital, and the museum and gallery. The Grand Avenue offered large park areas and land for the schools and churches. The industrial zone of the city was to ring the entire urban unit. In the model, the city was to be serviced by a belt rail line that separated the city from the rural land-use, yet served both the agricultural and urban zones.

The selection of the primary school as the organizational center of the wards in Ebenezer Howard's plans developed from the concerns of many of the middle class and other individuals and groups lobbying for urban reorganization. The thought of the time was that education would be one of the keys to unlocking the rigid class system and help in
Figure I

Ebenezer Howard's Garden City

Adapted from the garden city design proposed in Ebenezer Howard, *Tomorrow: A Peaceful Path to Real Reform*, 1898.
the general improvement of the workers' lot.

Ebenezer Howard's theoretical Garden City was a landmark proposal for the statement of several goals set by the planning movement in England. Of these goals, mass education, self-sufficiency, decentralization, and general improvement of urban conditions, and the mixing of social classes are most characteristic of the early planning movement.

The concept of the Garden City gained support and general acceptance and was to become a reality with the establishment of the Garden Cities of Letchworth and Welwyn. The cities, while using many of the concepts proposed by Ebenezer Howard, included modifications offered by Patrick Geddes, Robert Rowntree, and others. These modifications included the clustering of homes into groups, less adherence to a radial pattern, and less—if any—dependency on the surrounding land for self-sufficiency in food, and other minor changes. The success of these "Garden Cities" was limited, in the sense that many technical and social problems had to be solved; for example, the creation of job opportunities, the choice of suitable sites for the city, and a strategy for attracting resident population and an industrial base to the new sites had not been developed.

Bernard Shaw, in the early 1900's, suggested one method for enticing people to the municipality. According to Shaw, the city should own the land outright and rents of homes
could be paid to the local authority at a much lower rate. A method similar to this was adopted by the Garden City Corporation. Even with this total ownership, some of the development was financed by private corporations. Nevertheless, the Garden City movement suffered greatly from economic and social changes in Britain that occurred before, during, and after World War I.

Town Planning in North America: 1916 to 1930

The next developments in the Garden City concept, which later were to affect English planning, occurred in North America. These developments involved the building of two cities—Sunnyside, New York, and Radburn, New Jersey—and the publication of two significant studies on the internal and basic function of the city. The first study, produced by Robert McKenzie, was published shortly before the Sunnyside/Radburn experiment in 1921.

Clarence Perry criticized the organization of the naturally formed residential areas of the city. In turn, he later offered an alternative which did not materialize for another thirteen years (1929). His criticisms of residential areas were based mainly on the absence of boundaries of a central focal point, or of adequate shops and other amenities. Perry thought the problems created by the automobile in the neighborhood had to be reduced by eliminating through traffic, providing parking spaces, and coping with other associated
problems.

Robert McKenzie's series of papers on "The Neighborhood: A Study of Local Life in the City of Columbus, Ohio" provided a keen insight into the workings of the neighborhood. McKenzie relied on the use of a sample survey of a selected neighborhood in the city. What is remarkable about this study is the research and methodology employed by McKenzie as a social scientist. It was most assuredly an advanced study for its time. Although a detailed review of McKenzie's article is not within the scope of this paper, McKenzie did recognize the importance of the structure of his neighborhood study area and the attempts at home and abroad to reorganize and reconstruct the city.

If the neighborhood is ever to be organized as a political or social unit, it is of the utmost importance that the formal superstructure shall be made to coincide as nearly as possible with the natural neighborhood groupings of population. It is a remarkable fact that the most prominent advocates of neighborhood reconstruction have failed to take cognizance of this necessity. It is surely apparent that any effective system of community planning must take into account the divergent attitudes of various community groups; and this is just as important with respect to the locality of groups as it is with respect to the trade union or Chamber of Commerce.²

It is important to note McKenzie's explanation of the "natural" neighborhood:

²Robert McKenzie, "The Neighborhood: A Study of Local Life in the City of Columbus, Ohio, Part II (Continued)," American Journal of Sociology, 27 (January, 1922), 785.
The city neighborhood differs considerably from its traditional prototypes in that it represents a much more selected social group. Economic, racial, and cultural forces, by distributing the population into different residential sections, giving to the city neighborhood an external appearance of homogeneity that is not frequently found in small villages or rural neighborhoods—a homogeneity, however, as we will see later, which is more apparent than real. Racial prejudice, national "clannishness," and class conflicts all function as social forces to give the city neighborhood what self-conscious or solidarity it may possess.3

Thus, McKenzie demonstrated that the neighborhood is a product of many forces among which are ethnic prejudice, ethnic fraternity, discrimination, and economic levels. In Britain, ethnicity was not as significant a factor. However, in British society, one could substitute the word "class" for "ethnic," as class prejudice, class fraternity, and class discrimination do occur in Britain. It would also be unwise to assume that ethnic and class systems were the only forces acting on both the American and British social structure.

McKenzie realized that the planning movement had some rather romantic connotations and duly criticized this type of thinking.

However much we may idealize the values of the social solidarity of the traditional neighborhood and long for their return, the fact remains that social order has changed profoundly from

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3Robert McKenzie, "The Neighborhood: A Study of Local Life in the City of Columbus, Ohio, Part I (Continued)," American Journal of Sociology, 27 (November, 1921), 353-4.
the organic life of the old hamlet or village societies.\(^4\)

Not only did McKenzie realize or attempt to recognize the social forces of the time, but he also foresaw the impact of the automobile on the structure of the neighborhood and the cities.

The seething movements of population show no signs of abating. Community life is ever more mobile and transitory. The modern family is loath to assume any responsibilities which may interfere with its freedom to move when opportunity of occasions arises. It is all a phase of the dynamic economy and social order in which we are now living. With change we undoubtedly lose some of the values which went with solidarity, but, on the other hand, we gain much through the very looseness of the present social structure. Perhaps some of the neighborhood values may be restored by intelligent organization, but there seems to be little ground for belief that dreams of more extreme neighborhood promoters will ever be realized.\(^5\)

The effects of the motor car, as McKenzie saw them, seem to have influenced the later writing of Clarence Perry and others. What McKenzie saw occurring in American society was not to happen to the British until the post-World War II period and the end of rationing, perhaps about 1950.

Radburn, New Jersey, is an example of the use of the neighborhood unit in this type of planning system (Figure 2). The neighborhood is basically a clustered residential area


\(^5\)Ibid.
Figure 2

Neighborhood Design, Radburn, New Jersey

- Commercial
- Open Space
- Residential Dwelling
- Sidewalk or path

Modified from a Neighborhood Plan for Radburn, New Jersey, 1929 by Clarance Stein and Henry Wright.
with one corner of the cluster bounded by the school, the opposite end bounded by flats and shops, and the central spine of the cluster left as open space and park grounds. These neighborhoods were to range in population from 7,500 to 10,000, or enough individuals to support amenities specified in the plan. The school was not planned to function as a point around which to orient the neighborhood. This point is another of the many differences between American and British implementation of the Garden City plan and theory.

The neighborhood unit was bounded by four main roads. Automobile traffic, however, was separated from the pedestrian traffic within the neighborhood by the use of cul-de-sacs (single-outlet streets) lined with residential structures. These cul-de-sacs were to serve not only as streets for local population movement, but also as service streets. The houses were oriented with their fronts facing the street. The main problem with this pattern was that the cul-de-sacs became alleys and difficult to beautify.

Not until 1929 with Clarence Perry's publication of his plans for the neighborhood was the neighborhood concept reviewed with a written discussion and concrete proposal offered for its inclusion in the planning process.6 Perry presented the neighborhood unit as an interrelated functioning

area, i.e., with every allocation of land-use--residential, open-space, or commercial--having a reason for its placement in a particular location (Figure 3).

As a result of this precise land-use plan proposed by Perry, the neighborhood once again became an integral part of the total city. The neighborhood had a definite function, organization, social organization, and political identity. The diameter of the neighborhood was to be from one-half to three-quarters of a mile and was to be oriented around the community center involving the church, school, and a centrally located commons. The population of the neighborhood was suggested to be 5,000 to 10,000, essentially a large enough base to support a primary school and other planned neighborhood amenities. In the neighborhood, small open-spaces and parks were to be distributed throughout, breaking up what would otherwise be a homogeneous residential pattern. Perry included shops and service stations in this design; however, the placement of these amenities was at the edge of the neighborhood, not at the central point. The argument for this distribution was that a large cluster of shops serving two or more neighborhoods lends itself to more competition, but it would seem that these shops would presumably function additionally as foci for inter-neighborhood communications. As a result of this precise land-use pattern, the resulting city or suburb would tend to bear little resemblance to a city or suburb that developed without controls or planning.
Clarence Perry's Neighborhood Design

The arrangement of Perry's neighborhood is similar to the ward pattern proposed by Ebenezer Howard. Both the neighborhood and the ward were to be organized around the primary school, to have their own local amenities (community center, shops, and the school), and to have some amount of discrete identity. Clarence Perry's plan, however, differs in many ways from Howard's. The neighborhood became discrete by road boundaries and was organized radially from its center as opposed to the total city organized in a radial pattern. Major concessions were given to the automobile through the use of roads.

British Planning Policies in the Inter-War and Post-War Years: 1920 to 1947

The effect of World War I--the Great War--was to be felt in almost all parts of England during the inter-war years. The concept of Garden Cities was affected in the sense that it degenerated during this time from an organizing force of self-contained cities to one of a mixed rural-urban suburb and a not-so-mixed economic class settlement. The Planning Act of 1932 consolidated prior planning laws, but did little to correct class separation and sprawling suburbs. What was unusual about this growth of the Garden Suburb was the great numbers of homes built (mostly detached or semi-detached) during this period of time in the London and Birmingham areas. Primary building materials were cheap and easily
available to the builder. This "boom" of building or seeming expansion of the housing market in these areas was a phenomenon that was peculiar mostly to these cities. The rest of Britain, especially the industrial areas of Manchester, Scotland, and Wales, suffered greatly from the depression.

One result of this uneven economic distribution was that planners shifted their concern to regions and away from cities. The redevelopment of the coal industry and other basic industries became the main thrust of planning. The Garden City movement lost many supporters, and more importantly, the sound economic base which supported the mobile industries that the Garden Cities depended upon. The depression and its uneven economic effects on Britain also helped to bring about a synthesis of two dominant planning orientations. The first planning dogma was the containment of urban sprawl and the building of new communities. The second was the attempt to reduce the effects of the depression in certain industrial areas, i.e., a governmental policy of industrial relocation.

The threat of Nazi Germany to Britain, the devastating effects of the depression, and the slow process of isolating Britain from her industrial and agricultural supporters forced the restructuring of the industrial-agricultural base. Between 1937 and 1947, there was a relative explosion of information on theories of, and plans for, several types of planning processes and policies. Each of the major reports
produced at that time played a part in determining, at a later time, the role of the New Town in Britain.

The first report was on population and was more commonly known as the Barlow Commission. The commission was convened in 1937 and reported early in 1940.\textsuperscript{7} The study looked at the growth of the industrial and urban areas in the context of possible war. This orientation, however, pointed out the rather heavy dependency on London and Birmingham in relation to industrial production. The report mentioned immediate and future problems that these areas faced, mainly strategic and social problems in the context of impending war with Germany. Out of this report came the early plans and guidelines for the redistribution of industry and population.

The Barlow Report also emphasized land-use and agricultural needs of England. The report suggested that prime agricultural land should be under the control of the government, and not be reclassified until the developer could prove that the change was in the national interest. Another concern of the report was to devise or advise ways in which land and areas destroyed by the war could be rebuilt. Thus the Barlow Report recommended the control of a needed industrial land-use distribution and provided a second part of an emerging national policy (agricultural preservation).

The Uthwatt Report suggested three main points on land acquisition and development: first, there should be a national central authority whose powers covered all land development; secondly, the state should have the power to purchase land needed for development; and thirdly, the municipality was to be given authority for the compulsory purchase of land required for urban renewal.

From these reports came proposals and projects to cope with both decentralization of industry and population and the preservation of agricultural land. One proposed plan offered by the Modern Architectural Research group (MARS) was that of the linear city. Although this proposal was not warmly received (Figure 4), it was indicative of the degree of innovation which the architects and planners would recommend for the rebuilding and new construction of England's urban landscape.

Not until Patrick Abercrombie made proposals for the rebuilding of areas in the London area were plans for renewal seriously examined. The areas of London that were bombed were the principal topics discussed, in particular the neighborhood of Bethnal Green which later was to be an area for a British sociological study by Ruth Glass (whose study will be discussed later in this chapter). In Abercrombie's

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Great Britain, Expert Committee on Compensation and Betterment (The Uthwatt Committee), Final Report, Cmd. 6386 (1942).
MARS Linear City Proposal, 1942

- Political and Commercial Center
- Western Industries
- Culture Center
- Residential Districts
- Main Passenger Stations
- Secondary Goods Station
- Main Goods Stations
- Railroad

Adapted from Modern Architectural Research Group (MARS) Linear City Proposal, 1942.
1943 County of London Plan,\(^9\) he provided for new development as well as for renewal of English towns. The report stressed two main themes for the reorganization of London. The first was the need for comprehensive controls and the location of industry in the London area. Secondly, the organization of a Green Belt surrounding London was to be developed coincidentally with an active governmental policy of population and industrial decentralization in underdeveloped areas.

But Abercrombie's plans were not wanting for critics. In an article published in Architectural Review, Ruth Glass questioned the neighborhood plans for the renewal of Bethnal Green. It must be remembered that the neighborhood unit was widely accepted as well as the belief in the mixing of classes for the social good.

Socio-geographic differentiation will only disappear, and disappear slowly, as a result of a nation-wide deepening of democratisation. It will continue unless there is considerable industrial and social mobility and a general raising of standards of living. . . . In fact, in areas where such homogeneity is most marked, neighborhood life has developed. . . . Of course, the easiest and most desirable solution to the existing socio-geographic difference in our cities appears to be social mixing within neighborhood units. But it may not be so easy after all. At present neighborliness appears to develop spontaneously in areas of social homogeneity. Moreover, there is a present stubborn resistance to much reshuffling of people.\(^{10}\)

---


Again in 1945 Ruth Glass, J. Tyrwhitt, and David Chapman criticized the use of the well-defined and rigidly patterned neighborhood.

The neighborhood unit was defined as the area in which people met for primary social activities, e.g., education, shopping, and spontaneous social contacts.

It was felt that at the present time it was unlikely that the neighborhood unit would achieve social unity. It would not be assumed at this stage that the people of different income groups, if placed together, would mix, or that if adequate houses and services were provided, a community spirit would develop. It was felt, therefore, that the neighborhood unit should be considered as an elastic rather than as a well defined area; it was even suggested that the term "planning unit" should supersede that of "neighborhood unit."\(^{11}\)

The Government's final planning policy came from an influential report submitted to the London City Council (LCC) in 1945. The Reith Report called for the building of New Towns on Howard's model using the neighborhood concept with class mixing zones of differing population densities, segregation of industry and residential land-uses, and with the city functioning as self-sufficiently as possible.\(^{12}\) This policy was again to be reinforced except with the emphasis on industry of the Distribution of the Industry Act 1945, passed by the British government. A public corporation developing in the New Town (residential and industrial

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\(^{11}\)Ruth Glass, "Social Aspects of Town Planning," Architectural Review, 97 (March, 1945), 64.

zones), using governmental funds and being responsible only to the National government was a later addition by Parliament to the policy of New Town development.

With the passage of the New Town Act in 1946, the design and engineering began on eight New Towns. This act was modified in 1947 by the Town and Country Planning Act, which became the authoritative national planning law. There were three main provisions in the law. The first was that all development rights were nationalized. Second, these rights can be transferred not only to developers, but to the local authorities for both development and redevelopment of lands. Finally, local authorities were given the responsibility to devise and revise, when necessary, development plans.

The Post-World War II New Town Plans

The design of the New Towns was an amalgam of many of the principles and policies of England and America. The New Towns were based on the neighborhood concept, but slightly modified by Alker Tripp and his precinct (an English modification of the Radburn system). The neighborhood unity was further modified by the location at or near the center of all the amenities, i.e., school, shops, "pub," church, and others. Thus, the English neighborhood received an inward orientation rather than Perry's inward-and-outward

\[13\] H. A. Tripp, Town Planning and Road Traffic (London: Edward Arnold, 1942).
orientation. The concept of the combination of countryside with an urban center was also included in the plans. The city was to be self-contained, not dependent on the outside for its economic existence, although the agricultural dependence was allowed. Finally, the neighborhoods as well as the city were to reflect a well-established, mixed economic class structure. Out of these policies and others that governed the design emerged a basic neighborhood unit. One example is located in the city of Crawley (Figure 5). The Crawley plan involves some concessions to the automobile. Yet, little off-street parking and few wide streets were incorporated into the plan. It was assumed by the planners that the populace would either walk or ride the bus to work or shopping. The city depended on the mobile fabrication and service industries for its industrial base. These industries in turn were promoted by and with the use of the trucks and automobile. It is ironic, however, that the planners did not foresee the increase in the mobility of the urban population of England through the use of the automobile.
Figure 5
Langley Green Neighborhood Design,
Crawley New Town

- Residential
- Commercial
- Open Space

Source: Ordnance Survey, Chessington, Surrey, 1963 (Sheet TQ 23 NE Surrey - Sussex).
CHAPTER III

THE LOCATION, DESIGN, AND LAND-USE OF CRAWLEY
AND HEMEL HEMPSTEAD NEW TOWNS

With the end of World War II and the passing of the New Towns Planning Act, the first generation of New Towns began to appear. The New Towns of Crawley and Hemel Hempstead were among these first towns (Figure 6). Both towns have similar developmental backgrounds, although the philosophical, design, and locational aspects are quite different.

Ruth Glass made reference to the possible resistance of the population to the establishment of New Towns and redistribution of population (see footnote 10 in Chapter II). Crawley and Hemel Hempstead Development Corporations had to face this opposition at an early stage in their planning. When the sites for the two towns were selected, the resident population of the small towns already located in the selected areas challenged the impending redevelopment. The established older towns of Crawley and Hemel Hempstead fought legal battles to restrain the establishment of New Towns. Out of this litigation, in effect, came the test case and precedent for national control of New Town development. After a year of court work, the government won its case, and the establishment of the New Towns became a legally recognized function of the government.
Location of Crawley and Hemel Hempstead New Towns
The policy of decentralization of both industry and population of the London area pressured planners to select sites at London's distant periphery. As a result of this, people living in a New Town were expected to earn their livelihood in the New Town instead of London.

The New Town of Crawley

The New Town of Crawley is located in the county of Sussex in the Southern Downs region. The land in the immediate area is relatively flat or gently rolling. Originally two towns occupied the area, Crawley and Three Bridges; however, these two towns were redeveloped and incorporated into the New Town.

The city of Crawley, developed on 6,047 acres of land, had a population of 68,350 in 1971. The town was designed with ten neighborhoods in a radial pattern around the Central Business District (CBD). The population of a neighborhood ranges from 5,000 to 8,000. The land-use pattern for the New Town is shown in Figure 7. The radial pattern is reflected, to some degree, within the neighborhoods themselves. The core land-use of the neighborhood is the neighborhood center. This center includes shops, "pub," school, church, and an activities center. The residential land-use

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1A neighborhood, in the New Towns, is an architecturally defined area or, in other words, an arbitrarily drawn area meeting certain prerequisites that have been established by the architect and/or the Development Corporation.
Figure 7

Land-Use Plan of Crawley New Town

- Residential
- Park and Open Space
- Educational
- C. B. D. and Neighborhood Shops
- Industrial
- Railroad

NEIGHBORHOODS
I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green
is located around the neighborhood center. The industrial zone is concentrated in the northern part of the town with easy access to both the highway and railroad lines. The placement of the industrial area, however, would seem to necessitate a rather long journey-to-work for the worker living in the southern sections of town. The city also functions as a labor source area for the Gatwick Airport.

Plates 1 through 3 are photographs of a representative sample of the types of housing found in Crawley. Plate 1 shows flats for high-income residents. These flats are relatively secluded, but are not isolated. One policy concerning the flats is that only single persons or married couples with no children are allowed to occupy them. Plates 2 and 3 show two types of family housing. Both are of high density units, however, with rather different design philosophies. The housing shown in Plate 2 incorporates the use of open-space whereas that in Plate 3 tends to achieve maximum housing with small open spaces. Plates 4 and 5 show the two predominant types of housing in Crawley, the semi-detached and the town house; generally these houses have two to four bedrooms with a living room facing the street of the cul-de-sac and the kitchen at the rear facing the open space, usually looking across an open space (lawn) and into another kitchen. The most predominant type of home built in this New Town is

The semi-detached home is somewhat akin to the duplex found in America.
Plate 1. An Example of Apartments in Crawley New Town.
Plate 2. Middle Income Flats in the New Town of Crawley.
Plate 5. The English Duplex in the New Town of Crawley.
seen in Plate 5. The design tends to be a "mirror image" duplex, in that one-half of the house is exactly the same as the other. Limited amounts of money spent on diversification of house fronts resulted in a repetition of exterior design in this and other New Towns.

The New Town of Hemel Hempstead

Hemel Hempstead, although sharing a great deal of historic background with Crawley, shows a rather different land-use and planning design. While Crawley and its organization tend to conform to Howard's Garden City model, Hemel Hempstead shows considerable modification of the model.

Hemel Hempstead, in 1971, contained 67,200 people on 5,977 acres. The town's population is divided into ten neighborhoods, with a neighborhood population ranging from 3,000 to 8,000. Many of the neighborhoods tend to be loosely grouped units rather than rigidly well-defined neighborhoods such as those found in Crawley. The land-use plan of the city consists of a Central Business District (CBD), with neighborhoods extending to the west and mainly to the east (see Figure 8). There is a larger secondary neighborhood center located in Bennett's End to help make up for the distance to the central core. There are two industrial zones. The main industrial zone is located in the northeastern part of the city and a second smaller industrial zone is located in the south-central portion of the city (adjacent to the
Figure 8

Land-Use Plan of Hemel Hempstead New Town

- Residential
- Park and Open Space
- Educational
- C.B.D. and Neighborhood Shops
- Industrial
- Railroad

NEIGHBORHOODS
I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

Scale in Yards

200 0 500 1000
railroad). The general design difference between Hemel Hempstead and Crawley is quite evident when the land-use patterns of the two cities are compared.

In Plates 6 through 10 are shown some general views of the city as well as specific housing types. In Plate 6 is a photo of the central core of the city. The central road, passing under the building, is now a pedestrian mall with the principal shopping areas located at either side. In the lower left-hand and the upper right-hand portions of the picture are shown the "newer" types of housing. The upper right periphery of the central core was redeveloped with high density housing.

The land-use composition of one neighborhood, Adeyfield, is shown in Plate 7. To the right and center (within the pictured scene) is a neighborhood center. Shops, playing fields, the "pub," the neighborhood center parking lot, and other service industries are located in this area. The church and school are located in the upper-center portion of the picture. Between the school and the industrial zone, appearing in the lower portion of the picture, are the town houses. To the left and to the far right are the areas of semi-detached homes, with high density flats just to the right of the neighborhood. Plate 8 shows more detail of the design of town homes. Plate 9 shows an example of flats and town house blending. A vista of a street development in the New Town is shown in Plate 10.
Plate 6. The Central Business District (CBD) of the New Town of Hemel Hempstead.
Plate 7. Land-Use in a Neighborhood in Hemel Hempstead.
Plate 8. An Example of Town Houses and Apartment Mixing in Hemel Hempstead New Town.
Plate 10. A Neighborhood Vista in Hemel Hempstead New Town.
This chapter was used to describe the impact of planning theory on the actual engineering and architectural design of the two New Towns. While Crawley follows Ebenezer Howard's Garden City concept, to some degree, Hemel Hempstead shows a great deal of modification of the Garden City concept. With this understanding of the engineering and architectural design of the two New Towns, it is now necessary to put the population of the occupational classes into the Towns. From the analysis of the occupational class composition, it should be possible to discuss the "success" or "failure" of the goal of class mixing.
CHAPTER IV

AN ANALYSIS OF THE OCCUPATIONAL CLASS DISTRIBUTION
IN THE NEW TOWNS OF CRAWLEY AND HEMEL HEMPSTEAD

This chapter is an attempt to evaluate the "success" or
"failure" of the policy of occupational class mixing.\(^1\) While
deciding upon styles of architecture, engineering, and loca­
tions of land-use, the planners of England also assumed the
responsibility for instituting a policy of class mixing. As
pointed out in Chapter I, consequences of industrialization
were that the "lower" and "higher" occupational classes on
the social scale became segregated. The integration of occu­
pational classes, however, was to become the accepted and
implemented policy of planners during the post-World War II
urban redevelopment, the so-called New Town development
period. The two New Towns mentioned in the prior chapter,
Crawley and Hemel Hempstead, are examples of an architectural
approach by planners to achieve occupational class integration.

Although the New Town Planners did not define a specific
desired ratio of classes to be found in the New Town, they
attempted to use, but not always, the national occupational
class composition as a standard for New Town class composi­
tion. As a working definition of "occupational class mixing"

\(^1\)Occupational classes are groupings based upon the
definition of economic classes found in 1970 Classification
was not well developed, and as a comparison of New Towns to unplanned cities would not be a sound comparison, it would seem, therefore, that a comparison of occupational class composition of smaller areas within the New Town to the class composition of the New Town as a whole would be one valid method of evaluation. The basis for this class comparison is the 10-percent sample which was taken as a part of the 1971 Census of England.

To judge the degree of "success" or "failure" of the class integration policy, an analysis of the Census sample data by two methods was carried out. The first method of analysis is the calculation of Z-scores (see Appendix B). This statistical technique was employed to compare the population of a specific occupational group found in a single small area called an Enumeration District (herein referred to as ED), to the mean of that occupational class population.

The Z score is a result of a transformation of an ordinate (individual ED occupational population) statistic. The only use of the Z-score statistic in this paper is to express the ordinate (the individual ED occupational population) statistic as units of standard deviation from the mean (the average occupational group population for the New Town) and, as a result of this expression, areas of abnormally high numbers can be located throughout the New Town.

The second technique used in evaluation is Rodgers'
Index of Diversification\(^2\) (see Appendix C for an explanation and example of the technique). Rodgers' method employs the combining of the nine occupational groups in each ED to thereby produce a diversity index number for each ED. This index number is a summation of the ranked progressive total of the percentage of the ED's population in each of the nine occupational groups. By using the aforementioned ED index in a formula, a relationship between the ED and the New Town as a whole can be quantified, thereby providing a measure of the relative conformance of the occupational structure of each ED to the occupational structure of the New Town.

Occupational Class Distribution in Crawley New Town

The overall New Town occupational group composition is shown in Table 1. The classes comprising Junior Non-Manual Workers and the Foremen, Supervisors, and Skilled Workers account for 49.7 percent, or 26.8 and 22.9 percent, respectively, of the total city employed population. Added to this total is another 18.7 percent of Personal Service and Semi-Skilled Workers, with each of the other classes contributing less than 10 percent to the total.

The distribution of ED's for the New Town of Crawley is shown in Figure 9.

TABLE 1
OVERALL CLASS COMPOSITION OF CRAWLEY NEW TOWN

<table>
<thead>
<tr>
<th>Occupational Group</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>(D) Junior Non-Manual</td>
<td>26.8</td>
</tr>
<tr>
<td>(E) Foremen, Supervisors, and Skilled Workers</td>
<td>22.9</td>
</tr>
<tr>
<td>(F) Personal Service and Semi-Skilled Workers</td>
<td>18.7</td>
</tr>
<tr>
<td>(A) Employers and Managers</td>
<td>9.7</td>
</tr>
<tr>
<td>(C) Intermediate Non-Manual Workers</td>
<td>7.9</td>
</tr>
<tr>
<td>(G) Manual Workers</td>
<td>5.0</td>
</tr>
<tr>
<td>(B) Professional Self-Employed</td>
<td>4.4</td>
</tr>
<tr>
<td>(H) Self-Employed and Non-Professional Workers</td>
<td>2.6</td>
</tr>
<tr>
<td>(I) Armed Forces and Inadequately Described Jobs</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Figure 9
Location of Enumeration Districts in Crawley New Town

NEIGHBORHOODS

I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green
Group A, Employers and Managers

The distribution of Ed's with positive Z-score deviation for Group A, Employers and Managers, tends to be located in the east and west periphery of the New Town (Table 2, Figure 10). This includes the neighborhoods of Pound Hill (I:4, 5, 6, 11), Three Bridges (II:1, 3, 9), Langley Green (V:6, 8), Ifield (VI:3, 5), Southgate VIII:3, 5), and Furnace Green (X:3, 7, 8, 12). There seem to be no apparent localized concentrations in the distribution of this group. When the distribution of this group is compared to the land-use pattern, each of the ED's with positive deviations is located near neighborhood centers or educational areas (see Figure 7).

TABLE 2

CRAWLEY NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP A (Employers and Managers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>7</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>12</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>97</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>7</td>
</tr>
</tbody>
</table>

The notation I:6 refers to the location of the ED. The Roman numeral indicates the neighborhood and the Arabic number indicates the ED within the neighborhood. Hence, the ED I:6 is located in Pound Hill (I) near the central portion of said neighborhood. See Figure 9.
Figure 10

Crawley New Town

Distribution of Z-Scores for Occupational Group A: Employers and Managers

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99

NEIGHBORHOODS

I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green
Group B, Professional Self-Employed  
(Workers and Employers)

The cases of positive deviation for occupational Class B tend to be located in the northeast sector (Pound Hill I:4, 5, 11; and Three Bridges II:1, 4), Northgate (III:6, 8), and in the southwest sector of the New Town (Gossop's Green VII:2, 6, 12; and Southgate VIII:4, 5, 13). See Table 3 and Figure 11. A third concentration is located in the southeast section of the city in Furnace Green (X:1, 4, 9, 11). Each of the ED's recording a high Z-score value, except for VII:12, is located immediately adjacent to educational and neighborhood shopping areas.

TABLE 3

CRAWLEY NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP B (Professional Self-Employed)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>6</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>17</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>110</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>0</td>
</tr>
</tbody>
</table>
Crawley New Town

Distribution of Z-Scores for Occupational Group B: Professional Self-Employed (Workers and Employers)

Enumeration Districts with Z-Scores Greater than 2.0

Enumeration Districts with Z-Scores between 1.0 and 1.99

NEIGHBORHOODS

I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green

Figure 11
**Group C, Intermediate Non-Manual Workers**

The ED's of positive deviation of this occupational class, Group C, tend to be well distributed throughout the city (Table 4, Figure 12). The neighborhoods of Tilgate and Furnace Green (IX:5, 6, 14; and X:4, 7, 8, 9) tend to show a pattern of slight concentration. Other ED's with Z-scores of less deviation are located at the periphery of the city. The one exception is West Green (IV:2) which is located immediately adjacent to the main Central Business District, or CBD. This is the only ED with a high Z-score in Crawley located adjacent to the CBD.

**TABLE 4**

<table>
<thead>
<tr>
<th>CRAWLEY NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP C (Intermediate Non-Manual Workers)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range of Values</strong></td>
</tr>
<tr>
<td>More than 2.00</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
</tr>
<tr>
<td>-1.00 or less</td>
</tr>
</tbody>
</table>
Figure 12

Crawley New Town

Distribution of Z-Scores for Occupational Group C:
Intermediate Non-Manual Workers

Enumeration Districts with Z-Scores Greater than 2.0

Enumeration Districts with Z-Scores between 1.0 and 1.99

NEIGHBORHOODS
I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green
Group D, Junior Non-Manual Workers

Concentrations of Junior Non-Manual workers are found in the northern portions of the city, generally in the neighborhoods of Three Bridges, Northgate, and Langley Green (II, III, and V [see Table 5 and Figure 13]). Although two cases of high deviation occur in Gossop's Green, the majority of the ED's with positive deviation are located in areas adjacent to or near the areas of the industrial zone and the CBD (see Figure 7 in Chapter II). These ED's are within easy walking, driving, or bus distance of the major employing section of the town, the neighborhood of Northgate.

TABLE 5

CRAWLEY NEW TOWN: ED 2-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP D (Junior Non-Manual Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>3</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>22</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>88</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>20</td>
</tr>
</tbody>
</table>
Crawley New Town

Distribution of Z-Scores for Occupational Group D: Junior Non-Manual Workers

NEIGHBORHOODS
I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99
Group E (Foremen, Supervisors, and Skilled Workers) tends to be located in small concentrations in the northern section of town (Table 6, Figure 14). The main concentration of this group is in Langley Green (V:4, 6, 10, 14) and Ifield (VI:5, 12) with other concentrations in Northgate (III:2, 3, 8) and Tilgate (IX:6, 13, 15). The main concentration mentioned above and other smaller concentrations tend to be near the educational and neighborhood centers. For the first time, an ED adjacent to the industrial zone shows a high value (III:2).

**TABLE 6**

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>6</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>13</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>92</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>22</td>
</tr>
</tbody>
</table>

CRAWLEY NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP E (Foremen, Supervisors, and Skilled Workers)
Figure 14

Crawley New Town

Distribution of Z-Scores for Occupational Group E: Foremen, Supervisors, and Skilled Workers

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99

NEIGHBORHOODS

I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green
Group F, Personal Service and Semi-Skilled Workers

The mapped distribution of Group F, Personal Service and Semi-Skilled Workers, tends to reflect a concentration of numbers near both the industrial zone and the CBD (Table 7, Figure 15). One concentration is located at the periphery of the CBD (II:2, 4, 5, 7; and III:2, 3, 7), and the other at the periphery of the city (V:1, 2, 3, 5, 6, 8, 10; and VI:4, 6). While the first concentration is adjacent to the industrial center at the southeastern edge, the second concentration is adjacent or near the western side of the industrial area.

TABLE 7

CRAWLEY NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP F (Personal Service and Semi-Skilled Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>8</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>11</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>94</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>20</td>
</tr>
</tbody>
</table>
Figure 15

Crawley New Town

Distribution of Z-Scores for Occupational Group F: Personal Service and Semi-Skilled Workers

NEIGHBORHOODS
1. Pound Hill
2. Three Bridges
3. Northgate
4. Westgate
5. Langley Green
6. Ifield
7. Gossop’s Green
8. Southgate
9. Tilgate
10. Furnace Green

Enumeration Districts with Z-Scores Greater than 2.0

Enumeration Districts with Z-Scores between 1.0 and 1.99

Scale in Yards
Group G, Unskilled Manual Workers

The ED's for Unskilled Manual Laborers, Group G, are distributed mainly in the northern portion of Crawley (Table 8, Figure 16). The areas of high Z-scores are located in Northgate (IV), Langley Green (V), and Ifield (VI). Other Ed's are scattered about the city with higher Z-scores; however, there are few discernable clusters of ED's of this occupational group. The largest concentration, located in Langley Green, is immediately adjacent to the industrial park, the main road to London, and the neighborhood center. Many of the ED's with positive Z-scores tend to be located near the local amenities.

TABLE 8
CRAWLEY NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP G (Unskilled Manual Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>6</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>22</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>105</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>0</td>
</tr>
</tbody>
</table>
Figure 16

Crawley New Town

Distribution of Z-Scores for Occupational Group G:
Unskilled Manual Workers

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99

NEIGHBORHOODS

I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green
Group H, Self-Employed and Non-Professional Workers

Group H, Self-Employed and Non-Professional Workers, is rather unevenly distributed (Table 9 and Figure 17). This group is concentrated mainly in seven ED's. These high Z-score ED's are found in Pound Hill (I:12), West Green (IV:11), and Langley Green (V:14), Ifield (VI:13, 14), Gossop's Green (VII:8), and in Tilgate (IX:2). A slight concentration is located in Tilgate (IX:1, 2, 7, 8, 11). Other than this, each of the high Z-score ED's is isolated and is not located near other ED's with less positive deviation. There is only a slight relationship between the land-use pattern and ED's with high Z-score values.

Table 9

CRAWLEY NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP H (Self-Employed and Non-Professional Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>8</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>12</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>113</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>0</td>
</tr>
</tbody>
</table>
Figure 17

Crawley New Town

Distribution of Z-Scores for Occupational Group H: Self-Employed and Non-Professional Workers

NEIGHBORHOODS

I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99

Scale in Yards
Group I, Armed Forces and Jobs
Inadequately Described

The last occupational group, Group I (the Armed Forces and Inadequately Described Jobs), shows four areas of clustering (Table 10 and Figure 18). As the numbers of this group are quite small, their role in the total class composition of the city is minimal.

TABLE 10
CRAWLEY NEW TOWN: ED Z-SCORE DISTRIBUTION
FOR OCCUPATIONAL GROUP I
(Armed Forces and Jobs Inadequately Described)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>4</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>12</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>117</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>0</td>
</tr>
</tbody>
</table>
Figure 18

Crawley New Town

Distribution of Z-Scores for Occupational Group I: Armed Forces and Jobs Inadequately Described

<table>
<thead>
<tr>
<th>Neighborhoods</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Pound Hill</td>
</tr>
<tr>
<td>II Three Bridges</td>
</tr>
<tr>
<td>III Northgate</td>
</tr>
<tr>
<td>IV Westgate</td>
</tr>
<tr>
<td>V Langley Green</td>
</tr>
<tr>
<td>VI Ifield</td>
</tr>
<tr>
<td>VII Gossop's Green</td>
</tr>
<tr>
<td>VIII Southgate</td>
</tr>
<tr>
<td>IX Tilgate</td>
</tr>
<tr>
<td>X Furnace Green</td>
</tr>
</tbody>
</table>

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99

Scale in Yards

500 0 500 1000
Summary

Figure 19 shows the spatial distribution of the ED's with high Z-score values. As can be seen, the positive Z-scores are rather dispersed throughout the city. If there can be a clustering pattern (that is, a grouping of contiguous positive Z-scores) identified, there is a possible cluster in Westgate (IV), Langley Green (V), and Ifield (VI). The high values in these ED's are related to a concentration of occupational groups of E (Foremen, Supervisors, and Skilled Workers), F (Personal Service and Semi-Skilled), and G (Unskilled Manual Laborers). The significance of this concentration cannot be evaluated until the overall occupational composition of each ED is analyzed.

From the analysis based on the use of Z-scores, it can be stated that even though there are several ED's with high values to be found in the New Town, no one grouping of ED's tends to form a cluster to the point of excluding other ED's with high values for other occupational groups. The only possible exception as stated earlier may be the ED's in Langley Green (V).

The Diversification of the Neighborhoods and ED's in Crawley

The refined diversification values for the ten neighborhood units in Crawley are shown in Figure 20. The only
Figure 19

Z-Scores: Distribution of Enumeration Districts in Crawley New Town with One or More High Z-Score Values

- Enumeration Districts with Two (2) High Z-Score Values
- Enumeration Districts with One (1) High Z-Score Value
- Occupational Group(s) found in the Enumeration District

NEIGHBORHOODS

I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green

VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green
Figure 20
Refined Diversification Index Scores for the Neighborhoods of Crawley New Town

- Neighborhood with a Least Diversified Index Greater than One (1) Standard Deviational Unit Above the New Town Index

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Index Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Langley Green</td>
<td>1.93</td>
</tr>
<tr>
<td>West Green</td>
<td>7.72</td>
</tr>
<tr>
<td>Gossop's Green</td>
<td>5.31</td>
</tr>
<tr>
<td>Southgate</td>
<td>-7.24</td>
</tr>
<tr>
<td>Tilgate</td>
<td>7.34</td>
</tr>
<tr>
<td>Northgate</td>
<td>14.4</td>
</tr>
<tr>
<td>Three Bridges</td>
<td>6.76</td>
</tr>
<tr>
<td>Pound Hill</td>
<td>-9.17</td>
</tr>
</tbody>
</table>

Three Bridges

<table>
<thead>
<tr>
<th>Field</th>
<th>Name</th>
<th>Index Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Langley Green</td>
<td>1.93</td>
</tr>
<tr>
<td>VI</td>
<td>Ifield</td>
<td>5.74</td>
</tr>
<tr>
<td>IV</td>
<td>West Green</td>
<td>7.72</td>
</tr>
<tr>
<td>VII</td>
<td>Gossop's Green</td>
<td>5.31</td>
</tr>
<tr>
<td>VIII</td>
<td>Southgate</td>
<td>-7.24</td>
</tr>
<tr>
<td>IX</td>
<td>Tilgate</td>
<td>7.34</td>
</tr>
<tr>
<td>X</td>
<td>Furnace Green</td>
<td>-3.38</td>
</tr>
<tr>
<td>I</td>
<td>Pound Hill</td>
<td>-9.17</td>
</tr>
</tbody>
</table>
neighborhood showing any great deviation from the New Town composition is that of Northgate with a refined index of 14.4 (see Appendix C for explanation of scores). This type of neighborhood analysis would seem to indicate that the composition of the smaller individual ED's is greatly generalized in the total neighborhood composition. Prior published analyses of occupational classes in English New Towns by other investigators have dealt either with the city as a whole or only with the broader neighborhood units. Thus, an analysis based on the even smaller ED's would reveal more specifically the locations of occupational groups.

The distribution of the first and second standard deviation units of refined ED indexes is shown in Figure 21 and Table 11. No readily observable clustering pattern is observed.

The three least diversified ED's are II:8, VI:2, and IX:9. The diversity rate for VI:2 has little interpretive value, since only two responses form the sample base for this ED. The other ED's (II:8 and IX:9), however, tend to have a much higher sample count. The diversity rate for these two ED's is 77.2 for II:8 and 71.4 for IX:9. The class or classes that make up the greatest proportion in these ED's are from Group D, E, or F.

The next least diversified ED's (between 1.00 and 1.99 standard deviational units from the mean for the city) are seen in the lower portion of Table 11. Although the pattern
Figure 21
Refined Diversification Index Scores:
Distribution of Least Diversified Enumeration Districts in Crawley New Town

- Enumeration Districts with Least Diversity Indexes
  Greater than Two (2) Standard Deviational Units above the New Town Index Mean
- Enumeration Districts with Least Diversity Indexes
  Greater than One (1) but Less than Two (2) Standard Deviational Units above the New Town Index Mean
- Occupational Group(s) found in the Enumeration District

NEIGHBORHOODS
I Pound Hill
II Three Bridges
III Northgate
IV Westgate
V Langley Green
VI Ifield
VII Gossop's Green
VIII Southgate
IX Tilgate
X Furnace Green
### TABLE 11

LEAST DIVERSIFIED ED’s IN CRAWLEY NEW TOWN
(Ranked According to Least Diversification Indexes)

<table>
<thead>
<tr>
<th>Neighborhood &amp; ED</th>
<th>Refined Index</th>
<th>Group&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(A)</td>
<td>(B)</td>
</tr>
<tr>
<td>II:8</td>
<td>77.2</td>
<td></td>
</tr>
<tr>
<td>VI:2</td>
<td>75.8</td>
<td></td>
</tr>
<tr>
<td>IX:9</td>
<td>71.4</td>
<td></td>
</tr>
<tr>
<td>IV:3</td>
<td>61.8</td>
<td></td>
</tr>
<tr>
<td>VII:11</td>
<td>61.3</td>
<td></td>
</tr>
<tr>
<td>X:10</td>
<td>59.4</td>
<td></td>
</tr>
<tr>
<td>I:15</td>
<td>54.5</td>
<td>X</td>
</tr>
<tr>
<td>VI:7</td>
<td>51.6</td>
<td></td>
</tr>
<tr>
<td>VI:10</td>
<td>51.6</td>
<td></td>
</tr>
<tr>
<td>VII:4</td>
<td>51.6</td>
<td></td>
</tr>
<tr>
<td>VIII:15</td>
<td>51.6</td>
<td></td>
</tr>
<tr>
<td>IV:4</td>
<td>49.7</td>
<td>X</td>
</tr>
<tr>
<td>III:2</td>
<td>49.2</td>
<td></td>
</tr>
<tr>
<td>IX:12</td>
<td>47.3</td>
<td></td>
</tr>
<tr>
<td>VIII:5</td>
<td>46.8</td>
<td></td>
</tr>
<tr>
<td>IX:13</td>
<td>46.8</td>
<td></td>
</tr>
<tr>
<td>III:5</td>
<td>46.3</td>
<td></td>
</tr>
<tr>
<td>V:7</td>
<td>46.3</td>
<td>X</td>
</tr>
<tr>
<td>VIII:1</td>
<td>44.9</td>
<td></td>
</tr>
<tr>
<td>VII:9</td>
<td>44.4</td>
<td>X</td>
</tr>
<tr>
<td>IV:8</td>
<td>43.4</td>
<td></td>
</tr>
<tr>
<td>IV:6</td>
<td>42.9</td>
<td></td>
</tr>
<tr>
<td>VI:4</td>
<td>42.5</td>
<td></td>
</tr>
<tr>
<td>III:9</td>
<td>42.0</td>
<td></td>
</tr>
</tbody>
</table>

| Frequency of Occurrence | 4 | 1 | 1 | 17 | 15 | 9 | 0 | 0 | 0 |

<sup>a</sup>A = Employers and Managers.
B = Professional Self-Employed.
E = Foremen, Supervisors, and Skilled Workers.
F = Personal Service and Semi-Skilled Workers.
G = Manual Workers.
H = Self-Employed and Non-Professional Workers.
I = Armed Forces and Inadequately Described Jobs.
is rather random, there is a slight grouping of least diversified ED's in the central area of the city (between the industrial park and the main Central Business District).

The predominant composition of the ED's is quite consistent: of twenty-one ED's, twenty are a combination of Groups D and E, or only one of the two. Whichever of the occupational classes plays the most important role, its percentage of the total ED population is at least 30 percent or more. Other occupational groups involved in the predominant composition are Group F (six ED's), Group C (two ED's), and Group A (one ED).

The population included in the aforementioned twenty-one ED's (Table 11) is a rather small proportion of the total population for each class. In these twenty-one ED's, only 15 percent of Group D (Junior Non-Manual Workers), 14.6 percent of Group E (Foremen, Supervisors, and Skilled Workers), and 12.5 percent of Group F (Personal Service and Semi-Skilled Workers) are present from each occupational group's total population.

It is difficult to evaluate whether this trend of diversity is local or is similar to that of other New Towns. Thus an analysis of Hemel Hempstead using the same methods will provide an additional perspective. It is, however, possible to say that with slightly over 80 percent of the ED's conforming to the overall composition of the city, it appears that the attempt to socially diversify the residential areas in Crawley has succeeded to a degree.
In Table 12 is shown the occupational class distribution for Hemel Hempstead. Group E (the Foremen, Supervisors, and Skilled Workers) and Group D (the Junior Non-Manual Workers) account for 50 percent of the total city population. This occupational class composition, when compared to that of Crawley, tends to show a slightly lower concentration of Group D (Junior Non-Manual Workers) and a slightly higher population of Group E (Foremen, Supervisors, and Skilled Workers). Yet, it is the predominance of Groups D and E, with the added percentage of Group F (Personal Service and Semi-Skilled Workers), that is most noticeable in this New Town population.

The Enumeration Districts of Hemel Hempstead are shown in Figure 22. The ED's are used again as the basic units of analysis of the study area.
TABLE 12
OVERALL CLASS COMPOSITION OF HEMEL HEMPSTEAD

<table>
<thead>
<tr>
<th>Occupational Group</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>(E) Foremen, Supervisors, and Skilled Workers</td>
<td>25.4</td>
</tr>
<tr>
<td>(D) Junior Non-Manual</td>
<td>24.7</td>
</tr>
<tr>
<td>(F) Personal Service and Semi-Skilled Workers</td>
<td>17.9</td>
</tr>
<tr>
<td>(C) Intermediate Non-Manual Workers</td>
<td>9.0</td>
</tr>
<tr>
<td>(A) Employers and Managers</td>
<td>8.6</td>
</tr>
<tr>
<td>(G) Manual Workers</td>
<td>5.3</td>
</tr>
<tr>
<td>(B) Professional Self-Employed</td>
<td>4.3</td>
</tr>
<tr>
<td>(H) Self-Employed and Non-Professional Workers</td>
<td>2.8</td>
</tr>
<tr>
<td>(I) Armed Forces and Inadequately Described Jobs</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Figure 22

Location of Enumeration Districts in Hemel Hempstead New Town

NEIGHBORHOODS

I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor
**Group A, Employers and Managers**

The distribution of ED's with high Z-scores for Group A, Employers and Managers, shows three areas of concentration (Table 13, Figure 23). The most discernible area is in the southeast, in the neighborhoods of Apsley (I:16) and Leverstock Green (III:3, 5, 6, 8). A second area is located in the Northeast (IV:2) and in Grovehill (VI:4, 8, 13). A third area where this occupational group tends to have ED's of high deviation is in Warner's End (IX:9) and Boxmoor (X:5, 12, 13). These clusters tend to be found in areas of low density that are broken by open space and neighborhood centers.

**TABLE 13**

HEMEL HEMPSTEAD NEW TOWN: ED Z-SCORE DISTRIBUTION
FOR OCCUPATIONAL GROUP A
(Employers and Managers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>8</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>10</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>86</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>17</td>
</tr>
</tbody>
</table>
Figure 23
Hemel Hempstead New Town

Distribution of Z-Scores for Occupational Group A: Employers and Managers

NEIGHBORHOODS
I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

Enumeration Districts with Z-Scores Greater than 2.0
Enumeration Districts with Z-Scores between 1.0 and 1.99

Scale in Yards
Group B, Professional Self-Employed (Employers and Workers), tends to show a more dispersed pattern when compared to the distribution of Group A (Table 14, Figure 24). The ED's with higher Z-score values tend to be located in the southeastern section of the city (Bennett's End, Leverstock Green, Grovehill, and Boxmoor). The Occupational group has the first ED adjacent to the industrial park (VI:6). This type of distribution would seem to indicate a preference by this group to reside near, but not necessarily next to, the industrial park.

TABLE 14
HEMEL HEMPSTEAD NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP B (Professional Self-Employed)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>4</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>15</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>102</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>0</td>
</tr>
</tbody>
</table>
Figure 24

Hemel Hempstead New Town

Distribution of Z-Scores for Occupational Group B: Professional Self-Employed (Workers and Employers)

NEIGHBORHOODS
I Apsley
II Bennet’s End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner’s End
X Boxmoor

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99
The Intermediate Non-Manual Workers (Group C) are located partly in the southeastern portion of the New Town, with several other ED's of positive deviation dispersed throughout the remainder of the town (Table 15, Figure 25). While an ED with a high Z-score occurs in Warner's End (IX:12) and Grovehill (VI:5), the main concentration of ED's occurs in Bennett's End (II:2, 3, 6) and in Leverstock (III:1, 2, 3, 6, 7, 8). In this area are found lower density living (detached and semi-detached homes), schools, and easy access to the highway to London. The most influential factor for this pattern may possibly be that this area is close to the industrial zone, within walking distance, but styled in a more open and rural setting.

### TABLE 15


<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>7</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>13</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>86</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>15</td>
</tr>
</tbody>
</table>
Figure 25

Hemel Hempstead New Town

Distribution of Z-Scores
for Occupational Group C:
Intermediate Non-Manual Workers

NEIGHBORHOODS
I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Govehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99
**Group D, Junior Non-Manual Workers**

Junior Non-Manual Workers are more dispersed than any of the preceding three occupational groups (Table 16, Figure 26). The ED's with high Z-scores are located in widely spaced areas, namely, Apsley (I:6, 11, 13), Leverstock (II:6), Warner's End (IX:5), and Boxmoor (X:13, 15). There may be, however, a slight clustering of this group in Apsley in ED's I:6, 11, 13. The ED's of this group tend to be near neighborhood educational or commercial centers.

**TABLE 16**

HEMEL HEMPSTEAD NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP D (Junior Non-Manual Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>4</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>9</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>85</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>23</td>
</tr>
</tbody>
</table>
Figure 26
Hemel Hempstead New Town

Distribution of Z-Scores for Occupational Group D:
Junior Non-Manual Workers

NEIGHBORHOODS
I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99
The Foremen, Supervisors, and Skilled Workers (Group E) tend to be generally concentrated in the southern half of the city, in small isolated clusters of ED's (Table 17, Figure 27). These clusters are located at the boundary of Apsley and Bennett's End (I:5, 6, 11, 13, 14, 17; and II:4, 5, 7), in the Northeast (IV:6, 7, 8), and in Adeyfield (V:4, 5, 8, 9). Although the last two clusters are not ED's with high deviation Z-scores (greater than 2.00), they tend to be contiguous and located quite near the industrial zone. These two neighborhoods are thus provided with ready access to both the industrial and main CBD zones.

**TABLE 17**

HEMEL HEMPSTEAD NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP E (Foremen, Supervisors, and Skilled Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>3</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>17</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>77</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>24</td>
</tr>
</tbody>
</table>
Figure 27

Hemel Hempstead New Town

Distribution of Z-Scores for Occupational Group E:
Foremen, Supervisors, and Skilled Workers

NEIGHBORHOODS
I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99
Group F, Personal Service and Semi-Skilled Workers

The distribution of Group F, Personal Service and Semi-Skilled Workers, tends to be peripheral to the north-eastern industrial zone (VI:6 [see Table 18 and Figure 28]). This area includes the ED's located in Bennett's End (II:1, 2), the Northeast (IV:5, 8, 10), Adeyfield (V:5), and Grovehill (VI:10). A secondary concentration is located in Boxmoor (X:8, 9, 15, 17).

The above-mentioned distribution would tend to indicate that locations near to, but slightly removed from, the industrial zone attract many families in this occupational class.

TABLE 18
HEMEL HEMPSTEAD NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP F (Personal Service and Semi-Skilled Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>4</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>12</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>80</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>25</td>
</tr>
</tbody>
</table>
Figure 28
Hemel Hempstead New Town

Distribution of Z-Scores for Occupational Group F: Personal Service and Semi-Skilled Workers

NEIGHBORHOODS

I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99
Group G, Unskilled Manual Workers

The Unskilled Manual Workers (Group G) tend to be located throughout the eastern half of the city in ED's II:2, 3, 6 (Bennett's End), IV:3, 9 (Northeast), V:1, 9 (Adeyfield), and in VI:12 (Grovehill). See Table 19 and Figure 29. The relatively higher concentration of this group in the eastern half of the town suggests their preference for housing near or adjacent to the industrial park. This class is by no means the only class having this preference; however, the pattern of this group is more discernible.

TABLE 19

HEMEL HEMPSTEAD NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP G (Unskilled Manual Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>5</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>6</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>78</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>32</td>
</tr>
</tbody>
</table>
Figure 29
Hemel Hempstead New Town

Distribution of Z-Scores for Occupational Group G: Unskilled Manual Workers

NEIGHBORHOODS
I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99

Scale in Yards
Self-Employed and Non-Professional Workers (Group H) tend to show a very slight clustering pattern in the eastern portion of the New Town (Table 20, Figure 30). These slight concentrations are located in Apsley (I:1, 2, 3, 5), in the Northeast (IV:1, 2, 10), and in Grovehill (VI:5, 7, 12, 14). The ED's in the western section of the New Town tend to show no pattern of clustering. Many of the ED's that are away from the CBD or the industrial zone tend to be located near a neighborhood commercial or educational center.

**TABLE 20**

HEMEL HEMPSTEAD NEW TOWN: ED Z-SCORE DISTRIBUTION FOR OCCUPATIONAL GROUP H (Self-Employed and Non-Professional Workers)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>9</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>13</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>99</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>0</td>
</tr>
</tbody>
</table>
Figure 30

Hemel Hempstead New Town

Distribution of Z-Scores for Occupational Group H:
Self-Employed and Non-Professional Workers

NEIGHBORHOODS

I Apsley
II Bennet’s End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner’s End
X Boxmoor

Enumeration Districts with Z-Scores Greater than 2.0

Enumeration Districts with Z-Scores between 1.0 and 1.99
The number of this occupational class, Armed Forces and Jobs Inadequately Described, is small; nonetheless, ED's of this group are scattered throughout the New Town (Table 21, Figure 31). The only area of slight clustering is located in the northwest section of town, notably in Gadebridge (VIII:2, 8) and in Warner's End (IX:2, 3). In addition, one other high value Z-score ED is located in the Northeast (IV:4), with other less positive Z-scores grouped near the central and southeastern portions of the city.

**TABLE 21**

HEMEL HEMPTSTEAD NEW TOWN: ED Z-SCORE DISTRIBUTION
FOR OCCUPATIONAL GROUP I
(Armed Forces and Jobs Inadequately Described)

<table>
<thead>
<tr>
<th>Range of Values</th>
<th>Number of Enumeration Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 2.00</td>
<td>4</td>
</tr>
<tr>
<td>1.00 to 1.99</td>
<td>7</td>
</tr>
<tr>
<td>-0.99 to +0.99</td>
<td>110</td>
</tr>
<tr>
<td>-1.00 or less</td>
<td>0</td>
</tr>
</tbody>
</table>
Hemel Hempstead New Town

Distribution of Z-Scores for Occupational Group I: Armed Forces and Jobs Inadequately Described

NEIGHBORHOODS

I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

- Enumeration Districts with Z-Scores Greater than 2.0
- Enumeration Districts with Z-Scores between 1.0 and 1.99

Scale in Yards

500 0 500 1000
Summary

In Figure 32 is shown the distribution of ED's having high $Z$-score values (greater than 2.00) for the nine occupational groups. What is noteworthy of that map is the relative concentration of high scores in the eastern half, or, more specifically, the southeastern sector, reflecting the possible domination of an area of the New Town by certain occupational classes. The most likely reason for this distribution may be that the eastern half of the city is located near or adjacent to the industrial zone. This would tend to make Leverstock, the Northeast, and Grovehill the more desirable housing locations. The other surrounding neighborhoods of Apsley, Bennett's End, and Adeyfield would appear to be slightly less desirable. This would seem to indicate, if travel distance to work is a selection factor, that the remaining western neighborhoods are less attractive areas in which to live.

The Neighborhood and ED Diversification Levels of Hemel Hempstead

Figure 33 is a map of the distribution of the refined diversity rates for the neighborhoods of the New Town of Hemel Hempstead. Only one neighborhood possesses an index at or over one standard deviational unit over the mean. This neighborhood is Bennett's End. The predominant classes in Bennett's End are Groups E (Foremen, Supervisors and Skilled
Figure 32
Z-Scores: Distribution of Enumeration Districts in Hemel Hempstead New Town with One or More High Z-Score Values

- Enumeration Districts with Four (4) High Z-Score Values
- Enumeration Districts with Three (3) High Z-Score Values
- Enumeration Districts with Two (2) High Z-Score Values
- Enumeration Districts with One (1) High Z-Score Value

Occupational Group(s) found in the Enumeration District

NEIGHBORHOODS
I Apsley  VI Grovehill
II Bennet's End  VII Central
III Leverstock  VIII Gadebridge
IV Northeast  IX Warner's End
V Aseyfield  X Boxmoor
Figure 33
Refined Diversification Index Scores for the Neighborhoods of Hemel Hempstead New Town

Neighborhood with a Least Diversified Index Greater than One (1) Standard Deviation Unit Above the New Town Index

VII Grovehill 5.78
VIII Gadebridge 2.51
IX Warner's End -4.01
X Boxmoor 10.91

VII Central -8.63
V Adeyfield 11.84
IV Northeast 1.11

II Bennett's End 15.11
I Apsley 11.84

III Leverstock -58.7
Workers) and F (Personal Service and Semi-Skilled Workers). The same problem arises in Hemel Hempstead as did in Crawley. This problem is that the neighborhood diversification index tends to mask the composition of the smaller ED's.

The distribution of ED's in the New Town with least diversification is shown in Figure 34 and in Table 22. The ED's showing greatest specialization are located mainly in the northern half of the New Town. Atop this table are found four rather homogeneous (least diversified) ED's. Two of the four least diverse ED's are located at the edge of the CBD, while the remaining two cases are away from the CBD. One ED is located near the industrial zone and the other is located at the southwestern sector of the New Town. The two ED's of this group that have small samples tend to show a different composition than the other members of this group. The two ED's are mainly Group D (Junior Non-Manual Workers), with either Group A (Employers and Managers) or Group C (Intermediate Non-Manual Workers) making up the next largest population. The remaining two ED's, VII:4 and IV:8, have higher response levels and are predominately composed of Groups E and F.

There are fifteen ED's with a measure of diversity ranging between one and two standard deviational units from the mean (see lower portion of Table 22). The ED's of this group tend to fall within three locations in the New Town. The first grouping is located in the southeastern part of
Figure 34

Refined Diversification Index Scores:
Distribution of Least Diversified Enumeration Districts in Hemel Hempstead New Town

- Enumeration Districts with Least Diversity Indexes Greater than Two (2) Standard Deviation Units above the New Town Index Mean
- Enumeration Districts with Least Diversity Indexes Greater than One (1) but Less than Two (2) Standard Deviation Units above the New Town Index Mean
- Occupational Group(s) found in the Enumeration District

NEIGHBORHOODS
I Apsley  VI Grovehill
II Bennet’s End  VII Central
III Leverstock  VIII Gadebridge
IV Northeast  IX Warner’s End
V Adeyfield  X Boxmoor
### TABLE 22

LEAST DIVERSIFIED ED's IN HEMEL HEMPSTEAD NEW TOWN
(Ranked According to Least Diversification Indexes)

<table>
<thead>
<tr>
<th>Neighborhood &amp; ED</th>
<th>Refined Index</th>
<th>Group&lt;sup&gt;a&lt;/sup&gt;</th>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
<th>(D)</th>
<th>(E)</th>
<th>(F)</th>
<th>(G)</th>
<th>(H)</th>
<th>(I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII:4</td>
<td>61.2</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>X:6</td>
<td>58.9</td>
<td></td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VII:3</td>
<td>58.0</td>
<td></td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IV:8</td>
<td>57.0</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>I:10</td>
<td>56.6</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VII:7</td>
<td>55.6</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>VI:6</td>
<td>53.3</td>
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<td>X</td>
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<td>-</td>
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<tr>
<td>X:10</td>
<td>53.3</td>
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<td>-</td>
<td>-</td>
<td>X</td>
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<tr>
<td>I:11</td>
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</tr>
<tr>
<td>II:1</td>
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<td>-</td>
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<td>X</td>
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<td>II:7</td>
<td>50.0</td>
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<tr>
<td>X:11</td>
<td>49.1</td>
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<td>VI:11</td>
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</tr>
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<td>VIII:6</td>
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<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>I:9</td>
<td>39.8</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VI:12</td>
<td>39.8</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>VII:2</td>
<td>39.8</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
</tr>
</tbody>
</table>

**Frequency of Occurrence**

| 2 | 0 | 2 | 12 | 13 | 9 | 2 | 0 | 0 |

<sup>a</sup>A = Employers and Managers.
B = Professional Self-Employed.
E = Foremen, Supervisors, and Skilled Workers.
F = Personal Service and Semi-Skilled Workers.
G = Manual Workers.
H = Self-Employed and Non-Professional Workers.
I = Armed Forces and Inadequately Described Jobs.
the city, that is, I:4, 5, 9, 10, 11; and II:1, 7. Of these ED's, only I:5, 11 and II:1 received high Z-score values. The ED's located in Leverstock Green, many of which had high Z-score values, tended to be diversified when compared to the composition of the New Town. The second concentration is in the Grovehill and Central areas of the New Town. These areas have easy access to the industrial zone and the central core. A third minor location is comprised of three dispersed ED's in the western half of the New Town.

The composition of the thirteen remaining cases, including VI:6 and VII:2, would seem to indicate some relationship between Junior Non-Manual Workers, Foremen, Supervisors, Skilled Workers, Personal Service, and Semi-Skilled Workers, or Groups D, E, and F, respectively. This conclusion is drawn from the fact that thirteen of the fifteen cases are a combination of two or more of the aforementioned occupational groups.

Summary

The ED's with low diversity indexes for the occupational groups in Hemel Hempstead tend to be well distributed throughout the city. There seems to be a slight occupational class domination in some areas of the town. These areas are at the periphery of the industrial zone where Groups E (Foremen, Supervisors, and Skilled Workers) and F (Personal Service and Semi-Skilled Workers) dominate, and in the southern
section of the town where Groups E and F also tend to dominate in a small number of ED's. Groups C (Intermediate Non-Manual Workers), D (Junior Non-Manual Workers), and E (Foremen, Supervisors, and Skilled Workers) tend to dominate in several dispersed ED's in the western sections of the town.

At the level of ED's, Hemel Hempstead would seem to possess a greater degree of diversity than Crawley. At the neighborhood level and in overall composition, both Crawley and Hemel Hempstead are similar. Each New Town has one neighborhood with a low diversity index and both New Towns are similar in their overall occupational group composition.
CHAPTER V

CONCLUSION

The establishment of the English New Towns shortly after World War II was a result of prior experiments in architectural design and social concerns. Ebenezer Howard's *Garden Cities of Tomorrow*, published in 1902, was the fundamental design model for the post-World War II New Towns. This fundamental design model, however, was critiqued, modified, and added to by a series of reports and projects between the turn of the century and the establishment of the New Town system (in the late 1940's).

Contemporaneously with the development of design models, social goals were formalized for the new urban areas. Some of these goals were improvements in the health aspects of the city, consolidation of the industrial base, a reduction of the trip (time and distance) to work, and social class integration.

In this study, an evaluation of social class (classes based on occupational groups) mixing was done by two methods. The first method employed was the Z-score and the second method used was the Rodgers Diversity Index. The results of this analysis can be put into two general categories. The first category of generality deals with the New Towns as a whole and the second category deals with the neighborhoods.
and the sub-units of the neighborhood, the Enumeration Districts (ED's).

Occupational Class Composition of Crawley and Hemel Hempstead

In Chapter IV, it was noted that three occupational groups were present in large numbers in both New Towns. The three occupational groups are Junior Non-Manual Workers; Foremen, Supervisors, and Skilled Workers; and Personal Service and Semi-Skilled Workers.¹

Junior Non-Manual Workers and Foremen, Supervisors, and Skilled Workers when combined account for almost 50 percent of the New Town's employment population. This increases to over 66 percent when Personal Service and Semi-Skilled Workers are added to the total of the other two occupational groups.

The composition of Hemel Hempstead is quite similar to that of Crawley. In Hemel Hempstead the Foremen, Supervisors, and Skilled Workers and Junior Non-Manual Workers account for over 50 percent of the New Town's employment population. The Personal Service Workers account for an additional 18 percent of the employment population.

It is assumed that the types of occupations found in each New Town are directly related to the types of industries

¹Some occupations included in Junior Non-Manual Workers are shop salesmen, police officers, and commercial travelers. Personal Service includes occupations such as valets, barmaids, and waiters. See Appendix A.
located there. In the case of both Crawley and Hemel Hempstead, it would seem that the industrial base of the New Towns is oriented towards service industries and industries requiring some amount of skilled workmanship. What is difficult to evaluate is whether this occupational composition is indicative of New Towns of the same generation, or is limited to these two New Towns. However, it is possible to state that both New Towns share a very similar occupational class composition consisting of large numbers of service industry and trained employees.

Comparison of the Occupational Class Diversity at Neighborhood and Enumeration District Levels in Crawley and Hemel Hempstead

The occupational group composition of the neighborhoods tends to be as diversified, if not more than their respective New Town. Only one neighborhood in each New Town tends to be specialized (homogeneous). In each neighborhood that has some specialization, three occupational groups dominate the employment population: Junior Non-Manual Workers; Foremen, Supervisors, and Skilled Workers; and Personal Service and Semi-Skilled Workers.

While as a whole the neighborhoods tend to be diversified, at their sub-unit level the degree of diversity varies (Enumeration District, or ED). This variance of diversity at the ED level is shown in Figures 35 (Crawley) and 36 (Hemel Hempstead). Each neighborhood contains at least one
Zones of Crawley New Town based on Occupational Class Mixing

- Enumeration Districts with Low Diversity Index Greater than Two (2) Standard Deviational Units over the New Town Index
- Enumeration Districts with Low Diversity Index Greater than One (1) but Less than Two (2) Standard Deviational Units over the New Town Index
- Enumeration Districts with Two (2) High Z-Scores
- Enumeration Districts with One (1) High Z-Score
- Enumeration District in which Two (2) High Z-Scores and a Low Diversity Score of 1.0 to 1.9 occur
- Enumeration District in which One (1) High Z-Score and a Low Diversity Score of 1.0 to 1.9 occur
- Occupational Class (coded)

* (Standard Deviational units above Diversity Score Mean.)

---

**NEIGHBORHOODS**
1. Pound Hill
2. Three Bridges
3. Northgate
4. Westgate
5. Langley Green
6. Langley
7. Portfield
8. Southgate
9. Tilgate
10. Furnace Green
11. Gossop's Green
12. Ilfield
13. Southgate
14. Tilgate
15. Furnace Green
Figure 36
Zones of Hemel Hempstead New Town based on Occupational Class Mixing

- Enumeration Districts with a Low Diversity Index Greater than Two (2) Standard Deviational Units over the New Town Diversity Index Mean
- Enumeration Districts with a Low Diversity Index Greater than One (1) but Less than Two (2) Standard Deviational Units over the New Town Diversity Index Mean
- Enumeration Districts with Four (4) High Z-Scores
- Enumeration Districts with Three (3) High Z-Scores
- Enumeration Districts with Two (2) High Z-Scores
- Enumeration Districts with One (1) High Z-Score
- Enumeration District in which One (1) High Z-Score and a Low Diversity Score of 1.0 to 1.9 Standard Deviational Units over the New Town Mean Index Occur
- Enumeration District in which Two (2) High Z-Score and a Low Diversity Score of 1.0 to 1.9 Standard Deviational Units over the New Town Mean Occur.
- Enumeration District in which One (1) High Z-Score and a Low Diversity Score of Greater than Two (2) Standard Deviational Units over the New Town Mean Index Occur.

NEIGHBORHOODS
I Apsley
II Bennet's End
III Leverstock
IV Northeast
V Adeyfield
VI Grovehill
VII Central
VIII Gadebridge
IX Warner's End
X Boxmoor

Zone 1
Zone 2
Zone 3
ED with a low diversity index and as many as four (the neighborhood of Westgate in Crawley) or five (the neighborhood of Apsley in Hemel Hempstead) ED's with low diversity indexes.

Of interest about these ED's with low diversity is that they exhibit two patterns of distribution. These patterns occur in certain geographic areas of each New Town. These areas have been designated, for convenience, as zones. A zone is based on contiguous neighborhoods having specialized ED's with similar distribution patterns.

The first pattern is found in both New Towns. In Crawley the distribution is found in Zone 1 and in Hemel Hempstead, Zone 2. The characteristic of this distribution is that ED's tend to become more specialized (homogeneous) the closer the ED is to the industrial area or the CBD. The industrial area and the CBD are located in Northgate in Crawley, while the industrial area is located in Grovehill and the CBD is located in the central section of Hemel Hempstead New Town.

The second pattern of Enumeration Districts with specialization is that the ED's are frequently associated with commercial or educational neighborhood centers. This pattern occurs in the two remaining zones of each New Town. The distinction between the two remaining zones in each New Town is the number of Enumeration Districts with specialization. Zone 2 of Crawley and Zone 1 of Hemel Hempstead
have a greater occurrence of ED's with low diversity than does Zone 3 of each New Town.

An Overview of Occupational Class Mixing in English New Towns

The New Towns were able to accomplish the goal of class mixing, even though some specialization of classes did occur, because of each Town's control over providing locations of residence. After a probationary period of employment, a worker was nominated by his employer to the Development Corporation to have his name placed on a list for available housing. The worker was given a choice of two or more homes throughout the city. From this list of available homes, the worker was then expected to select his home. In some special cases highly desirable employees, with pressures from the company, have been allowed more freedom of choice. As a result of these pressures, selected workers have been offered a location of their choice, in some cases even receiving subsidies on their rent from the employer.

The assumption of the planner—and of this paper as well—is that the goal of social class mixing is valid. It was once recommended that the national average for the whole of England should be the guideline adhered to by New Town corporations, but in many regions or sections of the country this would seem to be questionable. For example, does London, Manchester, Birmingham, Bristol, or New Castle follow
or conform to the overall national class composition? It would seem that two factors most closely shape the guideline for the composition of New Towns. The first factor would be the setting of goals for class composition from the regional location of the area to be developed. The second factor would be a consideration of the types of industries to be attracted or developed in a New Town.

The two New Towns in this study tend to have an occupational class composition based largely on service and trained workers. But whatever happened to the objective of using the new urban centers to relieve congested working class communities in older cities? Because of the types of employees needed in New Towns, the demand was for skilled, semi-skilled, and service workers, and this did not alleviate the lot of the lower income occupational groups. The occupational groups overlooked included basic industry and factory workers along with miners—yet these occupational groups were most in need of assistance within the social framework of English society. The industries in which they are employed tend to be deleterious to one's health and, most importantly, characteristically non-mobile. As a result, neither these industries nor the workers in those industries may have been helped and would not realize the benefits of a New Town. As with many ideals; the operationalizing of the goal becomes so difficult that the end result either differs from the original goal, or the goal has been changed greatly to
accommodate the realities of the situation.

It then becomes the responsibility of the planner not only to know his goals and objectives in planning, but also the goals and objectives of the people from whom he is planning. What the planners of England (1900-1950) applied as goals were the goals the planners themselves thought the people of England desired. Yet, these goals became compromised as they were fitted into the reality of the New Town. The skilled and semi-skilled working classes were accepted into the New Town, but what was the status of these classes? Their status was relatively higher in comparison to the manual laborers of the basic and factory industries. Usually the New Town attracted the trained and service industrial worker, but out of necessity to fill the new job positions caused by a very selective industrial base. The need for selected employment groups reflected the specialized industrial base of the New Towns. The industries of the New Towns needed trained and skilled employees.

This paper has shown that although the two New Towns studied were diversified, they did have tendencies or patterns of occupational class specialization. What is needed is further study to provide information on New Towns of the same generation as Crawley and Hemel Hempstead. A further evaluation of the occupational class composition of New Towns should involve their similarity or dissimilarity to their regional or national setting. This additional
information would help to verify or modify the conclusions formed in this thesis on the occupational class mixing found in the two New Towns.
APPENDIX A

TYPES OF EMPLOYMENT USED TO DEFINE
OCCUPATIONAL CLASSES

The following is a partial listing of the types of jobs used in the Census of Britain 1971 to define the occupational classes. The source of this list is a publication of Her Majesty's Stationery Office, 1970 Classification of Occupations.

Occupational Group A: Employers and Managers

Employers.--Persons who employ others in enterprises.

Managers.--Persons who plan and supervise in enterprises. This category also includes people in central and local government, industry, and commerce; farmers who own, rent, or manage farms, market gardens, or forests and have no employees other than family workers.

Occupational Group B: Professional Self-Employed

Self-employed or employers or employees engaged in work requiring qualifications of University degree standards. Included within this category are medical doctors, pharmacists, engineers, town planners, judges, and lawyers.

Occupational Group C: Intermediate Non-Manual Workers

Employees engaged in non-manual occupations ancillary to the profession, not normally requiring qualifications of University degree standard; persons engaged in artistic work and not employing others. Types of jobs within this category are airplane pilots, painters, sculpters, laboratory assistants, nurses, occupational therapists, insurance brokers, and financial agents.

Occupational Group D: Junior Non-Manual Workers

Employees, not exercising general planning or supervisory powers, engaged in clerical, sales, and non-manual communications and security operations, excluding those
who have additional and formal supervisory functions. Included in this occupational class are traffic controllers, radio operators, shop salesmen, street vendors, commercial travellers, and police officers.

Occupational Group E: Foremen, Supervisors, and Skilled Workers

Foremen and Supervisors.--Employees (other than managers) who formally and immediately supervise others engaged in manual occupations, whether or not they themselves engage in such occupations.

Skilled Workers.--Employees engaged in manual occupations which require considerable and specific skills. Jobs included in this occupational class are underground coal miners, electricians, tool makers, plumbers, carpenters, upholsterers, painters, and craftsmen.

Occupational Group F: Personal Service and Semi-Skilled

Personal Service.--Employees engaged in service occupations carrying food, drink, clothing, and other personal needs.

Semi-Skilled Employees.--Workers engaged in manual occupations which require slight but specific skills. Jobs included in the category are housekeepers, matrons, stewards, valets, barmen, barmaids, waiters, assemblers, some textile workers (spinners), bricklayers, postmen, launderers, and hospital or ward orderlies.

Occupational Group G: Manual Workers

Employees engaged in unskilled manual occupations.

Occupational Group H: Self-Employed and Non-Professional

Persons engaged in any trade, personal service, or manual occupations not normally requiring training of University degree standard and having no employees other than family workers.

Occupational Group I: Armed Forces and Jobs Inadequately Described
APPENDIX B

COMPUTATION OF THE Z-SCORE

The Z-score statistic expresses the distance from the mean of an observation in units of standard deviation. The formula for the Z-score (Z) statistic is:

\[ Z = \frac{x_i - \bar{X}}{\sigma} \]  

Where:

- \( x_i \) is the value of the unit observation,
- \( \bar{X} \) is the arithmetic mean of the observations,
- \( \sigma \) is the standard deviation of the statistic.

Below is a hypothetical set of data from which Z-scores will be generated.

Date: Seven (7) observations.
1, 2, 1, 3, 4, 2, 2

The mean for the seven observations is 2.143 with a computed standard deviation (the computation is not shown here) of 0.99103.

For the z-score of the value of \( x_i = 1 \),

\[ Z = \frac{1 - 2.143}{0.99103} = \frac{-1.143}{0.99103} = -1.153 \]

For the Z-score when the value of \( x_i = 2 \),

\[ Z = \frac{2 - 2.143}{0.99103} = \frac{-0.143}{0.99103} = -0.144 = Z \]

For the z-score when the value of \( x_i = 3 \),

\[ Z = \frac{3 - 2.143}{0.99103} = \frac{0.857}{0.99103} = 0.865 = Z \]
For the Z-score when the value of \( x_i = 4 \),

\[
Z = \frac{4 - 2.143}{0.99103} = 1.857 = 1.874 = z
\]

The Z-score of \(-1.153\) shows that the observation value of \( 1 \) is \(-1.153\) standard deviational units below the mean.

The Z-score of \( 1.874 \) shows the observational value of \( 4 \) is \( 1.874 \) standard deviational units above the mean.

The main use of this statistic in the thesis is to show the distance of the observation, whether positive or negative, from the mean.
APPENDIX C

DETERMINATION OF THE RODGERS DIVERSIFICATION INDEX

The Rodgers Diversification Index is a means for indicating the relative position of an individual unit value (a score for a unit made up of a ranked progressive sum) to an overall value (the cumulative score of all individual units). In this thesis, Rodgers' method is utilized to compare the overall degree of diversity of an individual Enumeration District to the class composition of the New Town as a whole.

The scale of diversity ranges from -287.0 to +100.0, with the value of zero (0) indicating the equality of the two compared statistics.

In this study the individual unit value (crude index) is the total of the ranked progressive sum of each occupational class present within the Enumeration District (ED). Thus, a value for the city as a whole can be found by using the ranked progressive sum of each occupational class percentage present in the town as a whole.

Since this thesis deals with occupational classes in two New Towns, an example of the derivation of this index is taken from the paper. The Enumeration District used is that of I:1, found in the neighborhood of Pound Hill in Crawley New Town.

The first step in computing the index is the ranking
(from highest to lowest) of the percentages of the occupational groups appearing in the Enumeration District. This step is shown in Table C-1, columns 1 and 2. The order in which the occupational groups (column 1) appear is dependent upon the percentage of each group found in the Enumeration District (column 2).

<table>
<thead>
<tr>
<th>Occupational Group</th>
<th>Percent</th>
<th>Ranked Progressive Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>24.0</td>
<td>24.0</td>
</tr>
<tr>
<td>A</td>
<td>16.0</td>
<td>40.0</td>
</tr>
<tr>
<td>B</td>
<td>16.0</td>
<td>56.0</td>
</tr>
<tr>
<td>E</td>
<td>16.0</td>
<td>72.0</td>
</tr>
<tr>
<td>G</td>
<td>16.0</td>
<td>88.0</td>
</tr>
<tr>
<td>C</td>
<td>12.0</td>
<td>100.0</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>H</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>I</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Sum Totals</strong></td>
<td><strong>100.0</strong></td>
<td><strong>680.0</strong></td>
</tr>
</tbody>
</table>

The next step is to accumulate the percentages; this is done in column 3 of Table C-1. The value of 680.0 is the crude index value for Enumeration District I:1 in Pound Hill in Crawley New Town.

The same steps are used in calculating the value for the city as a whole. The only difference is that the total occupational percentages are used. This is done in Table C-2.
### TABLE C-2

**CRUDE INDEX FOR CRAWLEY NEW TOWN**

<table>
<thead>
<tr>
<th>Occupational Group</th>
<th>Percent</th>
<th>Ranked Progressive Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>26.8</td>
<td>26.8</td>
</tr>
<tr>
<td>E</td>
<td>22.9</td>
<td>49.7</td>
</tr>
<tr>
<td>F</td>
<td>18.7</td>
<td>68.4</td>
</tr>
<tr>
<td>A</td>
<td>9.7</td>
<td>78.1</td>
</tr>
<tr>
<td>C</td>
<td>7.9</td>
<td>86.0</td>
</tr>
<tr>
<td>G</td>
<td>5.0</td>
<td>91.0</td>
</tr>
<tr>
<td>B</td>
<td>4.4</td>
<td>95.4</td>
</tr>
<tr>
<td>H</td>
<td>2.6</td>
<td>98.0</td>
</tr>
<tr>
<td>I</td>
<td>2.0</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Sum Totals</strong></td>
<td><strong>100.0</strong></td>
<td><strong>693.4</strong></td>
</tr>
</tbody>
</table>

Thus: Column 1 = The ranked order for the occupational groups.

Column 2 = The ranked (highest to lowest) percentages of the occupational groups.

Column 3 = The progressive totals of the percentages.

In Table C-3 is found the hypothetical least diversified ED. This resulting value is used in the formula for a refined diversity index figure.

The compiled index number for ED I:1 is 680.0. This number is only a crude value, in that it is not compared against any standard. This comparison (standardization) is done by comparing the ED index to the city index (the value found at the bottom of Table C-2) and the minimum diversity score (found in Table C-3).
### Table C-3

#### Hypothetical Least Diversity

<table>
<thead>
<tr>
<th>Occupational Group</th>
<th>Percent</th>
<th>Ranked Progressive Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>B</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>C</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>D</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>E</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>G</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>H</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>I</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Sum Totals</strong></td>
<td><strong>100.0</strong></td>
<td><strong>900.0</strong></td>
</tr>
</tbody>
</table>

The formula for this computation is:

\[
\frac{DC_i - CDr}{M1D - CDr} = Rd \times 100
\]

(1)

Where:

- \(DC_i\) is the crude diversity rate for an individual Enumeration District.
- \(CDr\) is the crude diversity rate of the town.
- \(M1D\) is the minimum diversity rate value.
- \(Rd\) is the refined diversity index score.

Hence, the refined rate for ED I I is determined as follows:

\[
\frac{680 - 693.4}{900 - 693.4} = -0.648 \times 100 = -64.8 = Rd
\]

The refined index number, -64.8, would tend to indicate that the ED has greater diversity in occupational groups than the New Town as a whole. The thesis, however, deals with
ED's that tend to be one (1) to two (2) units of standard deviation above the New Towns index. This is done so that areas of class domination can be defined and described.
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